

ESHIA for 2D Seismic Survey Block 4 with extension into Blocks 2 and 3

Master Document

Shell B.V

Project number: 60568938

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Quality information

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ABBREVIATIONS

2D – 2-Dimensional

4WD – Four Wheel Drive

AGS – Albanian Geologic Service

AEWA – African-Eurasian Migratory Water Birds Agreement

ALARP – As Low as Reasonably Practicable

ASA – Archaeological Survey Agency

ASIG – State Authority for Geospatial Information

BTEX – Benzene, Toulene, Ethylbenzene, and Xylene

CAD - Current Account Deficit

CBD – Convention on Biological Diversity

CITES – The Convention on International Trade in Endangered Species of Wild Fauna and Flora

CM – Cultural Monument

Contractor – Seismic Contractor

CR – Critically Endangered

CSBI- Cross Sector Biodiversity Initiative

DCM – Decision of Ministerial Council

EAB – Eastern Albanian Background

EDM - Electronic Distance Measurement

EDT - Elbasani-Dibra-Tetova

EIA – Environmental Impact Assessment

EIA – Environmental Inspection Authority

EHS - Environmental Health and Safety

EMA – EMA Consulting

EMMP – Environmental Management and Monitoring Plan

EN – Endangered

EP – Equator Principles

ERA – Albanian Energy Regulator

ESIA – Environmental and Social Impact Assessment

ESHIA – Environmental, Social and Health Impact Assessment

EU – European Union

GDP – Gross Domestic Product

GHG – Greenhouse Gas

GIIP – Good International Industry Practice

GIS – Geographic Information System

GoA – Government of Albania

GPS - Global Positioning System

HSSE - Health, Safety, Security, Environment

IAGC - International Association of Geophysical Contractors

IAQM – Institute of Air Quality Management

IBA – International Bird (and Biodiversity) Areas

IC – Ionian Coast

IFC – International Finance Corporation

IFI – International Financial Institutions

ILO – International Labor Organization

INCA – Institute for Nature Conservation in Albania

IoCM – Institute of Cultural Monuments

IOGP – International Association of Oil and Gas Producers

INSTAT – National Institute of Statistics

IPIECA – International Petroleum Industry Environment and Conservation Association

ISO – International Organization for Standardization

IUCN – International Union for the Conservation of Nature

KBA – Key Biodiversity Areas

KO – Ohrid-Korca

KP – Kukesi-Peshkopia

LSMS – Living Standards Measurement Survey

LU – Lezha-Ulqini

MIE – Ministry of Infrastructure and Energy

MEI – Ministry of Energy and Industry

MTE – Ministry of Tourism and Environment

NAPA – National Agency of Protected Areas

NANR – National Agency of Natural Resources

NATO - North Atlantic Treaty Organization

NEA – National Environmental Agency

NGO – Non-Governmental Organizations

NUTS - Nomenclature of Territorial Measuring Units for Statistics

OECD – Organization for Economic Cooperation and Development

PA – Protected Areas

PAI – Project Area of Influence

PETN – Pentaerythritol Tetranitrate

PHI – Public Health Institute

PM – Particulate Matter

PL – Periadriatic Lowland

PP – Peja-Prizreni

PR – Performance Report

PS – Performance Standards

PSA – Production Sharing Agreements

PSC - Production Sharing Contract

PPNEA – Preservation and Protection of Natural Environment in Albania

Q2 – Second Quarter

QSUT – University Hospital Center

RBMP – River Bank Management Plan

RDCH – Regional Directory of Cultural Heritage

RDPA – Regional Directory of Protected Areas

REA – Regional Environmental Agency

RLA – Red List of Albanian

SAC – Special Area of Conservation

SEA – Strategic Environmental Assessment

SEP – Stakeholder Engagement Plan

SGS – Société Générale de Surveillance (French for General Society of Surveillance)

SK – Skopje Skopje

SP – Social Performance

SPA – Specially Protected Area

SPS - Social Performance Standards

ST – Shkodra-Tropoja

SUA - Shell Upstream Albania B.V.

TAP – Trans Adriatic Pipeline

TIA - Tirana International Airport

TNT – Trinitrotoluene

UNECE – United Nations Economic Commission for Europe

UNESCO – United Nations Educational, Scientific and Cultural Organization

UNFCCC – United Nations Framework Convention on Climate Change

VU – Vulnerable

WHO – World Health Organization

WRA – Water Regulatory Authority

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ESHIA for 2D Seismic Survey Block 4 with
extension into Blocks 2 and 3

Project number: 60568938

1. Introduction

1.1 Purpose and objective of the ESHIA

The purpose of the Environmental, Social and Health Impact Assessment (ESHIA) is to inform the project developer on sensitivities, concerns and potential impacts in order to design appropriate mitigation measures (including change of design) and to inform decision-makers and the public of the environmental impacts associated with the 2D Seismic Survey, Onshore Albania Project (the Project). The seismic survey will be used by the Project proponents to evaluate the hydrocarbon potential of the survey area and inform the potential survey locations of exploratory drilling activities. The project proponent, Shell Upstream Albania B.V. (SUA), has commissioned AECOM Infrastructure and Environment UK Limited (AECOM) as lead consultant to undertake the project ESHIA. AECOM has been assisted by Albanian consultant, EMA Consulting (EMA).

An Environmental Declaration is required for the Project to satisfy Albanian permitting requirements under the Law No. 10440/2011 "On Environment Impact Assessment". Furthermore, the ESHIA for the proposed seismic survey is required under Shell's Impact Assessment Manual in the Health, Safety, Security, Environment and Social Performance (HSSE and SP) Control Framework. The Project is being developed in alignment with the provisions of the International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability, and as such, this ESHIA has been prepared to comply with IFC Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts.

This ESHIA considers all the activities and facilities that are directly owned, operated or managed by the project proponent (including by contractors) and that are a component of the project. This document presents the findings of the environmental, social and health impact assessment (ESHIA) for the Project. It has been prepared to meet the Albanian regulatory requirements relating to the protection and improvement of the environment, and to support permitting of the proposed works.

The ESHIA process has been undertaken in accordance with the national regulatory requirements, Shell's corporate policies and procedures, as well as good international industry practice defined in the International Finance Corporation (IFC) Environmental and Social Performance Standards (SPS) (IFC, 2017)¹. The step by step process is outlined in Figure 1-1 below.

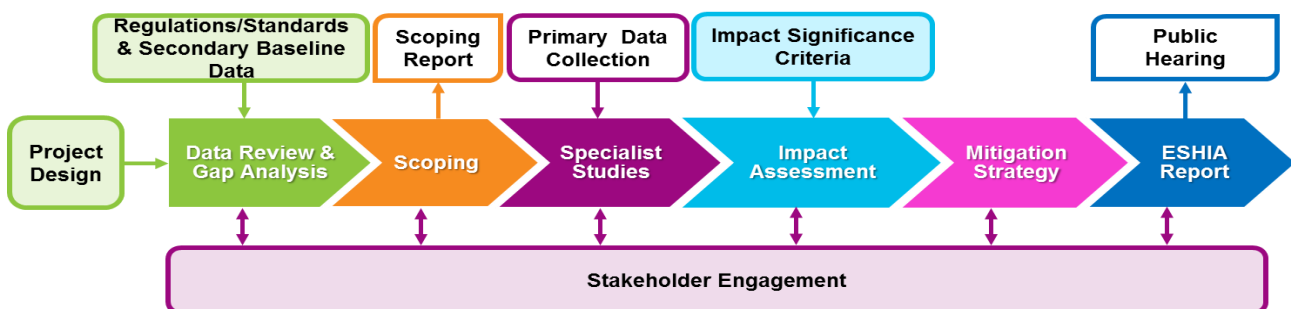


Figure 1-1 ESHIA Process Flowchart

¹ IFC (2017) - Environmental, Health, and Safety (EHS) Guidelines for Onshore Oil and Gas Development. Draft 2017, International Finance Corporation, World Bank Group

1.2 Legal and Institutional Framework

This section outlines the national policies, laws, regulations, standards and guidelines, as well as international conventions (to which Albania as a sovereign state is a signatory) that apply to the environmental, health, safety, human rights and social aspects of the Project. The requirements stipulated within this framework encompass all aspects of the Project. The specific objectives of the regulatory framework review are:

- to identify policies, laws and regulations applicable to the environmental, health, safety, human rights and social aspects of the Project, and to the conduct of the Environmental, Social and Health Impact Assessment (ESHIA);
- to identify environmental standards prescribed under national legislation that shall apply to the Project (Section 1.2.1);
- to identify international conventions to which Albania is a signatory that shall apply to the Project (Section 1.2.2)
- to identify approvals, licenses and permits required for the Project as stipulated under national legislation (Section 1.2.3);
- to highlight the Project Proponent's internal rules and standards applicable to the Project (Section 1.2.4);
- to address alignment of Albanian legislation with European legislation (Section 1.2.5); and
- to identify applicable international best practices and standards (Section 1.2.6)

1.2.1 National legal framework and environmental approval process

The Albanian Constitution, approved in 1998, calls upon the Albanian authorities to preserve a healthy environment, ecologically suitable for present and future generations (Chapter V, on social objectives). To achieve this, the Government must further improve and complete the legal and institutional framework covering the environment, nature and biodiversity protection². The Ministry of Tourism and Environment (MTE) is a department of the Albanian Government in charge of regulation concerning the environment, the sustainable use of natural resources, promotion of renewable resources, protection of nature and biodiversity, sustainable development and management of forestry and pastures, and the quality monitoring of water resources.

The MTE develops and proposes policies, strategies and action plans for the protection and management of the environment, forestry and water resources, improving the quality of life. This is achieved by participating, promoting and coordinating activities that lead to the development of long-term welfare and nature protection policies and raising public awareness.

At the regional level, environmental protection agreements take place between the Regional Directory of Environment, and the Regional Inspectorates of the Ministry of Agriculture and Food and the Health Inspectorate of the Ministry of Health³. Each region of Albania has a Regional Environmental Directory (RED) (i.e. 12 in total), which are responsible for implementing and enforcing legislation; carrying out site inspections; controlling operating facilities and the use of natural resources within their regions; taking part in environmental permitting for new activities; and supporting environmental monitoring and assessments. REDs also participate in the public consultation process and are consulted by the MTE on environmental permit applications in that region.

The Environmental Inspection Authority of the Environmental Inspectorate under MTE is the main governmental authority responsible for monitoring and enforcing compliance with environmental regulations and permits. Industrial projects are required to conduct environmental monitoring in accordance with the terms of their environmental permit. The principal monitoring indicators typically include air emissions, wastewater effluent quality and recently noise levels. The environmental permit establishes monitoring frequency and reporting requirements. These reports are submitted to the applicable RED.

² https://www.unece.org/fileadmin/DAM/env/epr/epr_studies/albania.pdf

³ https://www.unece.org/fileadmin/DAM/env/epr/epr_studies/albania.pdf

1.2.1.1 Environmental legal framework for environmental impact assessment

Albania has specific legislation requiring the need for an environmental impact assessment. The 2002 Law on Environmental Protection established environmental protection requirements, including the requirement to conduct an Environmental Impact Assessment (EIA) and to obtain an environmental permit before initiating a project. It establishes monitoring requirements to identify project impacts during operations and rehabilitation requirements during the project closure phase. The law was appealed by Law No.10431/2011 (from 09/06/2011), which aims to mirror European Union Directives and best practice towards environment management. The 2011 Law on Environmental Protection establishes the environmental protection framework, institutional framework and competencies, environmental impact assessment principles and environmental permitting⁴. It defines activities affecting the environment as “any economic and social activity that uses the environment or part of it, or that discharges materials and energy by changing its characteristics”. The framework and procedural legislation relevant for the undertaking of an EIA is provided in Table 1-1.

Table 1-1 Albanian legislation for an EIA

Legislation	Overview	Relevance to the Project
Law No. 10431 (09.06.2011)	“On Environmental Protection” – This law establishes the environmental protection framework, institutional framework and competencies, environmental impact assessment principles and environmental permitting. The law is based on European Union principles and best practice toward environment management.	It is required that an Environmental Impact Assessment (EIA) is conducted and an environmental permit obtained before initiating the Project. It establishes monitoring requirements to identify project impacts during operations and rehabilitation requirements during the project closure phase.
Law No. 10440 (07.07.2011)	“On environmental impact assessment” (as amended), sets the principles of an EIA, determines the project categories with environmental impacts, and establishes the responsibilities and rights of institutions and public in the EIA procedure. The law determines the competencies of National Environmental Agency (NEA) in the procedure, review of EIA report and final approval.	The ESHIA for the Project will be submitted to NEA for approval.
Law No. 10448 (14/07/2011)	“On Environmental Permit” defines the terms and conditions for granting environmental permits to industrial operators and determines measures for the prevention and control of pollution emissions and the safe management of chemicals. Generally, the objective of the regulatory regime is to: prevent environmental damage; comply with health and environmental standards; and protect against any residual liability.	Environmental Declaration applies for the Seismic Survey (regulated under law 10440/2011)
Decision of Ministerial Council (DCM) No.686 (29.07.2015)	“Approval of rules, responsibilities and timeframe of the environmental impact assessment procedure” - The act sets specific and detailed rules for the procedure, framework of EIA report and appendices, timeframe of the procedure, application for approval, final decision and impact monitoring and reporting during the project execution.	The ESHIA report has been prepared in accordance with this DCM.
DMC No. 247 (30.04.2014)	“Rules for public information and involvement in the environmental decision-making procedure”.	Stakeholders will be engaged/consulted throughout the ESHIA process; a Stakeholder Engagement Plan (SEP) has been developed and implemented.

⁴ https://www.unece.org/fileadmin/DAM/env/epr/epr_studies/albania.pdf

1.2.1.2 Environmental approval procedure

All projects with potential impact on the environment shall undertake an Environmental Impact Assessment prior to starting the implementation. The EIA report and other necessary documents will be submitted to the Ministry of Tourism and Environment who will transfer the project files to NEA for review. The project shall be approved with Environmental Decision/Declaration of the National Environmental Agency. The procedure of EIA is detailed in DCM No.686 dated 29.07.2015 "Approval of rules, responsibilities and timeframe of the environmental impact assessment procedure".

The EIA procedure flowchart is illustrated in Figure 1-2. Based on the legal requirements of Law No.10440/2011, the proposed 2D Seismic Survey is listed under Annex 2 (Point 2 – Extracting Industry, 2.4-Deep Drilling Activities) and requires a 'Preliminary EIA' process rather than a comprehensive 'in depth' EIA process. However, this project is classified to require a full EIA based on; previous classifications and procedures for such projects, and meetings with EIA officials during the first round of stakeholder engagement. Although Albanian legislation requires an EIA, a more comprehensive Environmental, Social and Health Impact Assessment (ESHIA) report will be prepared to satisfy the project proponent's and IFC requirements.

According to Law No.10440/2011 (Article 11), at the conclusion of the EIA process, NEA will decide if an Environmental Declaration will be issued or if further studies are required (i.e. and 'in depth' EIA is required). It is anticipated that at the end of the EIA process, an Environmental Declaration will be issued by the Ministry; hence an application to MTE will be made for an Environmental Declaration. The documents required to be submitted to MTE along with the application for the Environmental Declaration include:

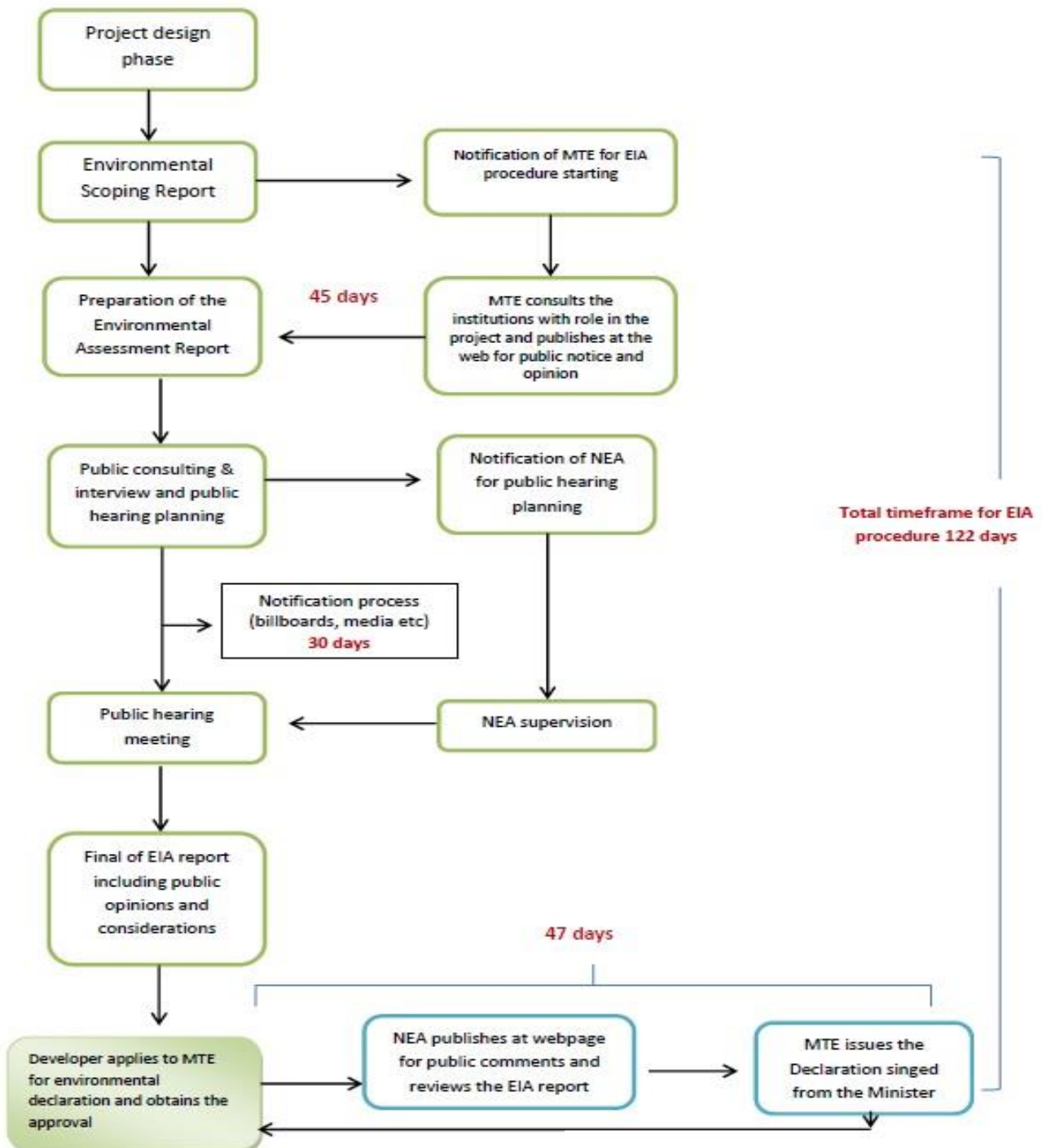
- Full ESHIA report
- Non-technical Summary
- Technical report summarizing the project
- A summary of consultation process with the public and other stakeholders, conducted during the ESHIA process
- A copy of the payment of the service fee as defined in the relevant legislation

National institutions with role during the ESHIA process include:

- The Ministry of Tourism and Environment
- The National Environmental Agency
- Regional Directory of Environment
- National Agency of Protected Area
- Regional Administration of Protected Areas
- Municipality of Gjirokastra
- Municipality of Permeti
- Municipality of Libohova
- Municipality of Kelcyra
- Municipality of Dropulli
- Municipality of Tepelena
- Municipality of Memaliaj

1.2.2 National Albanian Legislation

In addition to the legislation specifically pertaining to the need for an EIA, there are national policies, laws, and regulations applicable to the proposed Project and its environmental and social aspects. Furthermore, Albania has developed environmental standards that are mainly based in the European Commission Directives. Existing standards include: protection of the biodiversity; cultural heritage, air emissions; noise levels; water quality and discharge, and waste management.

Figure 1-2 Albania's EIA Procedure Requirements⁵⁵ based on DCM 686/2015

1.2.2.1 Protection of Biodiversity Framework

The MTE is responsible for natural resources conservation and management in Albania, including the protection of the environment, forest resources, biodiversity, pastures and watercourses. Biodiversity within Albania is protected by specific legislation and practical means as establishment as a system of Protected Areas (PAs). Albanian legislation for the protection of biodiversity and relevance to the Project is summarized in Table 1-2

The central government is currently restructuring and decentralizing the administration and management system of nature conservation focused mainly in the forest resources and pastures. The aim is to strengthen the existing policy and regulatory framework; create a more effective PAs administration; enable participation and active involvement of local governments in the management of PAs, Forest Areas and pasturelands; facilitate appropriate training of administration staff; and provide financial support and technical assistance for PAs management and biodiversity conservation.

Table 1-2 Albanian legislation on biodiversity relevant to the Project

Legislation	Overview	Relevance to the Project
Biodiversity		
Law No. 9587 (20.07.2006)	"On the Protection of Biodiversity" (as amended) – This law establishes requirements for the preservation and protection of biological diversity, including protected area and species, sensitive habitats and species. The law requires a biological assessment as part of environmental assessment and collection of all relevant data for the decision-making process.	The ESHIA baseline characterization of biodiversity in the Project Area includes a description of protected areas, sensitive habitats and species based on a desk top review of available literature supplemented by data collected as part of the baseline field studies. The impact assessment considers potential impacts to biodiversity and proposes mitigation measures for the protection of biodiversity.
Protected Areas		
Law No. 81/2017	"On Protected Areas" – This law governs all matters related to Protected Areas in Albania. It determines the categories of the protected areas in Albania, management rules and roles on decision making process. It requires compliance with the specific rules when accessing and working in the protected areas.	The Project will be undertaken in protected areas. The seismic activities will comply with rules set forth for the protection of the protected areas.
DCM No. 1631 (17.12.2008)	The proclamation of Bredhi i Hotoves – Dangelli as a "National Park	The Project will be undertaken within this protected area; only geophone activity will be undertaken in this area.
DCM No.354 (2.3.2015)	On expansion and proclamation of Natural Park of Zagori	The Project will be undertaken within this protected area. Some seismic lines will go through this park.
DCM No.676 (20.12.2002)	"On Declaration of the natural monuments protected area of Albanian" defines the natural landmarks in the country and district level that should be protected by various activities.	Natural monuments have been identified in the Project Area. Mitigation measures for the protection of the national monuments have been proposed.

Legislation

Overview

Relevance to the Project

Ordinance No. 1280,
dated 20.11.2013

Lists the status of the conservation for flora
and fauna species in Albania

Species of conservation interest are
identified and mitigation measures have
been proposed.

Law No. 81/2017 “On Protected Areas” defines the different categories of the Protected Areas in Albania and their management prescriptions. Albanian Law No. 81/2017 on PA defines 7 categories of PA, each with varying degrees of protection that have been found to be present in the study area:

- Strict Nature Reserve (Category I)
- National Park (Category II)
- Natural Monument (Category III)
- Municipal Natural Park (Category IV)
- Protected Landscape (Category V)
- Protected Area of Managed Resource (Category VI)
- Protected areas of international interest (no specific protection category)

The category designation does not necessarily define the protection afforded to a protected area. Additional information on protected areas in the Study Area is provided in **Chapter 4 Baseline**.

1.2.2.2 Protection of Archaeological Resources Framework

Albania is rich in archaeological resources. Relevant authorities comprise the local government offices, the Archaeological Survey Agency (ASA)⁶ and the Institute of Cultural Monuments (IoCM). ASA and IoCM are responsible for assessing the archaeological value of the objects found and determining whether work may continue or whether work must remain suspended until further ground investigations have been undertaken. The local authorities may also decide on any necessary changes or total suspension of work to preserve the objects found. All matters relating to protecting cultural heritage in Albania are governed by 27/20187 “On cultural heritage and museums”. Important definitions of Article 5 of Law 27/2018 include:

- “Cultural heritage” are the cultural assets, material and non-material of one individual, group or society inherited from the past to the present time and that will be transmitted to the future generations in order to express their identity, knowledge, tradition, beliefs and landscape cultural assets”. Material cultural assets (tangible) comprises the mobile and non-mobile assets of artistic, archaeological, architectonical, urban, ethnographic, archivist, bibliographic and other defined as assets of the civilisation values/history.
- Non-material cultural assets” (non- tangible) comprises the non-material cultural values such as practices, expressions, knowledge, tools, objects, artefacts and cultural spaces that are established and accepted as part of

Additional information on Cultural Heritage is provided in **Chapter 4, Baseline**. Legislation for the protection of cultural heritage and relevance to the Project are summarized in Table 1-3.

⁶ Formerly known as Institute of Archaeology (IoA)

⁷ Adopted in 17.05.2018

Table 1-3 Legislation for the protection of cultural heritage

Legislation	Overview	Relevance to the Project
Cultural Heritage		
Law 27/2018 (17.05.2018)	All matters relating to cultural heritage in Albania are governed by this law". The law defines the preservation and chance finds procedures (archaeological objects or items of cultural heritage value which are discovered by chance) to be used during Project implementation.	Cultural monuments have been identified within the seismic corridors. The ESIA proposes mitigation measures for the protection of the cultural heritage. A 200m buffer zone around cultural monuments will be adopted.
Article 146 of the law	Requires and obliges any persons who discover or excavate objects of cultural heritage value by chance during construction works to suspend work immediately and inform the relevant local authorities within three days. The relevant local authorities consist of the local government office (municipality), the Police Department and the Regional Directory of Cultural Heritage (RDCH) The RDCH verifies the situation/findings and reports to the Institute of Cultural Monuments (IoCM). These institutions are responsible for assessing the archaeological value of the objects found and determining whether work may continue or whether work must remain suspended until further ground investigations have been undertaken.	A chance finds procedure will be developed and implemented during the course of the seismic survey and in the event of a chance find, the authorities will be notified as required. The local authorities responsible for the preservation, restoration, and management of cultural monuments are the RDCH under the authority of Ministry of Culture. The regional directorate that applies for this project is Gjirokastr County RDCH.
Article 5, paragraph 64 and article 31	Defines the conservation of non-material cultural heritage by measures that aim of long lasting preservation of such cultural assets	The project has identified non tangible (non- material) cultural assets The Regional Directorates of Culture Heritage (RDCHs) is the local authority with a special unit for the preservation of the non-material assets and public education for this heritage.

1.2.2.3 Protection of physical environment framework

Albania has promulgated legislation for the protection of the physical environment including guidelines, thresholds and limits for emissions. Legislation related to water, air, noise, vehicle and equipment emissions, fuel quality, waste and wastewater is summarized in Table 1-4.

Table 1-4 Legislation related to protection of the physical environment

Legislation	Overview	Relevance to the Project
Water		
Law No. 111/2012	"On the integrated management of the water resources" based on Directive 2000/60/EC Water Framework. The aim of the law focuses on: (i) environmental protection and improvement of water, surface water, either temporary or	Where for purposes of protection of water and aquatic ecosystems it is necessary to undertake special protection measures, protected areas shall be determined, based on this Law and other specific laws. Protected areas may include the following: a) sanitary protected zones for potable water; b) areas for

Legislation

Overview

Relevance to the Project

	permanent, internal sea waters, territorial waters, exclusive economic zones, continental shelf, trans-boundary waters, groundwater, and their status; (ii) security, protection, development and rational utilization of water resources, protection of water resources from pollution etc. This law provides the definition of water bodies and sets some protection and use restrictions and requires others to be approved by several by-laws. The law defines the banks of the water resources, restriction of certain harmful construction activities in the banks⁸/shores and water protection areas.	fish and shellfish farming, according to the fishing legislation; c) areas for bathing and recreation; d) areas prone to eutrophication and areas vulnerable to nitrates; and e) areas intended for protection of humans, plants or animals or habitats where maintaining or improving water status is a significant element for their protection. The Minister, acting on a proposal of the River Basin Councils, shall designate protected areas. No River Bank Management Plan (RBMP) has yet been adopted for the Vjosa River Basin (the river within the project area); the water protection areas are not defined yet. Mitigation measures for the protection of groundwater and surface water quality have been proposed.
DCM No. 177 (31.3.2005)	2005 "On Polluted Water Discharge Norms" provides for the protection water resources.	All liquid effluents must comply with Albanian standards and regulations for quality, temperature and odor before being discharged to the environment. The water emissions norms related to the project are regulated only from discharge norms with respect to the construction of the fly camps. It shall be noted that there are no norms for small waste water discharge facilities and current norms consider only community discharge norms after treatment in a specific plant. Currently, there are no specific norms for discharges of small agglomerates (as might be the camps with less than 200 workers). In the absence of such emission norms for the project, an international norm or regulation can be applied but this shall be agreed with authorities through a clarification procedure for (potential) field camps installations and management.
DCM No. 379 (25.5.2016)	"The regulation⁹ of drinking waters". Its objective is to protect human health from adverse effects of any contamination of water intended for human consumption by ensuring that it is wholesome and clean. Regulates several issues related with, testing of drinking waters and protection zones around water well or community ground water deposit. The regulation sets three protection zones (buffer zones) from ground water well or water deposit places on the ground. The immediate zone of protection ranges from 15 to 100 m from the axe of the well or the deposit. The precise distance is set based on the evaluation of the geological formations by the hydrogeological expert. The second and third buffer zone are circling the first one, for those zones the regulation do not set any distance criteria but restricts the activities that can impact the water quality	The standard set by this regulation (immediate zone of protection) has been considered in the ESHIA and appropriate mitigation measures have been proposed.

⁸ **Banks** are strips of land adjoining seas, lakes, reservoirs, lagoons, ponds, rivers and streams which comprise a minimum of two areas of land: i. 5 meters at a right angle upper edge of the natural banks on steep banks and 20 meters from the maximum water level over a period of 25 years on flat banks, which can be used, on the basis of special provisions, for public purposes, ii. 100 meters at a right angle from the upper edge of the natural banks on the steep banks, and 200 meters from the maximum water level over a period of 25 years on flat banks, where every activity undertaken will be determined by the water authorities.

⁹ Based on Council Directive 98/83/EC of 3 November 1998 on the quality of water intended for human consumption) concerns the quality of water intended for human consumption.

Legislation

Overview

Relevance to the Project

such as disposal or burial of waste, mining etc.

Air

Law No. 162 (04.12.2014 enforced by the January 2018)	"On protection of ambient air quality", fully transpose Directive 2008/50/EC on ambient air quality and cleaner air for Europe, as well as Directive 2004/107/EC relating to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air. This Law entered in force in 1 January 2018 and provides the institutional framework, regulations, roles, penalties to ensure compliance. The law stipulates that natural and legal persons, public or private, native or foreign, have a duty to keep the air clean and protect it from pollution caused by the activities they conduct in the territory of the Republic of Albania	Mitigation measures to limit the impact of project activities have been proposed in the ESHIA.

Vehicle Emissions

Guideline No. 6527 (24.12.2004)	Minister of Environment and Minister of Transport "Over the permissible values of the elements of air pollutants from the environment and noise emissions caused through road vehicles and methods to control them" amended by Guideline No. 12, dated 15.6.2010 "On amendments and addenda to Guidelines No 6527, of 24.12.2004 accompanied by the Manual of Vehicles Control.	Certificate of technical compliance is issued by SGS Albania ¹⁰ and it is mandatory for all vehicle registered in Albania (with Albanian license plate). Compliance with this guideline has been considered in the development of mitigation measures of the ESHIA.

Transport, vehicle and equipment emissions

Order of Minister of Transport and Infrastructure No. 149 (7.04.2014)	"On the approval of the rules on implementing the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organizations", fully aligned with the Commission Regulation (EU) No 748/2012 of 3 August 2012, laying down implementing rules for the airworthiness and environmental certification of aircraft and related products, parts and appliances, as well as for the certification of design and production organisations.	Helicopters will be used on a limited basis due to the terrain of the Project area. Compliance with this order has been considered in the development of mitigation measures of the ESHIA.
Instruction No.6527 (24.12.2004)	"On allowed vehicle air emission, noise generation levels, and control methods "amended - This instruction includes requirements for annual vehicle inspections	Heavy machinery, 4 wheel drive vehicles and pick-up trucks will be used for the seismic survey. Certificate of technical compliance is issued by SGS Albania and it is mandatory for all vehicle registered in Albania (with

¹⁰ <https://www.automotivealbania.sgs.com/>

Legislation	Overview	Relevance to the Project
	and allowed air emissions. All vehicles must comply with these norms.	Albanian license plate). Compliance with this instruction has been considered in the development of mitigation measures of the ESHIA.
DCM No.613 (7.9.2011)	"Approval of the technical rules for the assessment of the noise conformity for the equipment installed in open spaces or environment". Sets noise release norms for certain equipment generating noise such as electricity generators, tractors, compressors etc. The regulation lists set thresholds.	Heavy machinery will be used for the seismic survey. Compliance with this decision has been considered in the development of mitigation measures of the ESHIA.
Guidance No.10 (30.5.2015)	"Relating to the type-approval of agricultural or forestry tractors, their trailers and interchangeable towed machinery, together with their systems, components and separate technical units" based on EU Directive 2003/37/EC dated 26.5.2003.	For seismic operations, tractors will be used for the transportation of drill rigs and heavy machinery will be used (vibrois machines). Compliance with this guidance has been considered as mitigation and recommendation measures at the ESHIA report.
Noise		
DCM No. 1063 (23.12.2015)	"On the Approval of the technical rules for the assessment of the noise conformity for the equipments installed in open spaces or environment" sets the noise release norms for certain equipment's generation noise such as electricity generators, tractors, compressors etc. The regulation lists set thresholds (mainly power capacity - kW).	Compliance with this decision has been considered in the development of mitigation measures of the ESHIA. Application of these rules needs to be ensured from seismic survey sub-contractor based on list of equipment and vehicles that will be employed for operations.
Guideline No. 6527/2004	The guideline regulates vehicle noise generation levels and control methods. This includes requirements for the annual vehicle inspections and to comply with predetermined norms. The compliance of these norms shall be verified with certification of control issued from SGS Albania ¹¹ .	Compliance with this guideline has been considered in the development of mitigation measures of the ESHIA. Application of these rules needs to be ensured from seismic survey sub-contractor based on list of equipment and vehicles that will be employed for operations.
Law No. 9774 (12.07.2007) Amended by Law No. 39/2013	"On the assessment and management of environmental noise", which defines the requirements for environmental protection from noise, how to avoid and to prevent, reduce and eliminate the harmful effects of exposure to them including inconvenience from noise. This Law aims to protect human health and the environment from adverse effects caused by noise emissions and sets general rules, authorities, inspection etc.	Heavy machinery and trucks will be used during the seismic survey. Of ESHIA importance is the day time classification ¹² for the operation of noise generating machinery. Compliance with this law has been considered in the development of mitigation measures of the ESHIA.
Instruction No.8 (27.11.2007)	Ministry of Environment and Ministry of Health on "Noise levels in different media", sets the numerical values of noise in specific zones and aims to ensure adequate noise exposure protection for human health.	Compliance with this instruction has been considered in the development of mitigation measures of the ESHIA.
Instruction No.6527	"On allowed vehicle air emission, noise generation levels, and control methods"	Compliance with this instruction has been considered in the development of mitigation measures of the ESHIA.

¹¹ <https://www.automotivealbania.sgs.com/index.php>¹² Daytime lasts 13 hours from 6 am to 7 pm

Legislation	Overview	Relevance to the Project
(24.12.2004)	amended - This includes requirements for annual vehicle inspections and allowed air emissions. All vehicles must comply with these norms.	
Fuel Quality		
DCM No. 147 (21.03.2007)	"On the quality of petrol and diesel fuels".	Only fuel available in Albania that is in compliance with this decision will be used.
DCM No.781 (14.11.2012)	"On the quality of certain liquid fuels for thermal, civil, industrial and water transport use (sea, river and lake)".	Only fuel available in Albania that is in compliance with this decision will be used.
Waste		
Law No.10463 (22.09.2011)	"On the integrated waste management" aims to protect human health and the environment and to ensure environmentally sound management of waste through integrated management.	Both hazardous and non-hazardous wastes will be generated during the seismic survey. Waste management has been considered in the development of mitigation measures and will be addressed in the Environmental Management and Monitoring Plan (EMMP)
DMC No.99 (18.02.2005)	"Albanian waste catalogue" which makes the classification of the waste based on industry types, and the criteria to assess the hazardousness of the waste. The regulation codifies the waste types based on the European Waste Catalogue.	This Law has been considered in the classification ow the wastes to be generated during the seismic survey.
DCM No. 229 (23.04.2014)	"The rules for transferring the nonhazardous waste and the data to register in the transferring document" - The newly enforced regulation requires transferring the waste at licensed companies and ensuring final disposal in approved facilities. The act requires documenting the waste transfers and providing the final disposal certificate to the National Environmental Agency (NEA). The regulation requires for all waste generating companies to be registered at NEA and obtain a personal waste generation number.	Non-hazardous wastes generated during the seismic survey project will be transferred and disposed of in accordance with this directive.
DCM No. 371 (11.06.2014)	"The rules for transferring the hazardous waste and the data to register in the transferring document" - The newly enforced regulation requires transferring the waste at licensed company and ensuring final disposal in approved facilities. The act requires documenting the waste transferring and delivering the final disposal certificate at the National Environmental Agency (NEA). The regulation requires for all waste generating companies to be registered at NEA and obtain a personal waste generation number.	Hazardous wastes generated during the seismic survey project will be transferred and disposed of in accordance with this directive.
Wastewater		
Law No. 9115/2003	"On the Treatment of polluted water" provides regulations that state the need for	Compliance with this law has been considered in the

Legislation	Overview	Relevance to the Project
(24/07/2003)	treatment of polluted water before it is discharged. Article 6 sets the obligations of physical and legal entities that discharge polluted waters. Physical and legal entities, the activity of which discharges polluted waters, are obligated to take measures to: a) continuously reduce the amount of used waters they discharge in the receiving environment; b) reduce the degree of pollution in discharged waters, especially such pollution as caused by hazardous substances and waste; c) manage and treat polluted waters. To comply with these obligations, the physical and legal entities whose activities discharge polluted waters must design a program of technical, technological and organizational measures. This program is subject to control by the Environmental Inspectorate, the licensing authority and the local government structures.	development of mitigation measures of the ESHIA.

1.2.2.3 Protection of health and safety framework

Law No. 10237/2010 "On safety and health at work" ensures the security and protection of health through prevention of professional risks, eliminating the factors that constitute risk and accident, inform, advice, balanced participation in accordance with the law. The present law applies the following¹³:

- The Directive of the European Council 89/391/EEC, dated 12 July 1989 "On the introduction of measures to encourage improvements in the safety and health of workers at work";
- The Directive of the European Council 94/33 EEC, dated 22 July 1994 "On the protection of young people at work," article 6; and
- The Directive of the European Council 92/85 EEC "On the introduction of measures to encourage improvements in the safety and health at work of pregnant workers and workers who have recently given birth or are breastfeeding"

Albanian legislation on health and safety and the relevance to the project are highlighted in Table 1-5.

Table 1-5 Legislation for health and safety

Legislation	Overview	Relevance to the Project
Health and Safety		
Law No. 10237/2010 (18 /02/ 2010)	"On Safety and Health at Work" - This law regulates the framework of health and safety in the work place and determines the roles of each party subject to the law.	The project will comply with this law to protect the health safety of its workers. Specific measures will be included in the mitigation plan.
Law No.	The State Sanitary Inspectorate aims to protect workers from the impacts of adverse working conditions, such as exposure to toxic substances, radiation, unworkable noise, vibrations, unfavourable	The project will comply with this law to protect the health safety of its workers. Specific measures will be included in the mitigation plan.

¹³ TAP ESIA report, 2011

Legislation Overview

Relevance to the Project

9863/2008	microclimate, and controls the level of occupational diseases and accidents as a result of adverse conditions.	
Law No. 9863/2008 (28/01/2008)	"On food" specifies the rules of food safety in Albania	The project needs to ensure the safety of food consumed by its workers. Specific measures will be included in the mitigation plan.
Law No. 10433/2011 (16/06/2011)	"On Inspection in the Republic of Albania"	The project is subject to inspections for adherence to health and safety regulations.
DCM No. 562/2013 (3/07/2013)	Decision of Council of Ministers concerning the approval of the regulation on minimum safety and health requirements for the workplace.	The project/employer needs to ensure the safety of its workers in the work place. A specific set of rules are to be drafted in the Safety Regulation of the Employer. Specific measures will be included in the mitigation plan.
DCM No. 312/2010 (5/5/2010)	"On safety in site construction" sets the rules of safety for construction activities.	The installation of worker camps needs to comply with the rules of this decision. Specific measures will be included in the mitigation plan.
DCM No. 410/2015 (13/05/2015)	"On the establishment, organisation and operation of technical and industrial state inspectorate". This act regulates the inspection of the installations related with industrial processes in Albania	The project may be the subject of several inspections as regulated in Albanian legislation and standards. Compliance with these rules is to be ensured by the Sub Contractor for seismic operations. An initial screening of equipment that will be used and communication with the appropriate inspectorate is required in order to determine any obligation before starting the field operations of importing the equipment.
Decision No. 692/2001 (13/12/2001)	"On special measures on safety and health protection at work"	The project will comply with this law to protect the health safety of its workers. Specific measures will be included in the mitigation plan.
DCM No. 842/2014 (3/12/2014)	"For the health safety and protection of the employee from noise risks in the working places" requires the employer to assess the noise levels at the working place and ensure the protection of its workers	Specific measures will be included in the mitigation plan.

1.2.2.4 Other relevant national legislation

Other national legislation relating to land use and the use of explosives relevant to the Project are provided in Table 1-6. With respect to land use, the land use plan for Gjirokaster has been prepared and was adopted in 2017¹⁴. Tepelena and Libohova municipalities do not have plans in place. Kelcyra, Dropilli and Permeti plans are under preparation. As the project is temporary in nature, the plans will become important for future activities in Block 4.

¹⁴ <http://planifikimi.gov.al/index.php?eID=dumpFile&t=f&f=1731&token=4208457a9a556f79b62c7da43a0155a1fd2c80ee>

Table 1-6 Legislation for land use and use of explosives

Legislation	Overview	Relevance to the Project
Land Use and territory planning		
Law No. 10119/2009	"On Territory Planning", amended by Law No. 10258/2010 and Law No. 10315/2010. The law aims to integrate the urban planning legislative framework into a single law, and includes the concept of the protection of natural and cultural heritage, and community's health and safety for territory planning.	The law and its bylaws require declaration for any construction. The project is only temporary; protection of natural and cultural heritage, and community's health and safety will be included in the ESHIA mitigation measures.
DCM No. 408 ¹⁵ (13.5.2015 amended by DCM 231/2017)	The regulation for territorial development.	This regulation specifies the type of installations requiring a construction permit. A preliminary clearance should be sought for the construction of field camps. Installations of mobile structures require a preliminary clearance (or declaration of works) issued by the municipality.
Law No. 9244/2004	"On Agricultural Land Protection" determines the protection status of given agricultural fields.	The project is obliged to inform the local authority of any damage to agricultural land from the operations. The authority assesses the damage and requires that the land user to restore any damage in agricultural land. Mitigation measures have been proposed.
Law No. 8752/2001 (26/03/2001) amended several time	"On the establishment and functioning of the structures for land administration and protection", amended by Law No. 10257/2010 regulates land uses issues, and their compatibility with Regional Planning.	The land administration department of each municipality is responsible for land management and leasing of state owned land. This authority will be responsible for the coordination of the implementing procedures and execution of the compensation during the project implementation.
Explosive and detonating substances		
Decision No. 467/2011 (29/06/2011)	This decision defines procedures for issuing import, export, and production licenses for civilian use of explosive material. The governing institution is the Ministry of Defense, which is responsible for issuing the licenses. Upon evaluation by the licensing committee of the Ministry of Defense, an import license is issued for a period of one year, subject to renewal.	Explosives, designed for use in seismic surveys will be used as a source of vibration. The seismic survey contractor will be responsible for abiding by all the requirements of this decision.
Decision No. 533/2005 (07/08/ 2005) amended by 467/2011	This decision defines the procedures for issuing import, export, and production licenses for civilian use of explosive material.	The project needs to comply with the explosive importation rules. The application for explosives importation and the required documentation is to be submitted to the Ministry of Defense.

¹⁵ https://srvd.e-albania.al/sherbimetxml/dokumentasherbimi/Aplikimi_per_deklarate_paraprake_per_kryerje_punimesh.pdf

1.2.3 International Conventions and Agreements

Albania is signatory to a number of international agreements relevant to the Project. These are outlined in Table 1-7.

Table 1-7 International Conventions and agreements signed/ratified Albania

Convention/Agreement	Overview	Ratified	Relevance to the Project
General			
Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (1998)	The Convention establishes a number of rights of the public with regard to the environment; including access to environmental information; public participation in environmental decision making and access to justice ¹⁶ .	26 October 2000	Arrangements are to be made by public authorities to enable the public potentially affected by the project and environmental non-governmental organisations to comment on proposals for projects affecting the environment, or plans and programmes relating to the environment. The comments received are to be taken into due consideration in decision-making, and information to be provided on the final decisions and the reasons for it.
Climate Change			
UN Framework Convention on Climate Change (UNFCCC) (1992) entered into force in 1994	The United Nations Framework Convention on Climate Change (UNFCCC) has been crucial in addressing climate change and the need for a reduction of emissions of greenhouse gases. The ultimate objective of the Convention, is to stabilise greenhouse gas (GHG) concentrations in the atmosphere at a level that would prevent dangerous human interference with the climate system	01/12/1994	As Albania is signatory to the convention, every effort should be made to limit GHGs.
Paris Agreement at the COP21 in Paris on 12 December 2015, entered into force on 4 November 2016	The Paris Agreement builds on the Climate Change Convention to combat climate change ¹⁷ .	21/09/2016	The project should adopt mitigation measures to minimize greenhouse gas emissions.
Kyoto Protocol	The Kyoto Protocol is an international agreement linked to the United Nations	01/04/2005	The project should adopt mitigation measures to minimize greenhouse gas

¹⁶ <http://ec.europa.eu/environment/aarhus/index.htm>

¹⁷ http://unfccc.int/files/paris_agreement/application/pdf/qa_paris_agreement_entry_into_force.pdf

Convention/Agreement	Overview	Ratified	Relevance to the Project
	Framework Convention on Climate Change; signatories commit to setting internationally binding emission reduction targets ¹⁸ .		emissions.
Water			
Convention on the Protection and Use of Transboundary Watercourses and International Lakes (1992)	Avoid or minimize adverse effects on water resources and water quality	5 January 1994	The study area is situated in the Vjosa River watershed basin. The Vjosa flows northward to the Adriatic Sea.
Biodiversity			
Convention on Biological Diversity (CBD) (1992)	Avoid or minimize adverse effects on important habitats and species, internationally and naturally designated nature conservation sites; conservation, sustainable and equitable use of biodiversity	5 April 1994	The Convention requires, under Principle 17, that EIA shall be undertaken for proposed activities that are likely to have a significant adverse impact on the environment and are subject to a decision of a competent national authority.
Convention on the Protection of Wild Flora and Fauna and Natural Habitats in Europe (Bern Convention) (1976)	The Convention aims to ensure conservation of wild flora and fauna species and their habitats. Special attention is given to endangered and vulnerable species, including endangered and vulnerable migratory species ¹⁹ ; to avoid or minimize adverse effects upon important habitats and species, internationally and naturally designated nature conservation sites.	2 March 1998	There are IUCN protected areas within the Study area including Category 1a (Strict Nature Reserve), Category II (National Park), Category III (Natural Monument) and Category IV (Species Management Area).
Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) (1979)	Avoid or minimize adverse effects upon migratory species	1 September 2001	The Project Area includes protected sites that contain globally vulnerable species of birds as well as migratory birds. There are specific resolutions and instruments such as species action plans under this convention that apply to Albania.

¹⁸ <https://unfccc.int/process-and-meetings/the-kyoto-protocol/what-is-the-kyoto-protocol>¹⁹ <https://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/104>

Convention/Agreement	Overview	Ratified	Relevance to the Project
Agreement on the Conservation of African-Eurasian Migratory Waterbirds (1995)	African-Eurasian Migratory Waterbirds Agreement (AEWA) covers 254 species of birds ecologically dependent on wetlands for at least part of their annual cycle. All AEWA species cross international boundaries during their migrations and require good quality habitat for breeding as well as a network of suitable sites to support their annual journeys ²⁰ . Avoid or minimize adverse effects upon migratory water bird species	1 September 2001	Species and habitats protected by this agreement may be present in the study area. Mitigation measures for the protection of flora and fauna have been identified in the ESHIA.
Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) (1975)	CITES (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival ²¹ .	27 June 2003	Threatened and endangered species and their habitats have been identified in the study area. Mitigation measures for the protection of flora and fauna have been identified in the ESHIA.
Cultural Heritage			
Convention on the Protection of the World Cultural and Natural Heritage (1989)	Avoid adverse effects upon Albanian and World Cultural Heritage sites; minimize adverse effects on unknown and intangible cultural heritage sites, material assets and another infrastructure.	10 July 1989	Cultural and natural heritage sites have been identified in the Study area including two world heritage sites. Mitigation measures for the protection of cultural heritage have been proposed.
Labor			
ILO Convention 29 Forced Labour Convention (1930) and ILO 105 Abolition of Forced Labour Convention (1957))	Its object and purpose is to suppress the use of forced labour in all its forms irrespective of the nature of the work or the sector of activity in which it may be performed.	25 June 1957 27 February 1997	Local workers will be employed on the project.
ILO Convention 87 Freedom of Association and Protection of the Right to Organise (1948)	Protects the rights of workers and employers to "join organisations of their own choosing without previous authorization.	3 June 1957	Local workers will be employed on the project.
ILO Convention 98 Right to	The convention provides	3 June 1957	Local workers will be

²⁰ <https://www.cms.int/en/legalinstrument/aewa>²¹ <https://www.cites.org/eng/disc/what.php>

Convention/Agreement	Overview	Ratified	Relevance to the Project
Organize and Collective Bargaining	for workers to be able to join unions and engage in collective bargaining.		employed on the project
ILO Convention 100 Equal Remuneration Convention (1951)	Each Member shall, by means appropriate to the methods in operation for determining rates of remuneration, promote and, in so far as is consistent with such methods, ensure the application to all workers of the principle of equal remuneration for men and women workers for work of equal value.	03 Jun 1957	Local workers will be employed on the project

1.2.4 Licenses, approvals and permits

Various approvals, licenses and permit are required to comply with Albanian legislation. The overarching licensing falls under the purview of the Albanian Energy Regulator (ERA) which is discussed in the following sections. Additional information on permits and licenses are provided in **Chapter 2, Project Description**.

The Oil and Gas sector in Albania is regulated by the Law No. 7746/1993 dated 28/07/1993 “on Hydrocarbons” (Exploration and Production), as amended by law 6/2017. By adopting Law No.6/2017, the Albanian Parliament amended the 1993 Law on Hydrocarbons (Exploration and Production). These last changes aim to make the law more easily applicable, as well as to bring it closer to the *acquis* of The European Union (EU). The amendments also focus on safeguarding these important public assets. Law No.6/2017 specifically requires compliance with environmental legislation which would include the need for and EIA.

Gas operations and marketing are further regulated by Law No. 102/2015, from 23/09/2015, “On natural gas sector”. This Law lays down the rules relating to the organization and functioning of the natural gas sector, access to the market, the criteria and procedures applicable to the granting of authorizations for transmission, distribution, supply and storage of natural gas and the operation of systems. Regarding the Oil & Gas industry sector, the main regulatory bodies are²²:

- The Ministry of Infrastructure and Energy (MIE). The Ministry's responsibilities include the drafting and implementation of policies aimed at ensuring the country's energy supply, utilization of energy and mineral resources in the context of sustainable economic development and public usefulness, industrial promotion, and development of environmentally friendly standards.
- The National Agency of Natural Resources (NANR). The NANR is established as a public entity reporting to the Ministry of Energy and Industry (MEI) that is responsible for the development, supervision of rational use of natural resources, according to government policy, and post-exploitation monitoring in the mining, hydrocarbons and energy sector.
- The Albanian Energy Regulator (ERA). The ERA issues secondary legislation; supervises the natural gas sector; issues licenses for the generation, transmission, distribution, supply and trading of natural gas (except for research and production); and establishes rules and requirements for licensing, and the transfer and withdrawal of such licenses.

²² [https://uk.practicallaw.thomsonreuters.com/7-628-9666?transitionType=Default&contextData=\(sc.Default\)&firstPage=true&bhcp=1](https://uk.practicallaw.thomsonreuters.com/7-628-9666?transitionType=Default&contextData=(sc.Default)&firstPage=true&bhcp=1)

- Albpetrol. This is a state owned petroleum upstream production and marketing company. This is a state owned company that holds the right to enter into agreements for gas development projects and is also in charge of supervision and regulation of the gas distribution system in Albania.

Under Article 3 of the Hydrocarbon Law, all hydrocarbon deposits existing in their natural condition in their geological strata within Albania belong to the State and are distinguishable from the ownership of land. Rights pertaining to the exploration and production of oil and gas can only be obtained based on a concession agreement/hydrocarbon agreement, concluded with the MEI or Albpetrol for the relevant areas (blocks) under their administration. Hydrocarbon agreements can be developed as production sharing agreements (PSAs) or in other forms as agreed between the parties.

A hydrocarbon agreement may impose rules relating to environmental management measures, working conditions during operations and the welfare of people who live where the operations are conducted²³.

Albanian legislation for the gas section that is relevant to the Project is summarized in Table 1-8.

Table 1-8 Albanian legislation for the gas sector

Legislation	Overview	Relevance to the Project
Law No. 7746/1993 amended by 7853/1994 by 8297/1998 and by Law No.6/2017 dated 02.02.2017	Includes several definitions which were not originally included in the 1993 law and its previous amendments. One of the more notable is the definition of the License Agreement, which is the authorization provided by the Ministry for exploration, development and production of hydrocarbons in the contract area. This license includes the possibility to transfer the rights wholly or partially, to a local or foreign legal person, or to an international financial institution	Article 4 of the law requires the Operator of the Hydrocarbons Agreement to comply with environmental legislation during the implementation of its operations. The Project will comply with national and international environmental standards.
Law No. 7746/1993 amended by 7853/1994 by 8297/1998 and by Law No.6/2017 dated 02.02.2017	Article 6 paragraph "stipulates: Indemnify the State or the Ministry against all claims made by third parties in respect of injury, loss or damage resulting from the conduct of any operation carried out by the Contractor or by any subcontractor	The Project will implement the damage prevention and compensation procedure.
Law No. 7746/1993 amended by Law No.6/2017 dated 02.02.2017	Article 6 paragraph "e" stipulates: Give priority to the employment and training of Albanian nationals as well as to local goods and service in accordance with stipulations to be included in the development plan to the extent that they are competitive in terms of price and comparable in terms of quality	The Project will implement a local hiring procedure to the fullest extent possible.

1.2.5 Project proponent standards and guidelines

The Project will be implemented in accordance with SUA standards and guidelines. These guidelines include:

- Shell Guidelines for Land Access and Stakeholder Management of Land Owners in Seismic Operations, 2008;
- Shell Health, Safety, Security, Environment and Social Performance Management System,(HSSE&SP MS) SUA-HSSE-06/2, Shell Upstream Albania (SUA), March 2017;

²³ [https://uk.practicallaw.thomsonreuters.com/7-628-9666?transitionType=Default&contextData=\(sc.Default\)&firstPage=true&bhcp=1](https://uk.practicallaw.thomsonreuters.com/7-628-9666?transitionType=Default&contextData=(sc.Default)&firstPage=true&bhcp=1)

- Shell HSSE &SP Control Framework Environment Manual, December 2012; and
- Shell HSSE &SP Social Performance Manual, December 2012.

1.2.6 European Legislation

The European Union (EU) officially recognized Albania as a "potential candidate country" in 2000 and in 2003 Albania started negotiations on a Stabilization and Association Agreement, which was signed on 12 June 2006, completing the first major step towards Albania's full membership in the EU. Most environmental laws are drafted by the technical directorates of The Ministry of Tourism and Environment (MTE) in close cooperation with the Ministry of European Integration and Foreign Relations. The Government pays special attention to harmonizing its national laws with the environmental legislation from the European Union.

Albania applied for EU membership on 28 April 2009 and received EU candidate status in 2014. The period since 2011 has therefore been characterized by intensive efforts to transpose the EU environmental acquis into the national legislation. Assistance with drafting the new pieces of legal and policy framework on the environment has been provided to the Government mostly through the EU-funded projects Strengthening Environmental Law Enforcement in Albania (SELEA, 2012-2014) and Institution Building for Enforcing Environmental and Climate Acquis (IBECA, 2015-2017). However, the number of acts in the environmental field transposed without external assistance, through the efforts of the ministry responsible for environmental issues alone, has recently increased²⁴. The status of alignment of Albanian legislation with the EU legislation is as follow:

- On water quality, the level of alignment remains partial. A National Agency for Water Supply and Sewerage was established, and performance-based contracts between municipalities and water utilities have been put place;
- Alignment in the field of nature protection is well advanced;
- Not yet fully aligned the legislation on air quality;
- The legal framework for waste management is partially aligned;
- Alignment with the EU legislation on industrial pollution and risk management is still at an early stage;
- On chemicals, Albania's national plan to reduce and eliminate persistent organic pollutants is currently being reviewed; and
- Climate change, Albania has achieved some level of preparation, but alignment is still limited.

1.2.7 International Best Practice Standards and guidelines

The proponent of a project must always demonstrate how it will conform to with relevant environmental standards and international industry best practices. In the event that no national standards are available, the proposed project will comply with internationally recognised standards relevant to the nature of the project.

The ESHIA has been prepared in line with the following international guidance:

- International Best Practice Standards and guidelines, including the IFC Performance Standards on Environmental and Social Sustainability. This includes guidance published by the World Bank Group, World Health Organisation (WHO) and the International Union for the Conservation of Nature (IUCN);
- Good International Industry Practices (GIIPs);

²⁴ United Nations Economic Commission for Europe , Albanian 3rd Environmental Performance Review , 2018
https://www.unece.org/fileadmin/DAM/env/epr/epr_studies/ECE.CEP.183_Eng.pdf

- Relevant international agreements and conventions to which Albania is a signatory, published by the United Nations (UN), International Labour Organization (ILO) and other parties; and
- International Organization for Standardization (ISO) (including ISO 9001:2015 (Quality management systems), ISO 14001:2015 (Environmental management systems), and ISO 18001:2004 (Information technology – Radio frequency identification for item management))²⁵.

1.2.7.1 International Finance Corporation

IFC uses a process of environmental and social categorization to reflect the magnitude of risks and impacts. The project is considered to be classified as Category B. The Category B classification applies to projects having activities with the potential of limited adverse environmental or social risks and/or impacts that are few in number. The impacts are, generally site-specific, largely reversible, and readily addressed through mitigation measures. The ESHIA will be guided by industry specific Environmental Health and Safety (EHS) guidelines developed by the World Bank Group and the IFC. The IFC Performance Standards (PS) are directed towards project developers, providing guidance on how to identify risks and impacts, and are designed to help avoid, mitigate, and manage risks and impacts as a way of doing business in a sustainable way, including stakeholder engagement and disclosure obligations for the Project. There are eight performance standards; their applicability to the Project is presented in Table 1-9.

Table 1-9 IFC Performance Standards

IFC	Standard	Overview	Applicable to the Project
PS 1	Assessment and Management of Environmental and Social Risks and Impacts	Establishes requirements for social and environmental performance management throughout the life of a project.	Applicable
PS 2	Labour and Working Conditions	Highlights the need for workers' rights regarding income generation, employment creation, relationship management, commitment to staff, retention and staff benefits.	Applicable
PS 3	Resource Efficiency and Pollution Prevention	Defines an approach to pollution prevention and abatement in line with current internationally disseminated technologies and good practice.	Applicable
PS 4	Community Health, Safety and Security	Specific requirements for mitigating any potential for community exposure to risks and impacts arising from equipment accidents, structural failures and releases of hazardous materials.	Applicable
PS 5	Land Acquisition and Involuntary Resettlement	Recognises that project related land acquisition and restrictions could have adverse effect on communities or persons that use the land and outlines a policy to avoid or minimise involuntary physical resettlement as a consequence of development.	Applicable
PS 6	Biodiversity Conservation	Sets out an approach to protect and	Applicable

²⁵ International Organisation for Standardisation (ISO) (including ISO 9001:2015 (Quality management systems), ISO 14001:2015 (Environmental management systems), and ISO 18001:2004 (Information technology – Radio frequency identification for item management)).

IFC	Standard	Overview	Applicable to the Project
	and Sustainable Management of Living Natural Resources	conserve biodiversity, including habitats, species and communities, ecosystem diversity, and genes and genomes, all of which have potential social, economic, cultural and scientific importance.	
PS 7	Indigenous Peoples	Recognises that Indigenous Peoples can be marginalised and vulnerable (e.g. if their lands and resources are encroached upon by or significantly degraded by a project).	Not Applicable
PS 8	Cultural Heritage	Aims to protect irreplaceable cultural heritage and to provide guidance for protecting cultural heritage throughout a project's life cycle.	Applicable

Performance Standard 1 underscores the importance of managing environmental and social performance throughout the life of a project. It aims to ensure that relevant environmental and social information is disclosed and disseminated to people who could be affected.

It is important to understand the requirements and expectations of local communities in the implementation of the project to ensure its proper integration and ensure the rights of communities through Stakeholder Engagement Plans.

IFC Industry Specific Environmental, Health and Safety Guidelines

Industry specific Environmental Health and Safety (EHS) guidelines have been developed by the World Bank Group and the IFC. The applicable industry sector guidelines for typical oil and gas projects include:

- EHS Guideline Onshore Oil and Gas Development (2007)²⁶ ;
- EHS General Guidelines (2007)²⁷, including but not limited to:
 - Hazardous Materials Management;
 - Noise;
 - Waste Management;
 - Occupational Health and Safety;
 - Water and Sanitation; and
 - Community Health and Safety.
- Good Practice Handbook for Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (2013)²⁸.

IFC Social and Stakeholder Engagement Guidelines

The ESHIA was prepared in line with best practices put forward in the IFC guidelines and in particular:

- 2007 Stakeholder Engagement Handbook²⁹ ;
- 2009 Good Practice Note Addressing Grievances from Project-Affected Communities³⁰ ;
- 2009 Handbook for Addressing Project-Induced In-Migration³¹ ; and

²⁶ International Finance Corporation, EHS Guidelines Onshore Oil and Gas Development (2007).

²⁷ International Finance Corporation, Environmental, Health, and Safety Guidelines: General EHS Guidelines (2007).

²⁸ International Finance Corporation, Good Practice Handbook, Cumulative Impact Assessment and Management: Guidance for the Private Sector in Emerging Markets (2013).

²⁹ International Finance Corporation, Good Practice Note Addressing Grievances from Project-Affected Communities, 2009.

³⁰ International Finance Corporation, Good Practice Note Addressing Grievances from Project-Affected Communities, 2009.

- 2009 Introduction to Health Impact Assessment³².

1.2.7.2 WHO Guidelines

Relevant WHO guidelines relevant and used within this ESHIA include:

- WHO Air Quality Guidelines (2005)³³ ;
- WHO Guidelines for Community Noise (1999)³⁴ ; and
- WHO Guidelines for Drinking Water Quality (2011)³⁵.

1.2.7.3 International Union for the Conservation of Nature

The IUCN Red List of Threatened Species, one of the most well-known objective assessment systems for classifying the status of plants, animals, and other organisms threatened with extinction. It contains explicit criteria and categories to classify the conservation status of individual species on the basis of their probability of extinction. The IUCN Red List (2017)³⁶ for Albania is utilized for the descriptions of flora and fauna within the Study Area.

1.2.7.4 Oil and Gas industry specific standards and international guidelines

Oil and Gas industry specific standards and international guidelines have also been developed by the International Petroleum Industry Environmental Conservation Association (IPIECA)³⁷, Cross Sector Biodiversity Initiative (CSBI)³⁸; the International Association of Oil and Gas Producers (IOGP) and the International Association of Geophysical Contractors (IAGC).

IPIECA is the global oil and gas industry association for environmental and social issues. From their vast publications, the following are relevant to the environmental impact assessment of onshore explorations:

- Guides to Social Impact Assessment and Health Impact Assessments in the Oil and Gas Industry;
- The Oil and Gas Industry: Operating in Sensitive Environments;
- Alien Invasive Species and the Oil and Gas Industry - Guidance for Prevention and Management;
- Guidelines for Oil Spill Waste Minimization and Management;
- 'Biological Impacts of Oil Pollution' report series.

The IAGC is an international trade union which represents the industry that provides geophysical services to the oil and gas sector of the economy. The IAGC's Environmental Manual for Worldwide Geophysical Operations³⁹ provides guidance on how to:

- Ensure the development of a project-specific ESHIA to show commitment to environmental preservation / protection and to ensure all environmental issues are appropriately characterised and addressed in the company's operations;
- Ensure personnel have keen environmental awareness of the sensitivity of the project terrain;
- Develop an environmental and social management plan as a roadmap to guide the performance of the seismic acquisition teams throughout the project duration; and
- Ensure all community relations issues are appropriately handled before during and after the project.

³¹ International Finance Corporation, Handbook for Addressing Project-Induced In-Migration, 2009.

³² International Finance Corporation, Introduction to Health Impact Assessment, 2009.

³³ World Health Organisation, Air Quality Guidelines, Global Update 2005.

³⁴ World Health Organisation, Guidelines for Community Noise, (1999).

³⁵ World Health Organisation, Guidelines for Drinking Water Quality, (2011).

³⁶ International Union for the Conservation of Nature (IUCN) Red List, (2017).

³⁷ International Petroleum Industry Environment and Conservation Association, (IPIECA).

³⁸ http://www.ipieca.org/media/1256/bes_fundamentals_2016_05.pdf

³⁹ Environmental Manual for Worldwide Geophysical Operations, (2013).

Other best industry practice references include the IAGC Safety Manual⁴⁰, IAGC Minimum Offset Guideline⁴¹ and IOGP's Guidelines for the Development and Application of Health, Safety and Environmental Management System.

1.3 ESHIA Methodology

1.3.1 Authors

The ESHIA is led by AECOM, a global leading engineering and environmental consultancy operating in more than 150 countries. AECOM has produced hundreds of ESHIAs for seismic survey projects worldwide.

The ESHIA is supported by EMA Consultancy based in Albania. EMA have extensive national EIA and stakeholder consultation experience in various industries including oil and gas sector and is ideally placed to provide local knowledge. The key contributors to the ESHIA are provided in Table 1-10. The key contributors were supported by disciplinary specialists as necessary.

Table 1-10 Key Contributors to the ESHIA

Name	Discipline	Company
Basit Khan	ESHIA specialist and technical reviewer	AECOM
Dr. Olga Shtepenko	ESHIA specialist	AECOM
Gail Muirhead	ESHIA specialist	AECOM
Dr. Brian Cuthbert	Ecology expert and EIA specialist	AECOM
Mark Westbury	Socioeconomist and social assessment specialist	AECOM
David Aspen	Cultural Heritage Specialist	AECOM
Etleva Bodinaku	Environmental specialist	EMA Consulting
Klodian Ali	Environment and stakeholder specialist	EMA Consulting
Ferdinand Bego	Zoology expert	EMA Consulting
Alfred Mullaj	Habitat expert	EMA Consulting
Mariol Meco	Flora expert	EMA Consulting
Lida Miraj	Archaeologist and cultural heritage expert	EMA Consulting
Klodjan Seferaj	Sociology expert	EMA Consulting

1.3.2 Overview of the ESHIA Methodology

The ESHIA process commenced with the scoping exercise, where interactions anticipated between the Project activities (aspects) and bio-physical and socio-economic receptors were analyzed to identify their potential significance and need for further assessment. This process was underpinned by the professional judgment of subject matter experts, and based on:

⁴⁰ International Association of Geophysical Contractors Safety Manual, (2012).

⁴¹ IAGC (2007)

- Liaison with the Shell Project Team to gather data and to formulate an understanding of project activities (detailed in Part 1 of the Scoping Report).
- Review of existing baseline data relevant to the Project area of influence (detailed in Part 2 of the Scoping Report).

In overall objectives of the ESHIA Scoping phase were to:

- Define the Project area of influence (Study Area);
- Review existing baseline data and identify critical data gaps ;
- Identify interactions between Project aspects and the environment;
- Identify further baseline studies required; and
- Conduct initial stakeholder consultations.

This Scoping Report documents the scoping exercise and serves as the terms of reference for the ESHIA. The ESHIA is then prepared building and expanding upon the information presented in the Scoping Report. The existing physical, biological and social environment is characterized to serve as the basis upon which potential project aspects will interact so as to determine and assess the potential impacts from project activities. The assessment of negative impacts is addressed in **Chapter 5, Negative Impact Assessment**, transboundary impacts in **Chapter 6, Transboundary Impact Assessment** and positive impacts in **Chapter 7, Positive Impact Assessment**. Once potential impacts have been assessed mitigation measures are proposed to adverse impacts and enhance the beneficial impacts. Mitigation measures are addressed in **Chapter 8, Mitigation Measures**.

1.3.3 ESHIA Baseline data collection and characterisation

Obtaining accurate and reliable baseline data within the Study Area is an essential component of the ESHIA process, which aims to provide a reference point against which potential impacts can be assessed and monitored. The approach to baseline characterisation is illustrated in Figure 1-3.

The Baseline description for the ESHIA is based on a combination of desk based research and targeted field studies and stakeholder engagement. Baseline studies focused on the areas of sensitivity identified during the ESHIA Scoping phase: ecology, cultural heritage, water resources, land use, tourism, infrastructure and people.

The initial step in the baseline characterization is the definition of the project area of influence and the study area. The Study Area where baseline conditions are investigated is defined by the Project "Area of Influence" as defined by the IFC Performance Standard 1 (IFC, 2012)⁴². The Project Area of Influence (PAI) by definition (IFC, PS1) includes the area affected by:

- The project activities and facilities that are directly owned, operated or managed (including by contractors) and that are a component of the project; (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which Affected Communities' livelihoods are dependent;
- Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable; and
- Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

The Study Area is the geographical extent of the area for which baseline conditions were characterised. The Study Area may be equal to, or smaller than the PAI, depending on the limitations of the baseline data collection methods. Different

⁴² IFC Performance Standard 1 (IFC, 2012)

types of Project activities (planned and unplanned) will exert different Areas of Influence. Given the nature of the Project and its anticipated impacts, the Study Area is considered to comprise:

- A 500 meter seismic corridor within which seismic lines (with an operational corridor not to exceed 5 meters width) will be defined and along which main operations will take place;
- A 200 meter protection zone (i.e. 100m on either side of the seismic corridor) to comply with Albanian legislation for protected areas (natural and cultural monuments, water supply sources and other sensitive social, physical and biological features);
- A few hundred meters zone around the seismic corridor where some project effects (i.e. noise, dust or accidental leaks etc.) may extend to;
- Road network and infrastructure (i.e. hotels, waste facilities) used by the Project; and
- A wider area of influence associated with social issues including land ownership and employment.

The baseline characterization of the physical, biological and social environment is based on secondary and primary data. A desktop study was undertaken to collate available baseline data from published sources. The information was evaluated by the technical study teams and data gaps were identified. The desktop study was supplemented by field surveys undertaken between May and September 2018 at selected locations along the seismic lines and through interviews with stakeholders based on the identified data gaps.

The data on environmental quality are collected from existing official publications. Geographic information system (GIS) data have been developed to support baseline characterisation (and impact assessment), incorporating remotely sensed data (satellite imagery and aerial photography), topographical maps, engineering drawings, Geographical Positioning System (GPS) data linked to information collected in the field (e.g. photographs and field notes).

Primary and secondary baseline data was evaluated, alongside monitoring data (as appropriate) by the technical subject matter experts. Potential receptors⁴³ have been identified; receptor sensitivities are presented in **Chapter 4 Baseline Conditions**. Receptor sensitivity is the degree to which a receptor is susceptible to a given impact, and takes into consideration the receptor's resilience and value. The criteria used to assess receptor sensitivity are presented in the impact assessment chapters. An overview of the methodology employed for the collection of baseline information is provided in the following sections. Baseline study methods, study areas/ sampling locations, descriptions of receptor sensitivity criteria and receptor sensitivities, are presented in **Chapter 4, Baseline Conditions**, with further detail provided in the ESHIA **Annex 5**.

⁴³ For the purpose of this ESHIA, receptors are defined as: "An element of the natural or human environment which may interact with, or be interacted by, the proposed Project"

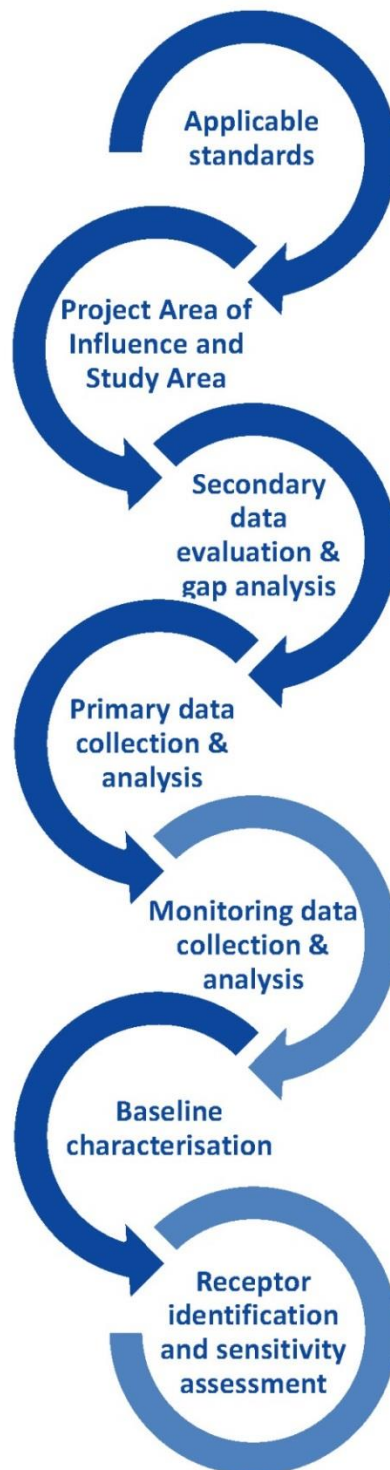


Figure 1-3 Approach to baseline characterization

1.4 Stakeholder Engagement

A major part of any ESHIA process is to solicit views, opinions and concerns on the proposed activities from various stakeholders, including representatives of local communities, interest groups, non-governmental organisations, government agencies and any other stakeholder as may be relevant to the proposed activities. Public access to and participation in environmental decision-making is sanctioned in Albanian legal and institutional frameworks, particularly by Law No. 8672/2000 (from 26/10/2000), "On Albania's Adherence to the Aarhus Convention". The mechanism and importance of public consultation is also established under Chapter III of Law No. 10440/2011, which requires a comprehensive consultation during the EIA for projects listed in its Annex 1 (the project fall under the annex 2 does not require Public hearing)

Decision No. 247, dated 30.04.2014, "On rules, request and procedures for informing and involving the public in environmental decision making" relates to the disclosure of information during EIA procedure. This includes access to information and consultation and public hearings in order to raise awareness of the public about the potential impacts of the project on the environment during the drafting stage of the EIA. Interested parties have the right to appeal against acts, actions or omissions during full EIA process and disclosure.

During the EIA process the developer undertakes stakeholder consultation and also organizes and delivers a public hearing with local government, Non-Governmental Organizations (NGOs) and general public and their opinions must be prepared and submitted with the application documents. Therefore it is prerequisite to carry out the public consultation before the application for an environmental declaration. Project activities, as well as the findings of the EIA, must be disclosed for consultation and stakeholders and interested/affected parties are allowed 20 calendar days to present any comments. Public meetings are to take place at the end of the disclosure period.

AECOM and EMA (or ESHIA team) developed a Stakeholder Engagement Plan (SEP) which set out the process for undertaking engagement and consultation with stakeholders during the ESHIA (See **Annex 2: Stakeholder Engagement**). The key objectives of stakeholder engagement during the ESHIA were to:

- Identify stakeholders and the key issues and concerns that stakeholders have about the Project.
- Introduce the Project to stakeholders, explaining its nature and potential impacts.
- Invite stakeholders to comment or provide proposals on the key issues that should be addressed in the ESHIA report.
- Advise stakeholders of the next steps in terms of the Project decision-making and design process and the plan for mitigation and enhancement measures.
- Demonstrate Shell Upstream Albania B.V's commitment to following national requirements and Good International Industry Practice (GIIP).
- Build positive stakeholder relationships and lay the foundations for ongoing stakeholder engagement for the execution of the Project.

A summary of the stakeholder engagement conducted for the ESHIA is presented in Table 1-11 and detailed in full in **Annex 2: Stakeholder Engagement**.

Table 1-11 Summary of engagement undertaken for the ESHIA

Engagement Activity	Stakeholders	Location	Timing
Introductory meetings with regulator and key national authorities	Separate meetings with national authorities: Ministry of Tourism and Environment National Environmental Agency National Agency of Protected Areas	Tirana	End-May / early June field mission
Introductory meeting with Regional authorities	Representatives of Prefecture of Gjirokaster. • Prefect • Regional Agency of Environment • Regional Directory of Cultural Heritage	Gjirokaster	End-May / early June field mission.
Meetings with each municipality intersected	Municipalities of: Gjirokaster, Libohova, Dropulli, Permeti, Kelcyra,	Central offices within	End-May / early June field

Engagement Activity	Stakeholders	Location	Timing
by the seismic lines.	Tepelena, Memaliaj, Delvina [Note: Kolonja municipality was met during the baseline phase field mission]	municipalities	mission
Initial meetings with Regional NGOs.	Invitations issued to the registered regional NGOs. Meetings were undertaken with those NGOs that expressed an interest and availability to meet.	Gjirokastra and Permeti	End-May / early June field mission
Meetings with sub-municipalities and villages. Objective was to provide project information, to receive feedback and collect baseline information, especially in the area of CH, water sourcing, social (including land uses), ecology and any other potential sensitive receptors..	Sub-municipalities and villages.	Various sub-municipality and village offices	July and September field mission
Meetings with Municipality Drinking Water Departments or Enterprises to collect data for the water supply systems in project area	Departments of Dropulli, Libohova, Gjirokastra, Tepelena, Kelcyra and Permeti	Municipality Offices	July and September field mission
Meetings with Regional Directories and Kolonja Municipality that could not be met during the May/June field mission.	- Regional Directory of Protected Areas, Regional Directory of Roads, Regional Directory of Transport - Municipality of Kolonja	Gjirokastra Kolonja municipality	July and September field mission
Meetings with National NGOs (IUCN Members)	- Institute for Nature Conservation in Albania (INCA) - Preservation and Protection of Natural Environment in Albania (PPNEA)	Tirana	November
Follow-up letters sent to authorities to ask for baseline information and clarity on protections and restrictions on protected areas and cultural heritage	- National Agency of Protected Areas - Regional Directory of Cultural Heritage	Tirana	November
Discussions to arrange public hearings and notification campaign	NEA, Regional Directorate of Environment, and Municipalities of Gjirokastra, Libohova, Dropulli, Permeti, Kelcyra, Tepelena	Stakeholder offices	November
Submission of PH Plan and Draft ESHIA to national regulators, with public comment period open for 20 days. Regulator will provide public advertisements at its website that ESHIA has been submitted.	Regulator and members of the public	ESHIA will be publically available via the regulators website	November
Public hearing meetings	Open to all stakeholders, including members of the public	Various municipality and sub-municipalities	December

The following key feedback was provided by stakeholders during the engagement undertaken for the ESHIA. A full record of feedback provided by stakeholders is provided in Annex 2.

- It will be important to communicate project information to stakeholders and communities before commencing the seismic survey.
- Land access, site restoration and compensation to landowners are key issues.
- The detonation of explosives during the seismic survey is of concern if it has the potential to cause deterioration of structural stability of dwellings, infrastructure or cultural heritage. It will be necessary to ensure that safety distances are adequate to protect these receptors.
- Activities undertaken in protected areas should be carefully managed. It is important to protect cultural heritage, including monuments and sites of local value.
- In some municipalities water resources are scarce during the dry season.

- Concern expressed about any risk of environmental pollution, especially of ground and surface waters. Concern that the explosives and seismic activities will pollute water sources.
- Concern raised by NGOs about the potential for future conflict between oil industry development and tourism potential during any future phases of exploration (i.e. drilling) if this project is successful. This issue of conflict with tourism was not raised specifically in relation to this seismic survey project.

1.5 Main constraints during the preparation of the ESHIA Report

The main constraints in the preparation of the ESHIA report are related to:

- Stakeholder engagement;
- Protection status of designated protected areas;
- Protection status for cultural monuments;
- Protection status of water supply sources;
- Baseline data availability and collection; and
- Locations of support facilities.

1.5.1 Stakeholder engagement

ESHIA team aimed to engage with heads of all villages which the seismic corridors cross. This engagement occurred successfully for the vast majority of villages during the baseline field missions (2018), though with a small number of exceptions where village heads were not available (engaged with agricultural activities, on holidays, or due to ill health) to meet during these visits. In order to help ensure that the village heads who were not available receive project information, AECOM provided their sub-municipalities heads with project information leaving printed leaflets. Although direct feedback on the project could not be elicited from this small number of village heads during the baseline field missions, it is not anticipated that there would be any specific concerns or other types of feedback that differ to what was heard from the many village heads who were met by AECOM.

The public hearings plan was developed in recognition of the large distances between potentially affected communities and the main regional towns. As such, public hearings are planned to take place for a number of sub-municipalities rather than only in the regional towns. This was done to reduce the distance that members of the public would need to travel to attend their nearest public hearing meeting. While public hearings could not be undertaken in all communities AECOM considers that the provisions of public hearings were extensive enough to help communicate project information broadly across the project area and to elicit comment from a wide number of potentially affected people.

1.5.2 Protection status of designated protected areas

The protection of designated protected areas (e.g. natural monuments, national parks and natural parks), including allowable activities, according to Albanian legislation is to be detailed in management plans; however, the management plans for many protected areas have not been prepared. Furthermore, we have noticed different statements and divergences between newly promulgated laws and the existing laws. Hence the clarity on the degree of protection and allowable activities in these areas is yet to be established. National Agency of Protected Areas (NAPA) was engaged to provide guidance to the ESHIA team and to provide confirmation of the protections and restrictions associated with PAs.

1.5.3 Protection status for cultural monuments

There are tangible cultural heritage sites that have been declared as cultural monuments though the Albanian legislative process within the seismic corridor and protection zones. These sites are protected by a buffer zone of up to 200m which is decided on a case by case basis by the RDCH. The RDCH was engaged to provide specific guidance on protections and restrictions applicable for the seismic survey for the protection of cultural monuments. A 200 m protection zone for cultural monuments has been adopted.

1.5.4 Protection status of water supply sources

Albanian legislation calls for the establishment of sanitary protection zones on a case by case basis by the water authorities for water supply sources; however, there is no official record of these areas. A precautionary protection zone of 200m, where no seismic survey activities will take place, has been adopted.

1.5.5 Baseline data availability and collection

Albanian legislation provides for the protection of biological, geological and hydrogeological features by designating them as “protected areas” (PA); each with varying degrees of protection. The Zagori Natural Park was first designated in 2015 and recently re-designated under Albanian legislation, after baseline field surveys had been completed. Surveys were completed at selected points along the proposed seismic corridors prior to a full understanding of the different management areas in the protected areas within the park (e.g. the Central Zone and Traditional Use Zone). Additional field surveys are under consideration to better characterize the ecology of the park, especially in the central zone. Data on the distribution of species with the Study Area is limited to those listed in the Red List of Albanian (RLA) and the IUCN Red list and no species-specific surveys were undertaken. In addition, detailed ground-truthing and mapping of vegetation types (e.g. EU Directive Annex I habitats) in the Study Area were not done. The impact assessment accounts for these uncertainties and mitigation measures that have been developed in relation sensitive species and habitats have been taken into account in assessing residual impacts.

Natural monuments designated because of their unique geological or hydrogeological features are presented in the study area. The Shpella e Mezgoranit is a cave system within the study area. However, the only portion of the cave system that is designated is the (known) entrance to the cave.

The system is located within karst geology and the extent of the cave system is unknown, represents a gap in the understanding of the subsurface geology baseline characterization. This will present a challenge while executing the seismic survey. Additional desktop study and geological study, prior to undertaking the seismic survey, will provide clarity on the specific protection measures that will need to be employed to protect the caves.

1.5.6 Location of support facilities

The locations of the Base and fly camps that will be required for the seismic survey will be determined by the seismic contractor in coordination with the project proponent and other interested parties. Mitigation measures have been proposed to avoid or minimize potential adverse impacts to the biological, physical and social environment.

2. Project Overview

2.1 Aim of the Project

Shell Upstream Albania B.V. (hereafter referred to as SUA) is the Operator of a Production Sharing Contract (PSC) for Exploration, Development and Production of Petroleum in Blocks 2 and 3, onshore Albania, where it is currently performing appraisal activities. SUA has signed a PSC for Exploration, Development and Production of Petroleum in Block 4, approved with the Decision of Council of Ministers of the Republic of Albania No. 350 dated 12.06.2018. As part of the work plan under the PSC Block 4, SUA proposes to conduct a 2D seismic survey (hereafter referred to as 'Project') during year 2019 in Block 4 with extended lines into Blocks 2-3.

A seismic survey is a method of imaging geological structures and their potential to exploration for petroleum and mineral deposits. Geoscientists use seismic surveying to obtain an indirect image of the structure and nature of the rock layers. The proposed survey will enable SUA to evaluate the hydrocarbon potential of Block 4 and inform the potential surface locations of exploratory drilling activities.

2.2 Project background

Shell Upstream Albania B.V. (SUA), a wholly owned Shell company, is conducting drilling appraisal activities in Block 2-3 (north of Block 4). In February 2018, Shell Upstream Albania B.V. (SUA) signed a Production Sharing Contract with the Government of Albania for oil exploration activity in Block 4 in the Gjirokastrë region. SUA is planning to conduct a seismic survey in Block 4 in 2019.

Albania has more than 100 years of oil exploration, and several seismic campaigns have taken place in Block 4 by:

- Geophysical Enterprise of Fier (Albanian state owned company) before 1990s;
- OMV (between 1998 and 2006)⁴⁴;
- Sky Petroleum (2010); and
- Petromanas Albania GmbH (2013)⁴⁵.

There are also a number of historical exploration wells that have been completed in Block 4 as shown in Figure 2-1

The 2D seismic campaign proposed by SUA will comprise of approximately 212 km of acquisition lines (spatial, not physical) and is expected to commence in the second quarter (Q2) of 2019 and could last for up to six months, subject to receipt of all relevant approvals. The seismic data will be acquired using predominantly impulsive as well as non-impulsive seismic energy sources. A combination of explosive (impulsive) and vibrator (non-impulsive) seismic sources are proposed. The choice of the source will depend on the terrain, access, shallow geology and other operational parameters.

The potential impacts of seismic surveys are well understood and have been documented in a number of studies, including Environmental and Social Impact Assessment (ESIA) reports from previous surveys in Block 4⁴⁶ and for campaigns in Blocks 2 -3^{47,48}. Impacts from such activities are well understood and supported by peer reviewed literature in the public domain and various Industry and regulatory guidelines are available to assist with the safe execution of such activities.

⁴⁴ <https://www.slideshare.net/SkyPetroleum/sky-petroleum-exploration-blocks-in-albania-summary>

⁴⁵ Petromanas Extension Project ESIA, 2012

⁴⁶ OMV ESIA, 1988

⁴⁷ Walsh Environmental (2012) Environmental and Social Impact Assessment for Seismic Exploration Activities (Blocks 2-3 Extension) in Blocks Dumre, 1, 4, 5, 6 Onshore Albania, Published: October 2012

⁴⁸ EMA (2014) Environmental and Social Impact Assessment for Seismic Exploration Activities in Blocks 2&3 Onshore Albania: 2015 Program, Published: October 2014

2.3 Project location

Block 4 is located in southern Albania, south of Blocks 2 - 3 and adjacent to the border with Greece, approximately 100 to 200 km south of Tirana and is connected to the capital through paved roads. The Block 4 covers four regions - Berati, Korca, Gjirokastër and Vlora, though the majority of the seismic acquisition lines will be located in the Gjirokastër region.

The indicative location of the proposed seismic corridors is shown Table 2-1. The position and length of seismic lines (within the corridors) will be finalised subject to terrain features, logistical constraints and proximity of sensitive receptors. Overall, there is approximately 212 km of seismic survey corridors. For the purpose of the ESHIA, it has been assumed that the seismic survey activities will be limited to 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition. The actual footprint of the seismic line within the 500m corridor where seismic activities will take place will be no more than 5m to accommodate the vehicles and allow for avoidance of small incidental features (e.g. structures, trees, ponds or rock outcroppings). In some locations, survey activities will be limited to the placement of geophones only; these locations are at each end of the seismic lines. Based on the overall length of the seismic lines and a practical operational width of 5m, approximately 1 km² (110 ha) will be accessed for seismic survey activities. The area of the seismic corridors based on a 500m width is 106km² (10,600 ha). Of the eight proposed seismic lines, only line 014 extends into Block 2 and 3 in Memaliaj Municipality.

Table 2-1 provides the start and end point GPS locations and a description of the seismic data acquisition activities along the seismic line.

Table 2-1 Summary of seismic lines

Line Name	Description	Easting	Northing	Description
19SUA_B44_011	Receiver Only	4416794	4452180	Receiver Start
	Shot point & Receiver	4420173	4454321	Shot point Start
	Shot point & Receiver	4428984	4459904	
	Shot point & Receiver	4435281	4465830	Shot point End
	Receiver Only	4438194	4468572	Receiver End
Total Line Length				27.078 km
19SUA_B44_012	Receiver Only	4417531	4443637	Receiver Start
	Receiver Only	4418990	4444486	
	Shot point & Receiver	4421013	4445652	Shot point Start
	Shot point & Receiver	4426036	4448235	
	Shot point & Receiver	4427174	4448821	
	Shot point & Receiver	4427583	4449031	
	Shot point & Receiver	4428425	4449464	
	Shot point & Receiver	4430426	4450558	
	Shot point & Receiver	4431289	4451030	
	Shot point & Receiver	4431358	4451068	
	Shot point & Receiver	4432550	4451731	
	Shot point & Receiver	4434720	4453476	
	Shot point & Receiver	4434872	4453599	
	Shot point & Receiver	4435871	4454202	

Line Name	Description	Easting	Northing	Description
	Shot point & Receiver	4436767	4454743	
	Shot point & Receiver	4437583	4455179	
	Shot point & Receiver	4440729	4457564	
	Shot point & Receiver	4442613	4458993	
	Shot point & Receiver	4442714	4459069	Shot point End
	Receiver Only	4443430	4459613	
	Receiver Only	4445896	4461510	Receiver End
Total Line Length			33.633 km	
19SUA_B44_014	Receiver Only	4421652	4467152	Receiver Start
	Shot point & Receiver	4424117	4464135	Shot point Start
	Shot point & Receiver	4424669	4463437	
	Shot point & Receiver	4425910	4461865	
	Shot point & Receiver	4428891	4458089	
	Shot point & Receiver	4431593	4455621	
	Shot point & Receiver	4434292	4453282	
	Shot point & Receiver	4435996	4451799	
	Shot point & Receiver	4436767	4451128	
	Shot point & Receiver	4441746	4446356	Shot point End
	Shot point & Receiver	4442496	4445638	
	Receiver Only	4444584	4443336	Receiver End
Total Line Length			33.154 km	
19SUA_B44_015	Receiver Only	4429718	4467275	Receiver Start
	Receiver Only	4430949	4466322	
	Shot point & Receiver	4432881	4464826	Shot point Start
	Shot point & Receiver	4432993	4464733	
	Shot point & Receiver	4434855	4463196	
	Shot point & Receiver	4435922	4462315	
	Shot point & Receiver	4441046	4458082	
	Shot point & Receiver	4441356	4457835	
	Shot point & Receiver	4443240	4456332	
	Shot point & Receiver	4444669	4455191	
	Shot point & Receiver	4447130	4453104	Shot point End
	Receiver Only	4449083	4451448	
	Receiver Only	4450223	4450481	Receiver End
Total Line Length			26.508 km	
19SUA_B44_016	Receiver Only	4415349	4454655	Receiver Start

Line Name	Description	Easting	Northing	Description
	Shot point & Receiver	4418000	4451660	Shot point Start
	Shot point & Receiver	4421088	4448172	
	Shot point & Receiver	4430502	4437538	Shot point End
	Receiver Only	4433156	4434539	Receiver End
Total Line Length				26.866 km
19SUA_B44_017	Receiver Only	4430653	4454595	Receiver Start
	Shot point & Receiver	4433909	4456917	Shot point Start
	Shot point & Receiver	4437002	4459124	
	Shot point & Receiver	4439599	4460976	Shot point End
	Receiver Only	4440780	4461819	
	Receiver Only	4441822	4462442	
	Receiver Only	4442968	4463127	Receiver End
Total Line Length				14.990 km
19SUA_B44_018	Receiver Only	4410541	4461593	Receiver Start
	Shot point & Receiver	4414674	4461889	Shot point Start
	Shot point & Receiver	4419037	4462320	
	Shot point & Receiver	4423094	4462857	Shot point End
	Receiver Only	4427126	4463312	Receiver End
Total Line Length				16.678 km
19SUA_B44_019	Receiver Only	4410259	4477494	Receiver Start
	Receiver Only	4411883	4474620	Shot point Start
	Shot point & Receiver	4412210	4474025	
	Shot point & Receiver	4414251	4470313	
	Shot point & Receiver	4423741	4453739	
	Shot point & Receiver	4424628	4452412	Shot point End
	Receiver Only	4426871	4449056	Receiver End
Total Line Length				32.947 km

Note:

GIS data – Albanian_1987_GK_zone 4; Gauss Kruger Protection

The accommodation for the project work force will be either in camps, hotels or guest houses or a combination of the three. A Base will be required to provide logistical support during the seismic campaign. The Base includes accommodation, storage of vehicles and materials. The preferred location is likely to be close to the town of Gjirokastrë (in an industrial area) however, the seismic contractor may decide on a different location such as Tepelene, Permet or Kylcera. The Base will utilize existing facilities with the possibility of a camp only if there is not sufficient accommodation and existing infrastructure is not suitable. If a Base camp is required, it will have a footprint of less than 1ha and be established close to the town of Gjirokastrë. Smaller “fly” camps will also be temporarily established closer to the seismic lines to accommodate the working crew (up to 30 people approx.) for a short duration (days-weeks). The final location of the Project camps will be defined by the contractor. The

“fly” camps may comprise temporary tented facilities having a footprint of approximately 0.05 ha or take advantage of existing facilities. One of them likely is to be located at Line 14, within the Zagori Natural Park close to the villages of Shepper or Polican.

2.3.1 Land use

Overall, there are seven municipalities within the project area. There are six municipalities with settlements in the vicinity of where energy discharge will occur and one municipality where the seismic lines will cross however only geophones will be placed and no energy sources will be deployed.

Within the above mentioned 6 municipalities, there are 35 settlements which fall within the 500m seismic corridors and 200m buffer area on either side of the seismic corridor (assumed buffer zone where Project impacts i.e. noise/vibration/visual can extend). There are 10 villages where only geophones will be used. These are summarized in Table 2-2 and mapped in Figure 2-2.

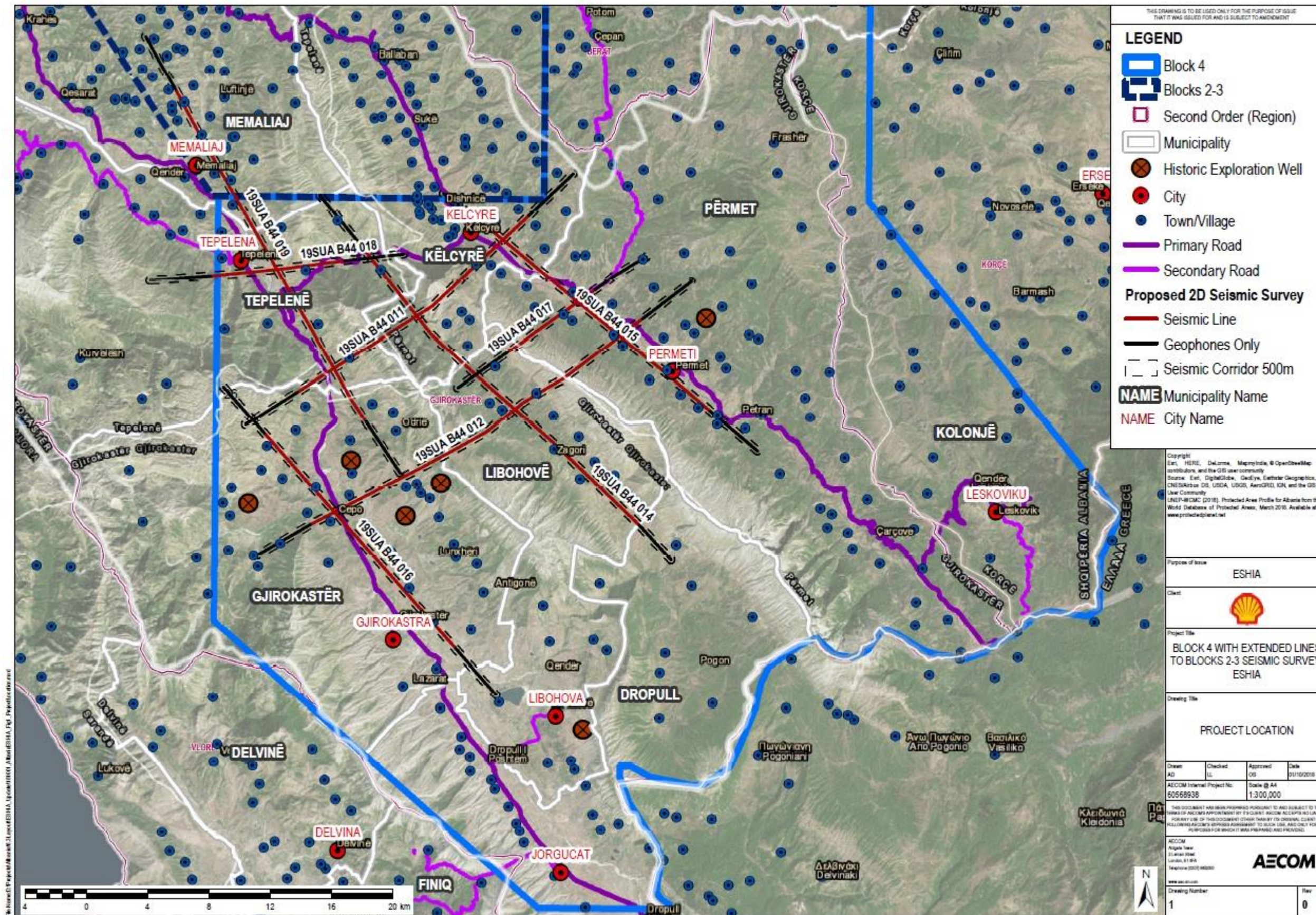


Figure 2-1 Proposed seismic acquisition plan

Table 2-2 Summary of settlements within the 500m seismic corridors and 200m protection zone

Municipality	Sub-Municipality	Settlement Name	Type	Geophones Only
Përmet	QenderPiskove	Buali	Village	N
		Petran	Village	Y
		Badelonja (Lagja e Re)	Village	Y
		Leshnica	Village	N
		Leusa	Village	N
		Lipe e re	Village	N
	QenderPiskove	Buali	Village	N
		Buali (golemas)	Village	N
		Piskova	Village	N
	Përmet	Permeti	City	N
Këlcyrë	QenderPiskove	Mokrice-zleusha	Village	Y
		Rapcka (Vila)	Village	N
Këlcyrë	Kelcyra	Brezhani (Rreza)	Village	N
	Dishnica	Bedqyras	Village	Y
Tepelenë	QenderTepelene	Hormova	Village	N
		Mezhgorani	Village	Y
		Peshtani	Village	N
		Dragodi	Village	N
Gjirokastër	Cepo	Cepuna	Village	N
		Humelica	Village	N
		Kardhiqi	Village	Y
		Plesati	Village	Y
	Antigone	Arshi lengo	Village	N
	Picar	Picari (Picari i Vjeter)	Village	N
	Lunxheri	Topullaraj	Village	N
Libohovë	Zagorie	Hoshteva	Village	N
		Topova	Village	N
		Doshnica	Village	Y
Memaliaj	Memaliaj Fshat	Cerrila	Village	N
		Damesi	Village	N
		Damesi (bofeng)	Village	N
		Damesi (kallem)	Village	N
	Luftinja	Luftinja e Siperme (Canaj)	Village	Y
		Zhapokika	Village	Y
		Zhapokika e Siperme (Ballaxhija)	Village	N

2.3.2 Land use within the seismic corridor

Land use in the Study area as indicated by the Corine land cover data set are (Table 2-3 and Figure 2-2):

- Agricultural areas;
- Forest and semi natural areas;
- Water bodies; and
- Urban areas.

Within the seismic corridors the predominant land uses are:

- Scrub and/or herbaceous vegetation associations (33 %), which includes natural grasslands, sclerophyllus vegetation and transitional woodland shrub.
- Forest (25 %), which is principally broad-leaved forest.
- Heterogeneous agricultural areas (24%), which include areas of small land parcels with diverse annual crops, pasture and/or permanent crops, and agricultural areas interspersed with significant natural areas.

These data indicate that the following types of land use can be anticipated to occur within the seismic corridors:

- Farming of a variety of agricultural crops
- Farming of livestock, including use of pasture lands.
- Farming of fruit trees and berry plantations.
- Growing and collection of herbs from pasture and other areas.
- Use of forests for recreational values and collection of wood.

It is noted that the Corine land cover data set is a coarse classification of land uses and that the actual land uses crossed by the seismic line will only be known once the location of the line has been set, within the already set seismic corridor. As such, there could be, for example, a higher proportion of the line impacting permanent crops than is shown in this table. The data shown in Table 2-3 is, however, expected to be indicative of the project area.

Table 2-3 Different land uses within the 500m seismic corridors

Main Land use	Category of land use	Sub-Category of land use	Total Area*	% of total
Agricultural Areas	Arable land	Non-irrigated arable land	833	
		Permanently irrigated land	38	
	Arable land Total		870	8.1
	Heterogeneous agricultural areas	Complex cultivation patterns	1366	
		Land principally occupied by agriculture, with significant areas of natural vegetation	1208	
	Heterogeneous agricultural areas Total		2574	23.9
	Pastures	Pastures	467	
	Pastures Total		467	4.3
	Permanent crops	Fruit trees and berry plantations	66	
		Olive groves	40	
	Permanent crops Total		106	1.0
Forest and	Forests	Broad-leaved forest	2558	

Main Land use	Category of land use	Sub-Category of land use	Total Area*	% of total
Semi-Natural Areas		Coniferous forest	140	
		Mixed forest	26	
	Forests Total		2724	25.3
	Open spaces with little or no vegetation	Beaches, dunes, sands	69	
		Burnt areas	11	
		Sparsely vegetated areas	162	
	Open spaces with little or no vegetation Total		241	2.2
	Scrub and/or herbaceous vegetation associations	Moors and heathland	133	
		Natural grasslands	1243	
		Sclerophyllous vegetation	895	
		Transitional woodland-shrub	1274	
	Scrub and/or herbaceous vegetation associations Total		3544	33.0
Water Bodies	Inland waters	Water courses	154	
	Inland waters Total		154	1.4
Urban Area	Urban fabric	Discontinuous urban fabric	69	
	Urban fabric Total		69	0.6
TOTAL LAND USE WITHIN SEISMIC CORRIDOR			10750	

Data Source: European Commission, Corine Land Cover, 2012.

Within study area there are protected designated areas such as parks and reserves, natural monuments and cultural monuments. Protected designated areas are shown in Figure 4-13 and Cultural monuments are shown in Figure 4-48 in **Chapter 4 Baseline**.

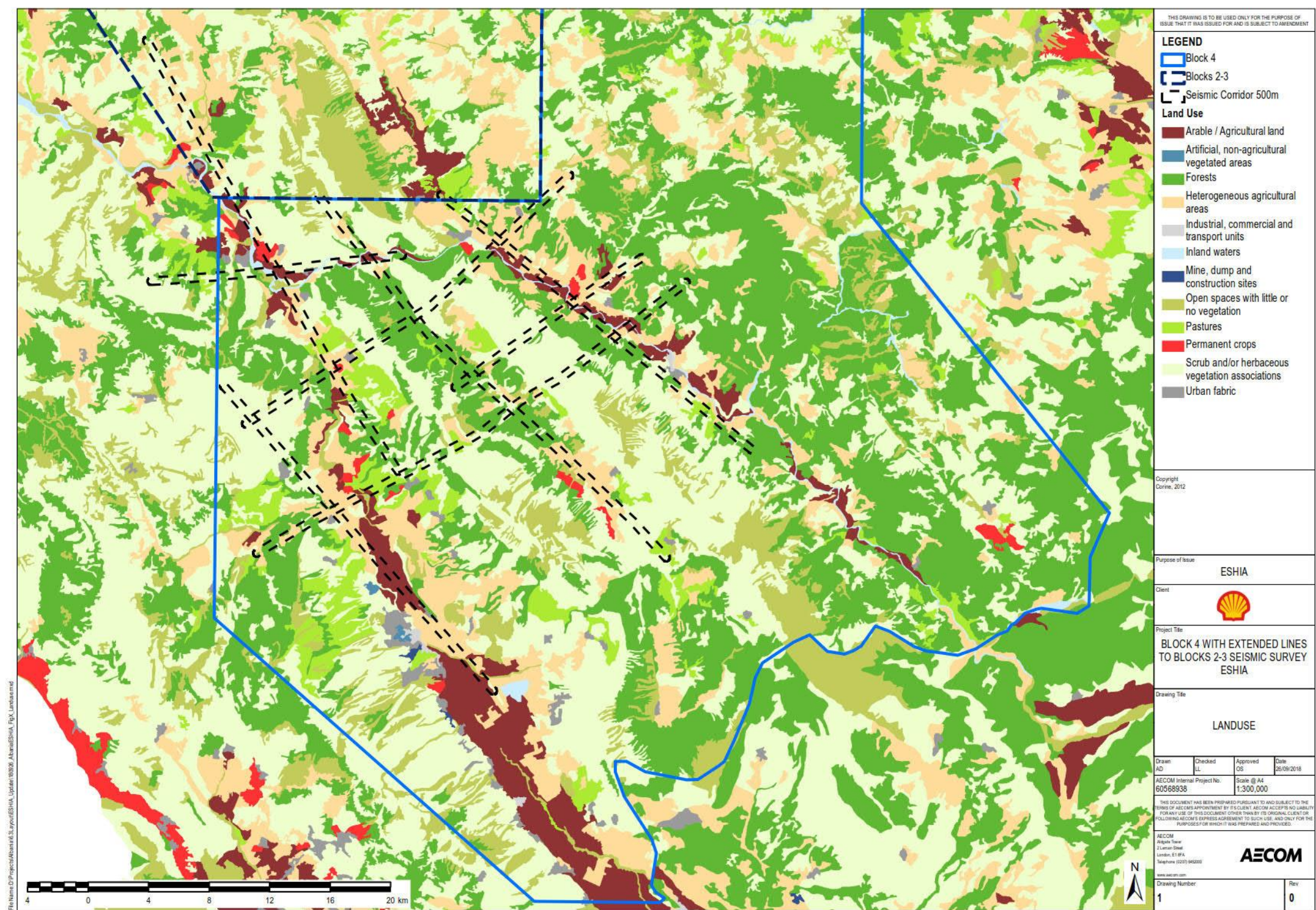


Figure 2-2 Land use in the study area

2.4 General principles of seismic acquisition

Seismic data is the primary source used in the oil and gas industry for producing images and maps of the rock strata. Seismic imaging is used to identify potential hydrocarbon accumulations and also possible hazards to drilling operations. These images are usually produced by emitting and receiving an energy pulse at or below the ground surface. Different types of seismic energy sources can be used including both impulsive (explosive) and non-impulsive (vibroseis).

The impulsive energy sources include detonation of explosives which transfer seismic energy into the ground in the form of a short duration pulse. The explosives are loaded into drilled shot-holes and detonated in sequence during the recording phase. The depth of the drilled shot-holes can vary between 6 and 12m thus reducing the risk of encountering groundwater and the size of the charge is dependent on the sub-surface response.

Non-impulsive method like vibroseis typically deploys motorised trucks equipped with vibrating plates and moving along pre-determined seismic lines. Several trucks vibrating in phase are aligned according to the profile to be studied and spaced out to soften energy waves at the surface and to strengthen the wave intensity emitted vertically.

The choice of energy source is dependent on topography, ground conditions and the quality of seismic data that can be obtained by these sources in the given sub-surface geology. The ground conditions taken into consideration while choosing an energy source include:

- Access restrictions;
- Ecological or social considerations;
- Structural integrity of existing infrastructure (e.g. buildings and existing oil and gas facilities);
- Local terrain and land use; and
- Line clearance and restoration efforts.

The energy generated by either impulsive or non-impulsive sources penetrates the subsurface and partially absorbed or reflected back to the surface by various rock formations with different geophysical characteristics. The reflected portion of this energy is detected by receivers or geophones on the surface. Geophones (similar to a microphone) are small electro-mechanical devices that are placed on the ground along the seismic line at precisely known positions from the energy source. They are connected by electrical cable to digital processing devices (boxes) placed at specified intervals along the seismic line. It is possible that wireless systems will be used on the project in some places. The wireless systems do not use electrical cables to connect the geophones to the recording unit. Both systems may be used on the project.

The reflected data is sent through a network of cables or radio to a recording unit where data is analysed and computer modelled to generate subsurface geological images that enable the geophysicists and geologists to highlight areas most likely to contain gas and/or oil reserves. The recorded data is sent to central data hub for further processing.

The seismic imaging produced by the proposed 2D data acquisition will graphically present a two dimensional profile or “section” of the underlying geology that is situated directly below each seismic line. As such, in order to generate a better understanding of the geological structure over an entire prospective area, a 2D survey is executed using a planned grid, or network, of 2D survey lines.

The 2D seismic lines are usually spaced several kilometres (1-4 km) apart. Each line has geophones placed at regular intervals, and energy source points are located along the same line, typically between every third or fourth geophone station. The location of the energy source points and geophones may however be offset in the field to avoid a sensitive receptor (buildings, water wells, transmission lines, archaeological sites, water body, among others).

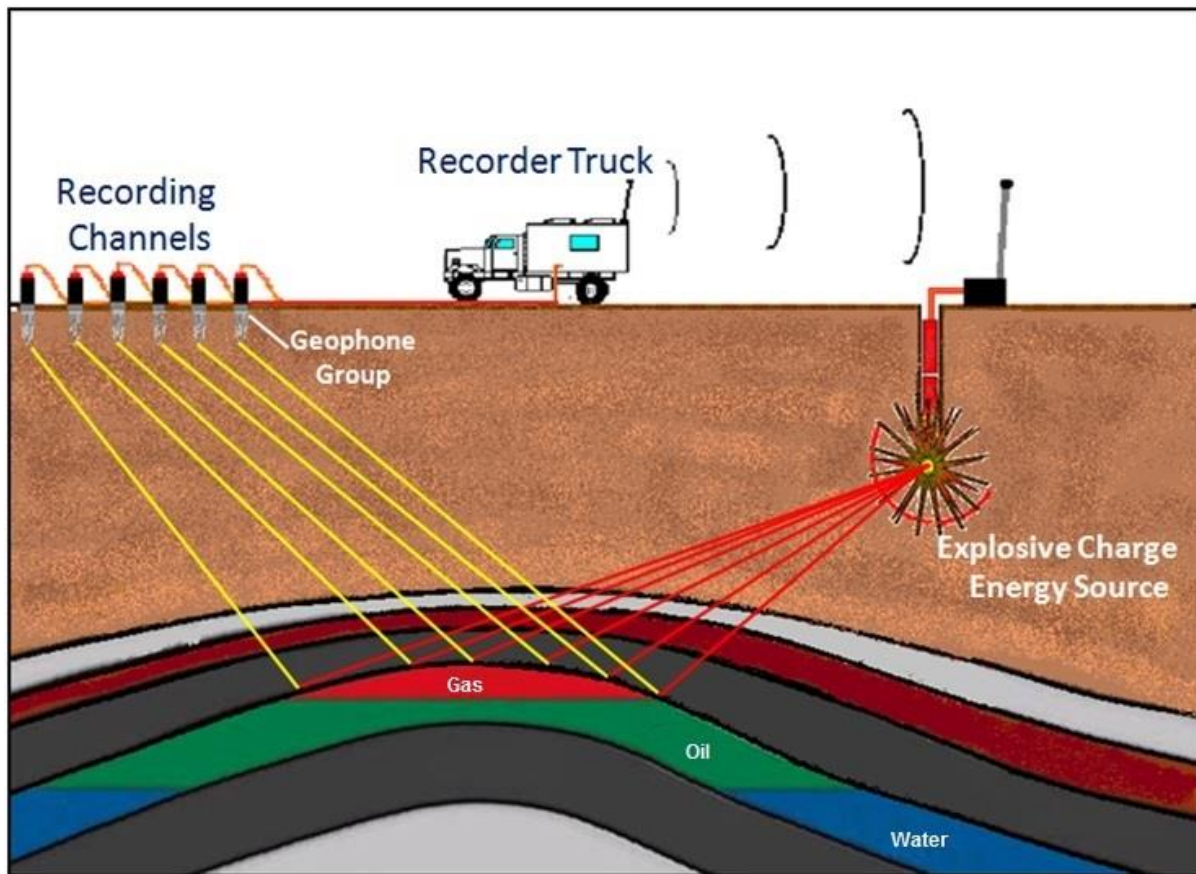


Figure 2-3 Schematic example of 2D seismic survey with explosive source and recorder trucks

Typical onshore seismic campaigns involve the following phases; these are grouped and further described below in **Section 2.5, Seismic survey**:

- a. Desktop Survey Planning and Scouting: design of seismic lines to achieve subsurface imaging objectives. This design is followed up by a reconnaissance of the area;
- b. Permitting: notification of local authorities and communities and obtaining access permission from land owners, communities and local authorities;
- c. Early works and Mobilisation: setting up of camps, crew and equipment;
- d. Line Survey: positioning and marking of seismic lines. The actual positioning of the seismic lines due to offsets is known as the post-plot design;
- e. Line Clearance: where necessary improving physical access for personnel and equipment on seismic lines;
- f. Establishment of impulsive energy sources: drilling of shot-holes and loading of explosive charges;
- g. Deployment of non-impulsive energy sources: mobilisation of trucks with vibration plates along seismic lines.
- h. Shooting and Recording: Detonating explosive charges or activating vibrating plates to release energy into the ground and recording the data across the live spread;
- i. Post Survey Clean up and Restoration: demobilisation activities and camp restoration, environmental restoration of seismic lines. It also includes observation and documenting of any damages by the permitting team and the payment of compensation if required.

The proposed survey will use explosive charges as the main seismic source which will transfer seismic energy into the ground in the form of a short duration pulse. The survey proposes to use a combination of Heli-portable, man-portable and conventional shot hole drill rigs for placement of explosive material (degradable Pentolite). Approval is pending for pre-loading of the explosives into the shot hole. Vibroseis sources may also be used on certain seismic acquisition lines depending on the available access, shallow geology and other operational parameters. Figure 2-4 summarises different activities associated with both methods.

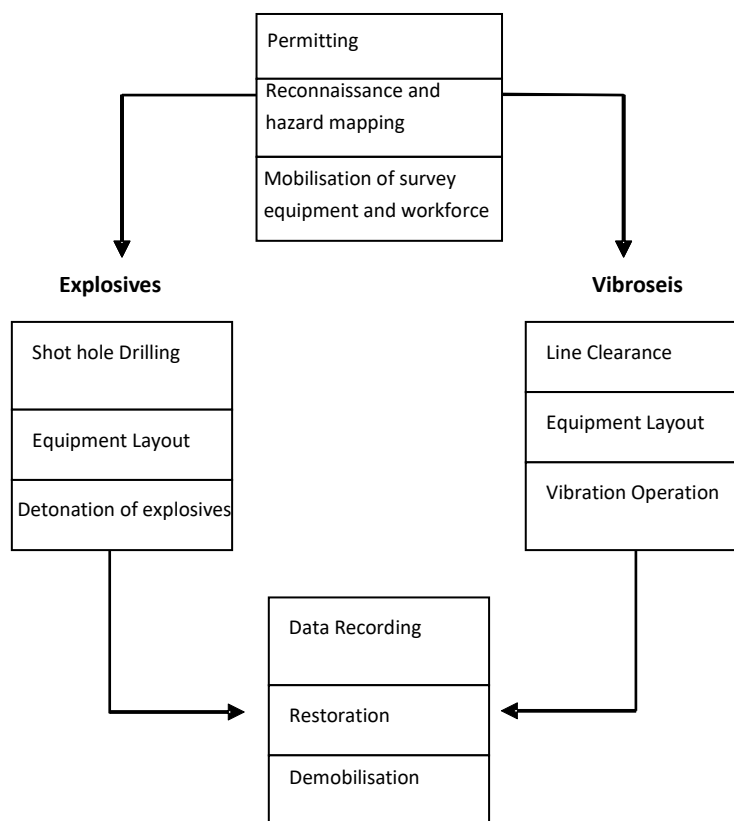


Figure 2-4 Seismic survey process flow diagram using explosives

2.5 Seismic Survey

2.5.1 Pre-acquisition phase

2.5.1.1 Permitting

The term “permitting” associated with the seismic survey is used to describe the process of arranging permissions and agreements to access land and provide compensation to land/property owners for providing access to the land or any damage to the property (e.g. structures, crops etc.).

Prior to the initiation of field operations, seismic permitting crews will conduct a comprehensive landowner permitting effort. The land permitting team will determine land ownership along the lines, visit with landowners and arrange for permission to enter the property. Land shall not be entered upon without formal, written approval of the Land Owner and, in case of leased land, the actual user(s) of the land.

Landowners or users will be confirmed with local authorities and through meetings with landholders or users. This will be compliant with the Project Stakeholder Engagement Plan and the 2008 Shell's Guidelines for Land Access and Stakeholder Management of Land Owners in Seismic Operations. Negotiations for access agreements and terms and conditions for compensation will be agreed prior to commencement of any on-site survey work, and will be supported by an inventory and photographic evidence of crops or structures located along the proposed seismic acquisition lines.

The permitting team will visit the landowners at different stages of the Seismic survey to ascertain the status of crops and other resources prior to and after the seismic survey. This will enable them to document any damage or loss to property and crops, negotiate and agree market based compensation for any losses, ensure payments are made to the rightful owners and the payment evidence is secured. Compensation will be paid upon justification of the damages incurred and in accordance with the description of a crops and structures inventory agreed with landowners/land users prior to start of activities to avoid disputes upon completion of works. Sometimes some lands are crossed simply to access the seismic line; hence will not “see” any equipment laid out however this land may be used to access the seismic lines after recording operations have been completed to

supervise restoration works. Also, compensation is only for actual damages (either anticipated or unanticipated). A community feedback process which includes a grievance mechanism will be in place during the compensation negotiations.

2.5.1.2 Reconnaissance of the Area

The seismic acquisition lines will be designed based on existing information such as topographical and geological maps, satellite imagery, and data from previous seismic programs. All topographic features and obstructions will be mapped and then verified in the field through scouting exercises.

The reconnaissance team will scout each planned seismic line prior to seismic operations. The scouting trip may include an over-flight by fixed-wing or helicopter, travel by vehicle along roads, or walking along to the proposed seismic lines.

Among other responsibilities, the reconnaissance team will note the presence of any potentially sensitive environmental conditions (wetlands, nesting or breeding grounds), document the proximity of seismic lines to inhabited areas and infrastructures (bridges, roads, trails) and note the locations of any archaeological sites not previously identified. The team will also establish efficient logistics and movement of crew and equipment within the survey area.

The seismic line plan will be finalised and adequate distance offsets will be incorporated into the final design to protect sensitive social and environmental receptors.

2.5.1.3 Mobilisation

Mobilisation will involve acquisition of environmental approvals and other relevant permits, risk assessment and EHS planning and mobilisation of staff and equipment as well as the establishment of the temporary Base camps / 'fly camps' and explosive storage facilities (see Section 2.7 and Section 2.9 for further details).

2.5.2 Seismic survey activities

2.5.2.1 Line Survey

The survey crew will undertake a detailed scouting or reconnaissance survey along each of the proposed seismic lines and access routes to mark out survey positions for receivers/geophones and shot-holes /vibrois positions while maintaining prescribed offset distances from sensitive social and environmental receptors. The layout of seismic lines will be indicated through pegging (temporary markers); with each peg location recorded using a global positioning system (GPS) (Figure 2-5). Usually a survey crew consists of two members: a surveyor operating the instrument and the assistant will help carrying equipment and ensure that the "buddy" system (nobody alone on the line) is in place according to HSSE rules.

Any hazards not previously identified will be recorded and lines adjusted. The location and types of crops will be recorded by the land permitting team for damage calculations and verification.

Any discovery or excavate objects of cultural heritage value by chance during construction works shall suspend work immediately and inform the relevant local authorities within three days. These institutions are responsible for assessing the archaeological value of the objects found and determining whether work may continue or whether work must remain suspended until further ground investigations have been undertaken (article 146 of law 27/2018)



Source: Shell Albania, 2018

Figure 2-5 Example of line survey in Albania

Safe operating distances will be determined by following industry guidelines as outlined by the International Association of Geophysical Contractors (IAGC)⁴⁹ for operating in proximity to dwellings and other structures.

Before recording activities commence along each seismic line, the surveyors will determine minimum safe offset distance for the area of operations to prevent impacts to the existing infrastructure or protected areas (i.e. buildings, natural monuments, cultural heritage, and water sources). Where protection zones established by Albanian regulations for cultural heritage and natural monuments are greater than safety distances these will take precedence. If a seismic survey point falls within the confines of the safe operating distances then the surveyor offsets the seismic survey point.

Offsets are typically considered for the following list to ensure safe operating distances are observed:

- Buildings
- Irrigation structures
- Houses
- Water wells
- Cultural heritage sites

2.5.2.2 Clearance of Survey Lines

Vibrators will predominantly be using existing tracks or be driven in fields with minor vegetation trimming required, similarly to tractor mounted drill rigs. Although opening of linear tracks and soil stripping may be required for vibroseis trucks to drive through, vegetation clearance along seismic lines is expected to be minimal while using explosive sources to enable access for truck mounted drill units if necessary.

In both methodologies, some areas may need to be cleared to allow the operator to have a clear line-of-sight and create sufficient access for vehicles and personnel for the deployment and retrieval of seismic survey equipment. There might be cases where access may require trimming the vegetation (e.g. thick bushes) for access to the 500m corridor and for the placement of receivers.

⁴⁹ IAGC (2007) - Minimum Offset Guidelines for Land Seismic Surveys, 2007. Rev 1. . International Association of Geophysical contractors (IAGC), Houston, USA

Vegetation clearance within the seismic track will depend on the type of vegetation to be crossed and the types of vehicle needing access. The survey lines where shot holes will be installed (see section below and Figure 2-1) will be kept to an absolute minimum width, just wide enough to walk through and set up the survey equipment. The cutting of trees (greater than 10 cm DBH⁵⁰) will be avoided. Vegetation will be cut about 10 cm above the ground level to preserve rootstock and promote sprouting. Cut material will be piled along the line to be placed over the cleared area after recording.

If levelling is required organic-rich topsoil will be removed and stockpiled in appropriate locations for later use in the restoration of affected areas. Any cut-slopes and fill areas along the roads will be stabilized with appropriate drainage and erosion control techniques to prevent loss of soil, formation of gulleys, and slope failure.

River crossings by trucks and equipment will be kept to a minimum. Crossing will be arranged under appropriate angle not to disturb geomorphology and integrity of the banks. Temporary bridges or other support structures will be removed prior to line abandonment unless it is determined these structures will benefit local communities.

2.5.2.3 Shot Hole Drilling

Approximately 3,000 diameter shot holes with a diameter of maximum 9 cm will be drilled along predetermined seismic lines 40 to 80 meters apart (12 to 25 shots holes per kilometre, depending on the terrain and presence of obstructions). The depth of the shot-holes is anticipated not to exceed 12 m; there is no plan to drill shallower than 12m.

The program schedule will call for a minimum number of kilometres of seismic data to be recorded daily; this requires that numerous shot holes be drilled each day. Several drill crews will be operating simultaneously, with each drill crew being self-contained. A drill unit normally consists of three to seven people depending on the drilling method (Heliportable and man portable, respectively); a driller and his helpers.

The shot hole drilling is accomplished by a steel drill stem, rotated by a diesel engine mounted on the rig. For tractor mounted drill rigs, water is used to force the cuttings out of the hole and cool the bit. Heliportable rigs will use compressed air. Each shot hole will need approximately 100 litres of water for the shot-hole drilling. A water truck will accompany each tractor mounted drill rig. Bentonite (clay) may be added to the water to help drilling in unconsolidated ground. Drilling of shot holes will displace some soil which will be backfilled once the explosives are placed at the bottom. Additional gravel will be used for an effective backfilling that improves the recording results and reduces the chance of a blowout⁵¹.

After each shot hole is drilled, a small explosive charge (1 to 4 kg) and blasting cap will be placed in the bottom of the hole and tamped into place using displaced soil and gravel. The shot holes can be immediately loaded with explosives⁵² (Pre-loading) pending approval from the Ministry of Energy at the start of the survey or charge loads can be placed once geophones are ready for recording (no Pre-loading). While the former requires the drilling and explosives loading team to move together, the latter requires the shot-holes to be cased. Once the charge is placed, the location of the hole is marked and covered with dirt until the line is ready for the shooting.

There are various types of explosives commonly used for seismic data acquisition. The seismic contractor, based on the site conditions, will select the most appropriate type of explosive charges to be used. An example of a commonly used seismic explosive is provided in Figure 2-6.

Each drilling area will be designated as a work area with appropriate signage such as flagging and warning signs. Only trained workers with the appropriate certification as well as health and safety equipment will be allowed in the area. Community members or other bystanders will be kept away to prevent accidents. No shot holes will be drilled near water lines and shot holes that flow ground water to the surface (i.e. artesian) will be plugged immediately and the shot hole location relocated.

⁵⁰ Diameter at breast height, or DBH, is a standard method of expressing the diameter of the trunk or bole of a standing tree.

⁵¹ Blowout occurs when the source charge is not contained in the boring and, during the explosion, forces material to the surface producing a spray into the air.

⁵² If Pre-loading is used, explosives will be anchored in the shot-hole and cannot be pulled out of it.

Osx™ & DEGRADABLE PENTOLITE SEISMIC EXPLOSIVES

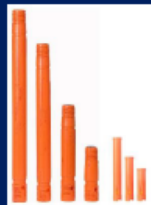
INTRODUCTION

- In Oil & Gas exploration explosives are deployed as a seismic source to generate controlled seismic energy to perform both reflection and refraction seismic surveys.
- Tens of thousands of charges may be deployed down narrow boreholes often in remote areas and harsh conditions which are common to geophysical exploration.



- Misfired charges often cannot be recovered and must be abandoned.
- Abandoned charges pose a risk to safety, the environment and increase the security risk of unlawful recovery.
- These risks can be mitigated by the use of high quality explosives and initiating systems, technical support, training and effective operating procedures.
- The type of explosive used can influence the impact of abandoned charges.
- Emulsion explosives are the most suitable for reducing the impact of abandoned charges, whilst Pentolites provide the highest stability.

Property	Dynamites	Pentolites	Emulsions
Biodegradability	> 10 years	> 10 years	< 5 years
Self degrading	No	No	Yes
Toxicity	Higher	Higher	Low
Friction & Impact sensitivity	Most	Moderate	Least



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PROPRIETARY TECHNOLOGY

- Significant leverage of technical expertise and Intellectual Property in explosives for the seismic market
- Orica has a significant and expanding Intellectual Property portfolio specific to the Oil & Gas / Seismic exploration market covering:
 - Degradation Technology (Osx™ 5, Osx™ 8)
 - Wire-protection to reduce detonator wire damage during loading
 - DetLok™
 - Osis™
 - Shell designs
- Over 200 existing patents that relate to marketed Orica Oil & Gas products, with over 20 patents pending

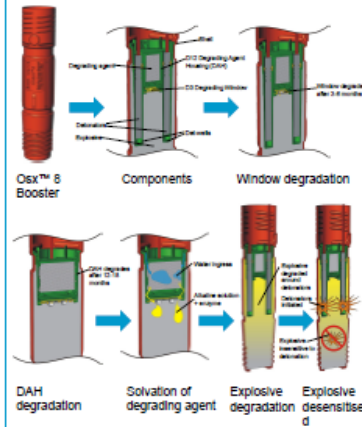
SHELL DESIGN PHILOSOPHY

- Robust shell design critical to ensure reliability of premium explosive
- Degrading agent must be physically separated from explosive until the desired sleep time has elapsed
- Release of degrading agent dependent upon breakdown of proprietary plastic barrier under borehole conditions
- Rate of release can be tailored depending upon the type of degradable plastic used:
 - D3 = 3 months sleep (Osx™ 5)
 - D12 = 12 months sleep (Osx™ 5 & Osx™ 8)
- A wide range of plastics have been assessed under "worst-case" conditions and plastics have been identified that maintain integrity for at least 3 months or 12 months under borehole conditions

Osx™ 8 SF components

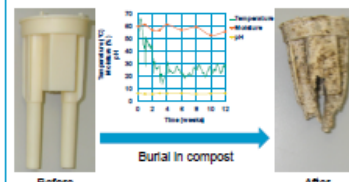


DEGRADATION PROCESS



PLASTIC DEGRADATION

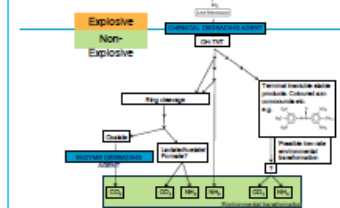
- Plastic selection is key to product degradation timing
- Over 25 "degradable" plastics have been assessed for function in a det-well configuration
- Range of results from no measurable effect to complete degradation
- Orica's plastics have been selected to initiate release of the degrading agent following 3 or 12 months, depending on the product variant



TNT DEGRADATION

- The chemical and enzyme degrading agent formulation is based around the use of alkali and a specific enzyme blend to accelerate the process
- TNT hydrolysis is well documented, but the mechanism is poorly understood
- In general, it involves a nucleophilic displacement of nitro groups by hydroxides, followed by a series of hydrolysis, condensation and polymerisation steps.
- A variety of end-products is formed, with the final end-point of complete hydrolysis being oxalate

TNT Schematic



PETN DEGRADATION

- PETN degradation is essentially an acceleration of the autocatalytic de-nitration of this ester, via a chemical and enzyme formulation
- PETN degradation is limited by low water solubility, however rapidly desensitises
- Orica has developed an improved version of an existing PETN reductase enzyme, used as per US8,754,284

SUMMARY

- Orica's Osx™ degrading technologies are the only commercial degrading seismic explosive charges that carry all the chemical potential to desensitise "on-board"
 - No microbial-based degrading agents
 - No mechanicals to trigger
- Technology based on:
 - Proprietary degradation technologies
 - Proprietary plastics
 - Proprietary designs

Contact information

Steven Kotsonis
Manager, IS/EBS (Aus/Asia) and Oil & Gas Technology
steven.kotsonis@orica.com



Source: Orica Limited, 2018 (This is an example, actual explosives supplier will be selected by seismic contractor)

Figure 2-6 Example of explosive material that can be used as an energy source

Explosives will be stored in safe and licensed warehouses/ permanent and secure Magazine and explosives and detonators (separately) will be transported to the site in a secure licensed transport/special purpose vehicles escorted by shooters and security.

Where access is good, shot holes will be drilled with tractor mounted rigs (**Error! Reference source not found.**), fitted with oversized tires to minimize damage to agricultural lands. Drainage improvement and surface preparation may also be required to provide areas for the drilling. Road conditioning will be minimized by using portable drilling equipment, especially in mountainous areas.

Use of truck mounted rigs will be limited due to mountainous terrain. These areas will be accessed for shot hole drilling by portable (hand carried) drill rigs or by helicopter (Heli- portable rigs) (see Figure 2-8).



Source: Petromanas, 2013

Figure 2-7 Example of Tractor mounted drill rig



Source: Petromanas 2013

Figure 2-8 Examples of heli-portable drill rigs

2.5.2.4 Layout of Ground Equipment

After the shot holes are drilled, the 'receiver lines' will be laid along the seismic lines in a predetermined grid forming a linear array of geophones on the surface, connected by cable to the amplifier boxes. Each receiver line will have geophone arrays (with 6 geophones) every 20 m.

In places where vehicle access is difficult (Figure 2-9) or where there are sensitive receptors (e.g. natural or cultural protected monuments, habitats) potentially susceptible to environmental, social or health impacts, the cables and geophones will be hand carried into position by the front crew.



Source: Petromanas 2013

Figure 2-9 Receiver line being laid by hand in difficult terrain

Seismic data acquisition proceeds in a "rolling" fashion where all activities are occurring simultaneously as the crews move along the length of the source line. At any one time, lines are being laid out, lines are active for recording (active spread) and lines are being picked up.

The active spread is monitored by the observers ensuring that it meets a pre-defined set of technical recording parameters. On occasion, parts of the active spread may face technical issues causing it to fall outside the scope of the parameters. The observers will send the line checker crew to the area of concern to troubleshoot the issue, which can include changing out damaged geophone strings or damaged cables. Once satisfied that the spread meets the parameters, the observers can continue with seismic data acquisition.

2.5.2.5 Vibroseis

The vibroseis method of recording seismic data employs a fundamentally different approach to impulse energy sources. Instead of attempting to input all the energy in one short instant in time, each frequency is vibrated independently with the frequency of vibration being gradually changed until the entire frequency range has been vibrated.

The method generates a controlled vibration that is less likely to damage structures in close proximity to the signal source and may be used in areas where explosives are difficult to use and/or environmental or safety concerns discourage the use of explosives or shot-hole drills. However, vibroseis trucks can be very large (Figure 2-10) and good access is required for their operation.



Source: SUA 2013S

Figure 2-10 Example of a vibroseis truck

Once geophones are active for recording, the shot holes are uncovered and the wires unrolled and connected to remote detonators, controlled by radio from the recording station. The geophone array is tested before the explosives are detonated. Recording takes place with up to 800 channels at a sampling rate of 2 millisecond for 10 seconds.

To acquire the data, the observers must instruct the shooting teams (Figure 2-11) to detonate in sequence the optimal amount of explosives in the preloaded shot-holes. The shooting team will ensure that the surrounding area is clear of people and animals prior to detonation. The shooting crew start detonating the charges for each source point one by one in sequence (starting at the beginning of the line and finishing at the end). Shots and recording are repeated several times per day until all shots are detonated. Following the detonation by the shooting crew, the back crew will recover the geophones then the permitting crew will come to assess any damage with the land owners.

If a miss-fire caused by electrical or mechanical failure occurs, several attempts will be made to fire the charge⁵³. All misfired charges will be abandoned in the well bore and left to decompose, while any casing will be removed from the ground. The wire leads to the charges must be cut below the surface to a minimum of 50 cm. The location of the misfired charge must be recorded. Additionally, it will be attempted to detonate the charge by sympathy (a second hole is drilled 2-3m away from the initial hole, loaded and detonated causing both charges to explode).

⁵³ The seismic contactor might use double detonators to guarantee the blast.



Source: Petromanas 2013

Figure 2-11 Shooting crew during a seismic survey in Albania

2.6 Survey programme and supporting operations

2.6.1 Timeline

The 2D seismic survey programme is anticipated to commence in the second quarter of 2019 and last between 4 to 6 months to avoid snowfall (typically to April) as a result of permitting and mobilisation delays it may extend into 2020. Table provides an estimate timeline for the proposed activities. Many of the processes will be conducted concurrently with the exception of the mobilisation and line equipment and crew pick up. Shot hole drilling will precede the layout of cables/geophones and recording by 1 months. It is anticipated that the programme will last for 6 months from start of mobilization until end of line equipment and pick up.

Table 2-4 Proposed Seismic Operation Programme

Key Operations	Estimated time
Mobilisation, Scouting, Planning & Permitting	3-4 weeks
Shot Hole Drilling	3 months
Layout of cables/geophones & Recording	3 months
Line Equipment and Crew Pickup	1 month
Post Survey Clean-up and Restoration	2 months

Source: SUA 2018

2.7 Temporary camps

The accommodation for the project work force will be either in camps or hotels or a combination of the two. One Base will be required to provide logistical support during the seismic campaign, and are likely to be located close to the town of Gjirokastër (in an industrial area). Smaller “fly” camps will also be temporarily established closer to the seismic lines to accommodate the working crew for a short duration (days-weeks).

The location of the Project camps will be defined by the contractor. Their design and installation criteria in relation to sensitive social and environmental receptors will ensure that no significant impact on the environment occurs. If the Seismic Contractor elects to use a camp rather than existing facilities then International best practice, such as the International Association of Oil and Gas Producers (IOGP) Guidelines will be adopted to provide guidance for the selection of camp types and camp sites as well as camp designs, layout and facilities. IOGP Report 541 provides guidance on the selection of camp type and camp location⁵⁴.

⁵⁴ IOGP, 2015 Report 541 *Temporary onshore accommodation – Selecting camp type*, December 2015

Factors to be considered for camp site selection include:

- Site terrain;
- Natural hazards;
- Land ownership;
- Accessibility and transport risk;
- Environmental factors (e.g. geology, hydrogeology, protected areas);
- Social and cultural factors; and
- Local infrastructure and resources.

All camps will be sited in accordance with regulatory authority conditions (i.e NEPA conditions for allowable activities in designated areas) and international standards. The site selection process for temporary camps will take into consideration the following characteristics of possible locations:

- Adequately drained and not subject to flooding;
- Located on previously disturbed land wherever possible (e.g. use camp sites from previous operations)
- Sited as far as practicable on level, open ground using natural or existing clearings to the maximum extent possible
- Located so the drainage from and through the camp should not endanger any aquifer, domestic or public water supply
- Graded, ditched, and rendered free from depressions in which water could become a nuisance
- Located away from any lake, stream, watercourse or water supply
- Located away from swamps, pools, sink holes, or other surface collections of water unless such quiescent water surfaces can be subjected to mosquito control measures

In addition, the following specific criteria will be used for selecting their final location:

- Areas that are generally prone to slope failure should be avoided (e.g. base of slopes, developed or deforested hillsides, base or top of slopes or man-made fill or steep cut slope);
- Site is above the highest annual flood level if practical and such that it will not permanently disrupt the natural drainage of the area;
- Site selection should seek to minimize the personnel transport risk exposure related to daily transportation to and from the remote work site;
- Site selected to avoid, where possible, the flow of daily camp traffic passing through towns, villages or busy roads;
- The size of a cleared camp area should be kept to the absolute minimum required for safe and efficient operations;
- The site located so as to minimize impact on any local wildlife but also to minimize the risk of animal incursion to the camp;
- Site located outside of areas of archaeological significance;
- Provide good access from the exiting road network;
- Good availability of water resources;
- Availability of centralised water supply and ideally sewage network;
- Flat levelled areas where no or minimal vegetation clearance and earthworks are required;
- At least 1 km offset distance from sensitive social receptors (e.g. residential zones, schools, mosques and churches, recreational areas, and cultural heritage sites) to insure no /minimal disturbance by noise, workforce and vehicles;
- At least 200 meters offset distance from sensitive environmental receptors (e.g. protected zones, water bodies, sensitive habitats like riparian zones, forests etc.) to ensure no /minimal disturbance to flora and fauna species;
- Reduced visual impact as much as practicable.

The "Base" includes accommodation of personnel/crew, and storage of vehicles and materials. The crew will consist of a maximum of 190 people (including expatriates and local people) and in this respect; this is the maximum of people that could be accommodated in the Base. However, it is very unlikely the full capacity of the

camp will be reached as the crew also includes local hires who will not be accommodated in the Base, in this case transportation will be provided to where they live. The anticipated occupancy of the Base is anticipated to be in the order of 50-60 people comprised primarily of non-local crew members.

Base camps will have a footprint of less than 1ha, and comprise administration and communication facilities, materials/equipment storage and fuel storage, maintenance workshop, vehicle parking and may provide accommodation for the survey crew. The preferred option for the survey crew is to stay in hotels and/or guesthouses however if base camps are based out of town then they will be also used to accommodate the expatriate project workforce, the local workforce being accommodated at their home. Seismic Camps are temporary by nature and camp locations will be restored to their original state according to OGP, IAGC and Shell standards and guidelines.

The base will include medical facilities, to provide first aid care and treat emergency patients, and helicopter area (heliports / landing pad). Waste management areas will be installed for waste separation and storage before being collected for disposal. Portable toilets, dry latrines or a septic system will be installed if no connection to sewage system is available.

Explosives will be stored in licensed magazines at secure locations, in compliance with industry standards, local legislation national permitting requirements, at a safe distance away from the living area of the camp. The magazine construction will fall under the responsibility of the explosives sub-contractor that will be fully licensed and hold the required certifications. License magazines follow the Albania local regulations. The details of the explosive storage facility were not available at the time of the writing of this report.

The base will be supported by smaller “fly” camps to be established closer to the seismic lines. The “fly” camps may comprise temporary tented facilities having a footprint of approximately 500m² to accommodate the seismic crews working in the field⁵⁵. The fly camp will be able to accommodate a maximum of 30 people. The ‘fly’ camp siting will take into consideration the guidance provided above and will preferably be located in previously deforested and flat areas and will be designed to leave no notable impact on the environment when dismantled. Upon demobilisation, the site will be reinstated to its state prior to the erection of the ‘fly’ camp

Survey mobilisation will involve acquisition of environmental approvals and other relevant permits, “permitting” operations, risk assessment and EHS planning and mobilisation of staff and equipment as well as the establishment of the ‘Base’ and ‘fly camps’. The location of camps is not known and will be determined by Seismic Contractor based on the criteria specified above. The Base is most likely in an industrial area of Gjirokastrë. All camps will be installed and operated in line with IOGP Report 541 (Camp type selection) and IOGP Report 542 (Design layout and facilities)^{56,57}.

2.8 Survey crew

The estimated Project workforce will comprise of approximately 190 people including expatriates and local people. Semi/unskilled personnel will be recruited locally (e.g. Project area, regionally or country wide). The seismic program will be conducted by a seismic contractor (Contractor) who will provide the necessary specialized equipment and trained personnel to complete the work. The Contractor will be selected by SUA based on strict technical and HSSE criteria. The contractor will supply experienced personnel for the operation of portable drill rigs, trucks, recording trucks, the wiring and placement of charges, and all supervisory personnel.

Local workers may be hired to help with transportation, line clearing, line security, placement of the geophones, lay out and retrieval of cables, and assisting in clean up and restoration of the lines. Additional jobs will include vehicle drivers, mechanics, painter, welder, carpenters, electrician, mason/plumber, radio technician, store keeper, laundry, cleaners, cooker and helpers, as required.

⁵⁵ The ‘fly’ camps will be able to accommodate an appropriate number of personnel to allow for adequate leads to be maintained

⁵⁶ IOGP 2015 Report 541 *Temporary onshore accommodation – Selecting camp type*, December 2015

⁵⁷ IOGP 2015 Report 542 *Temporary onshore accommodation – Design, layout, accommodation, facilities and services*

2.9 Equipment and Logistics

The seismic survey activities will require the use of various types of equipment and support vehicles. These will include the drilling equipment, recording trucks, geophones, cables, batteries and digital processing devices. In addition to the recorder truck, helicopter(s) and small tractor / 4WD vehicles mounted drill rigs will be used to carry out the surveys. As a general rule, such specialized seismic equipment and materials needs to be brought into Albania.

The Contractor will endeavour to obtain as much equipment locally as is reasonably possible, though all locally contracted equipment must meet Albanian and Shell standards. This may include vehicular support – the provision of light-duty trucks, water trucks, flat-bed trucks, personnel vans, etc. Vehicles will be inspected periodically for leaks and mechanical and safety deficiencies, which will be promptly remedied. All vehicles will be compliant to national emission and safety regulations and Shell Land Transport HSSE.

Explosives will be purchased by the seismic contractor under permits to import, to store and to use explosives; permits will also be sought to transport the explosives. They will be delivered to a secure approved bunker storage (magazine) location for use specifically on the seismic project, before being transported to the operations area.

A summary of the equipment and materials required for the Seismic Survey is provided in Table 2-5.

Table 2-5 Summary of equipment and materials

Equipment	Description	Quantity	Source
4x4 LV	Geophysical Ops. Pickups	50	Imported
4x4 HV	Equipment Transport	10	Imported
Heli Rig	Heliportable drilling rigs	5	Imported
Tractors	Tractor Mounted Rig and Water trailers	10	Imported
Helicopters	Operations Support	3	Imported
4x4 HV	Recording Unit	1	Imported

Explosives will be handled, stored and disposed in compliance with national legislation and good international industry practice (GIIP) outlined in the IAGC Land Geophysical Safety Manual (IAGC, 2012)⁵⁸. Explosives will be distributed daily and transported to the shot-hole sites; unused materials will be returned to the magazine storage location. At pre-defined intervals an explosives inventory will be conducted to account for all explosives and detonators used during the survey. Any explosives/ detonators unaccounted for will be immediately investigated.

Transportation of all personnel and equipment will be by road. The conventional drill and other seismic equipment will be transported through a combination of 4WD vehicles and tractor. Helicopters will be necessary due to the steep mountains and lack of access to certain remote locations, but their use will be restricted to transport of equipment to locations that are inaccessible by other means. These include steep, heavily vegetated hills and mountainous areas. Helicopters will use long-line techniques (Figure 2-12) and will avoid landing along the seismic line except in the case of medical emergency. Pre-determined and approved landing zones will be used on the project and close to seismic operations. A helibase will also be prepared with maintenance facilities close to the Base.

The helicopter pad will be located at a safe distance from the sensitive social and environmental receptors, and follow SUA Air Transport Risk Management.

Landing zones will be marked so that it is clearly visible from the air. Albanian and international standards will be used for the construction and operation of helipads, as well as the helicopters' operation.

⁵⁸IAGC (2012) - Land Geophysical Safety Manual, 2012 10th Edition. International Association of Geophysical Contractors (IAGC), Houston, USA

New access roads are not planned to be developed for the Project, and existing road network will be used throughout the seismic campaign. Where required, clearance work of surface might be undertaken. No access road widening activities are expected.

All land transport operation will be compliant to the SUA Land Transport HSSE, and no driving will be undertaken after dark, unless in case of emergencies.



Source: Petromanas 2013

Figure 2-12 Example of a helicopter transporting a drill rig

2.10 Resource Use

The seismic survey operations will need electricity, fuel and water at the base and fly camps and during seismic survey. Electricity will be provided by the national power grid to the Base camps, which are expected to be located in an industrial area within Gjirokastër. In the 'fly' camps, electricity will be provided by two diesel generators, to be used on an alternating basis to provide back-up in case of mechanical breakdown of one of the generators. Approximately 1.5-2.0 kW/day per person is anticipated.

The Base will likely be connected to the town water supply grid. Water requirements for the 'fly' camps and drilling activities will potentially be acquired through water trucks from an approved water supplier and stored in the 'fly' camps. It is assumed that 200 litres/day/person of potable water will be required.

During shot hole drilling compressed air or water is used to force the cuttings out of the hole and cool the bit. Shot holes drilled with tractor mounted drill rigs will need approximately 100 litres of water per shot hole. A total water consumption is estimated to be between 30,000 to 40 000 liters for this phase of the project. A water truck may accompany each tractor mounted drill rig; in inaccessible terrains, water will be provided in water containers if and when required

All fuels will be transported in bulk to the base camp(s) and 'fly' camps⁵⁹, where they will be appropriately stored and distributed as required. All fuels will be stored in contained bunded areas and refuelling will be carried out in dedicated areas with hard standing/ impermeable layer. Lubricants will also be stored in bunded areas to contain potential spills or leaks.

Aviation fuel will be required for helicopters, which will be stored at helicopter staging areas. The distribution, safe storage, and security of the fuel will be the responsibility of the helicopter Contractor.

A summary of resource use and source for the project is provided in Table 2-6.

Table 2-6 Summary of resource use

Resource	Quantity/day	Total Quantity	Source
Water	5,000l	600 000	Domestic Utility Grid
Water	600l	72 000l	Bottled Water
Water		55000	Approved Town Supplier
Power	570kw	68400kw	Utility grid
Fuel (Diesel)	1050l	126000l	Commercial Fuel Provider
Jet A1	4500l	579 000l	BP Tirana

2.11 Waste generation

Wastewater routinely generated at the base and fly camps will include sewage and drainage water, equipment and vehicle wash waters containing residual fuel and hydraulic oils. It is anticipated that approximately 220 litre wastewater per day per person will be generated. The management of the camp wastewater will be guided by the national legislation and GIIP; discharge of contaminated effluents into the open environment will not be allowed.

Waste streams generated by the project will include biodegradable, non-biodegradable and hazardous streams (e.g. plastic and metal containers; equipment maintenance solvents and degreasers, paints and coating; oily or chemically contaminated materials; fuel, lubricating oils; batteries; clinical waste). Anticipated solid wastes from the seismic survey and camp activities will include vegetation, wood, construction materials, rubble and debris, packaging, domestic waste arising from site personnel, medical waste of the care unit and waste lubricating oil, batteries and tyres from the camp workshops. All generated waste other than organic and biodegradable waste (to be buried) will be collected into designated storage containers or areas.

There will be waste segregation procedures applied and there will be no mixing of hazardous waste (if generated) with non-hazardous waste. Waste will be removed from the Project site by a licensed waste management contractor and disposed of at an appropriately licensed waste facility.

Other wastes that could be produced from the survey activities include;

- Explosive packaging;
- Waste oils from engine or hydraulic systems;
- Other industrial waste (wires and cables, plastics);
- Clinical waste; and
- Waste water (black/grey effluent).

The camps will be designed and operated such that:

⁵⁹ Given the distance between the base camp and some survey areas, refueling will be also potentially be required at the 'fly' camp

- the camp operator shall be responsible for removal of solid waste to suitable solid waste handling / landfill / waste transfer sites; and
- Offsite disposal of waste water shall require a Waste Water Disposal Permit for this activity from the relevant national / local authority.

A target for recycling is under consideration however the local waste management infrastructure may not be available to be able to fully implement a comprehensive recycling program. Waste minimization efforts will be adopted where practicable. Non-hazardous waste will be transported by licenced disposal contractors to government approved waste sites. Domestic wastewater will be discharged to the local sewage system. The disposal options for hazardous waste are under consideration as secure disposal options are not currently operational in Albania. The Seismic Contractor will be responsible for the safe storage of the hazardous waste. SUA will be responsible for the ultimate disposal of hazardous waste.

A summary of waste to be generated and disposal options is provided in Table 2-7.

Table 2-7 Summary of waste generation

Waste	Description	Quantity/Day	Disposal Options
Non-hazardous Waste			
Packaging		10kg	Government Approved waste disposal site
Construction materials			
Domestic solid waste (camps)		119kg	Government Approved waste disposal site
Wastewater (grey)		5000 liters	Sewage system
Wastewater (black)		1900 liters	Sewage system
Hazardous Waste			
Clinical waste		500g	To be determined
Batteries		0.5g	To be determined
Oils and fuels		5 liters	To be determined
Tires		1	To be determined

2.12 Project alternatives

An analysis of the available alternatives is necessary to establish the feasibility of the project design, and to ensure that the most suitable management and technology options will be adopted for the project. The suitability of alternatives may differ between various environmental and economic conditions. Project alternatives with respect to location and technology are identified below and further described in **Chapter 3, Project Alternatives**. In addition, project alternatives the “No Project” alternative and for site access are also discussed in **Chapter 3, Project Alternatives**.

Prospecting for petroleum is an expensive and technologically complex process with an uncertain outcome, because not all seismic surveys lead to discovery of hydrocarbons, development and production. Desktop studies on subsurface geology inform the decisions to explore areas that may have the potential for petroleum reserves. Seismic surveys provide data of sufficient detail and quality such that geophysical experts can determine if an initial investment should be made to move the next step in the process of oil and gas explorations which is the drilling of exploration wells. The seismic survey is required to identify locations with the most promise for future exploration and development. Several concession areas and exploration sites exist in the surrounding areas,

including Block 2 and 3. Previous studies, including a limited seismic survey, have indicated that Block 4 is worthy of investigation.

2.12.1 Alternatives for location

Alternatives have been considered for the locations of the seismic survey base camp, fly camps and the actual design of the seismic data acquisition plan (i.e. seismic corridors). The accommodation for the project work force will be either in camps or hotels or a combination of the two. The locations of the camps will be defined by the seismic contractor and will consider the biological, physical and social environmental sensitivities. The final design to locate the seismic lines will depend on the site reconnaissance activities undertaken by the scouting team. The layout of the seismic lines will also take into account sensitive receptors (i.e. environmental and social; including protected and designated areas) and the topography of the survey area.

2.12.2 Alternatives for technology

Factors that influence the selection of a particular method or technology for seismic surveys include land use (e.g. cultivated/barren/forest etc.), accessibility, regulatory authority approvals and restrictions, social and environmental concerns. Seismic data can be acquired using the following methods:

- deep shot hole survey
- shallow shot hole survey;
- surface shots; and
- vibrating energy sources.

The 2D seismic survey of Block 4 will use a combination of deep shot hole survey (shot holes using explosives) and vibrating energy sources (using vibroseis machines). These methods are discussed in more detail in **Chapter 3, Project Alternatives**.

2.13 Project interaction with other developments/activities

The Project will be undertaken in predominantly underdeveloped and rural areas where industrial activities are limited. The known activities within the Project Area of Influence include:

- Agricultural farming, mainly seasonal crops and fruit plantations. This activity is present in the valley of largest river Vjosa and its tributaries.
- Husbandry and milk processing facilities, which are particularly common in the Gjirokastrë and Dropulli areas.
- Several main water bottling facilities are located within Block 4, and include Trebeshina, Tepelena, Glina sparkling and spring water. These bottled water brands comprise considerable share on the national market.
- Several stone quarries producing decorative stones are located along the Vjosa valley from Kelcyra to Permeti.
- Development of small hydropower plants has increased in the recent decade backed up by national policies on renewable energy. The majority of developments take place along the Benca River (tributary of Vjosa River and along several tributaries of Vjosa River from Kelcyra to Carshova). Some of these are known to be in planning and construction phases.
- Tourism including eco-tourism of the Bredhi i Hotoves-Dangelli National Park, natural monuments, cultural monuments and hot springs in the area.
- Conservation areas, including the Zagori Natural Park.

The spatial extent of the above activities have been verified during the ESHIA process and assessed in terms of their potential to result in cumulative impacts.

2.14 Project permits and licenses

All permits and licenses required to undertake the Seismic Survey will be obtained prior to undertaking the survey. The permits and licenses identified are summarized in the Table 2-8. The Environmental Declaration and Land Access Permitting are the responsibility of SUA as the project developer, The remaining permits will be obtained by either SUA or the seismic contractor as necessary.

Table 2-8 Summary of Project Permits and Licences

Permit	Reason	Authority	Responsible	SUA
Environmental Declaration	Required by Albanian legislation	National Environment Agency	SUA	
Land Access Permitting	Agreement to access private and public lands	Property owner	Contractor (only for seismic lines)	Supervision
Triangulation Point	Required to tie into maps provided by authorities	Topographic Institute of Army	Contractor	Support as required
Import and Use of Explosives License	Import and use of explosives	Albanian Ministry of Defense	Contractor	
Customs/Import Authorization	Importation of equipment, if required	Albanian Customs Authority	Contractor	Support (SUA has the license to operate on the blocks)
Helicopter Use Permit	Use of helicopters, if required	Albanian Civil Aviation Authority	Aircraft provider	Support
Radio Wave Permit	Need to apply for the use of specific radio wave frequency bands	Electronic and Postal Communications Authority	Contractor	Support
Contractor Registration	All contractors must be registered as a legal entity in Albania	Ministry of Finance and Economy – National Business Center	Contractor	Support
Employee Work Permits	Up to 10% of workers can be foreign nationals Required for staff staying longer than 80 days in any 180 day period	Work Office under the Ministry of Finance and Economy (after the 2017 elections)	Contractor for contractor personnel and sub-contractor	

3. Project Alternatives

Prospecting for petroleum is an expensive and technologically complex process with an uncertain outcome, because not all seismic surveys lead to discovery of hydrocarbons, development and production. Desktop studies on subsurface geology inform the decisions to explore areas that may have the potential for petroleum reserves. Seismic surveys provide data to enable geophysicists to determine if an initial investment is feasible to undertake exploration drilling. The seismic data helps identify well locations with good prospects for accessing sub-surface hydrocarbon formations. Several concession areas and exploration drilling/well sites exist in the surrounding areas, including Block 2 and 3. Previous studies, including a limited seismic survey data, have indicated that Block 4 merits further investigation for exploration potential.

An analysis of the available alternatives is necessary to establish the feasibility of the seismic survey project design, and to ensure that the most suitable management and technology options will be adopted for the project. The suitability of alternatives may differ between various environmental and economic conditions. As recommended in the International Finance Corporation (IFC) Performance Standards Guidance Note 1: Assessment and Management of Environmental and Social Risks and Impacts⁶⁰, the ESHIA Report includes:

“An examination of technically and financially feasible alternatives to the source of such impacts, and documentation of the rationale for selecting the particular course of action proposed.”

This chapter examines the technical and financial feasibility of alternatives to achieve the Project objectives by addressing:

- the no action alternative;
- seismic survey location;
- seismic acquisition method (including technology and selection of explosives)
- site access; and
- logistics and accommodation

Project alternatives with respect to location and technology; presented in **Chapter 2, Project Alternatives**, have been included and expanded upon in this chapter to provide a comprehensive overview of the key project alternatives considered for executing the Project.

3.1 “No Action” alternative

The “No-action” alternative involves projecting what is likely to occur if proposed project is not undertaken. It provides the means to compare the environmental, social, and economic impacts of various project alternatives with those of a scenario in which the project is not implemented. This alternative takes into consideration what is likely to occur during the timeframe of the project and any benefits that would be forgone should the project not be implemented.

The focus of most of the municipalities is development of the tourism industry. An important aspect of promoting tourism is the preservation of cultural heritage and natural monuments including natural and national parks as these are tourist attractions. No specific plans in this regard have been identified. However, there are plans to develop agro-tourism and eco-tourism further, especially in the Gërokaštër and Permet areas. The Zagori Natural Park management plan should be developed within the timeframe of the project. These initiatives are likely to continue with or without the seismic project.

Natural resources are a valuable asset for Albania and for the country's economic development. The purpose of the seismic survey is to produce detailed images of the geological formations beneath the earth's surface and then use this information to determine the location and size of oil and gas reservoirs. Without a seismic survey the potential and viability of extracting oil and gas reserves cannot be reasonably assessed. The financial benefit

⁶⁰ IFC 2012. Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts. <http://www1.ifc.org>. Accessed 8 August 2018.

to the country would be forgone without the proposed project as there would not be sufficient information to responsibly develop an oil field.

The seismic survey will endeavour to provide opportunities for short term (up to 6 months) employment of semi-skilled and unskilled workers to help with transportation, line clearing, line security, placement of the geophones, lay out and retrieval of cables, and assisting in clean up and restoration of the lines. Additional jobs could include vehicle drivers, mechanics, painter, welder, carpenters, electrician, mason/plumber, radio technician, store keeper, laundry, cleaners, cooker and helpers, as required. Employment of local workers enhances the livelihoods of the population in the area. Short term employment opportunities and limited skills development is considered to be a beneficial impact of the project. Without the project, these economic and social opportunities would not be realized.

3.1.1 Alternatives for the seismic survey location

Alternatives have been considered for the design of the seismic data acquisition plan (i.e. seismic corridors). Seismic surveys do not require absolutely straight lines, and data analysis can be carried out by allowing for reasonable deviations (8 degrees at most) from a straight line, particularly for receiver lines. This means that the lines may make an angle of 8° to avoid an obstacle, such as trees or culturally sensitive areas without jeopardizing the value of the acquired seismic data. Considering the depth of the target geological layers are at least 1 km deep, it is materially insignificant if there are minor deviations to the seismic lines on the surface.

The final design to locate the seismic lines will depend on the site reconnaissance activities undertaken by the scouting team. The layout of the seismic lines will also take into account the topography of the survey area. Within the 500m corridors the acquisition of the seismic signal will generally be of higher quality in valleys and plains (i.e. less interference in signal reception due to topographical features), and will tend to downgrade on slopes and hills (i.e. more interference with signal reception). Therefore, seismic lines final locations will be adjusted areas according to operational and terrain constraints with additional source points in difficult access areas to compensate for the degraded quality of the seismic signal.

3.1.2 Alternatives for the seismic acquisition method

The choice of energy source is dependent on topography, ground conditions and the quality of seismic data that can be obtained by these sources in the given sub-surface geology. The ground conditions taken into consideration while choosing an energy source include:

- Access restrictions (see Section 3.1.3);
- Ecological or social considerations;
- Structural integrity of existing infrastructure (e.g. buildings);
- Local terrain and land use; and
- Line clearance and restoration efforts.

Seismic data can be acquired using various methods.

- deep shot hole survey
- shallow shot hole survey;
- surface shots; and
- vibrating energy sources.

The 2D seismic survey for Block 4 will use a combination of the deep shot hole and vibrating energy sources methods as they are most appropriate for the site conditions. A description of the seismic data acquisition methods is provided in the following sections.

3.1.2.1 Shallow Hole Seismic Operations

In this type of operation, several shallow holes, usually 1.5 to 2.0 m deep, are drilled in a pattern instead of a single standard hole. Multiple holes are drilled in a close spaced pattern to compensate for the smaller charges used closer to the surface. Hand held portable drills powered by compressed air are used to drill the holes. Each

charge is 200 to 300 g in weight, and only one detonation cap per charge is required. These patterns generally consist of three to twelve holes. This method generally produces data of a lower quality than deep shot hole seismic operations. Nevertheless, it is used in mountainous terrain or environmentally sensitive areas, where road access to seismic lines is limited, or the ground is so steep that all equipment must be carried manually. This method is not proposed for the project as other methods are more suitable for the environmental and social settings in the survey area and other methods offer better quality data potential.

3.1.2.2 Deep Shot Hole Operations

In this method, a single hole is drilled by a truck-mounted drilling unit, a small explosive charge (typically 3 to 5 kg) is placed at its bottom, and then the hole is refilled. Detonation of the buried charge creates a seismic sound wave. The typical seismic shot hole ranges from 10 feet to 200 feet in depth and is about four inches in diameter. The size of the charge used diminishes if it is to be used closer to the surface and in this way detonations are contained within the hole to force the energy downward through various rock strata. The only sound heard above ground is a dull thud. This method will be used because of its reliance on access by trucks.

3.1.2.3 Surface Shots

The 'Poulter Method', also known as the surface shot method, is often used in remote areas, away from people. This is usually a portable operation, with helicopters used to transport workers and equipment along the survey line. The Poulter Method avoids the use of motorized vehicles and impacts on land. Small charges are mounted on wooden stakes several feet above the ground in a pattern that could include one to a dozen charges at each shot point. The detonation of these charges can be heard for a considerable distance, depending on surface terrain, weather conditions, and other factors. This method is considered unsuitable because the detonation of charges above ground have the potential to disturb wildlife and human settlements in the area.

3.1.2.4 Vibrating Energy Source

The Vibroseis™ method involves surface vibration rather than detonations. Vibroseis™ is undertaken using vibrator pads attached to the chassis of heavy-duty four wheel drive (4WD) vehicles. Working in convoy, the vehicles lower the pads to the ground and vibrate them for about 30 seconds. The pads are then raised, the vehicles move forwards a short distance and the process is repeated. Several of these vehicles operate together to form the energy source. The vibrator trucks themselves move on tires or tracks. The use of vibrators will be used where there is suitable access.

The selected seismic survey methods including vibroseis and explosive energy sources (deep shot holes) are most suitable for the given geo-technical and environmental conditions and no other alternatives are proposed. Vibroseis machines cannot be used throughout the entire survey area because of the rugged terrain and difficult access. In addition, the energy frequency can be altered using vibroseis machines to prevent damage to fragile receptors (e.g. natural and cultural monuments). For the purpose of the ESHIA, the potential impacts will be assessed for both survey techniques.

3.1.2.5 Explosive Material

Seismic data acquisition utilizing explosive energy sources requires the selection of an explosive material. Specific properties of explosives such as denotation velocity, density, water resistance, composition and degradability are considered during selection process. The project proponent has selected Pentolite; the product specification of this preferred explosive is provided in **Chapter 2, Figure 2-6**.

Pentolite is composed of equal parts pentaerythritol tetranitrate (PETN)⁶¹ and trinitrotoluene (TNT). Pentolite is the most stable explosive and suited to seismic surveys. The majority of detonation products are gaseous⁶². The predicted detonation end-products are provided in Table 3-1. The only 2 products that are of any concern are ammonia and nitric oxide, which both occur at low levels, so will likely react with any water present, to become harmless.

Table 3-1 Pentolite detonation end products

Detonation end-product*	Osx8Z	Osx8L
Methane	+	+

⁶¹ <https://wikivividly.com/wiki/Pentolite>

⁶² SUA, 2018

Detonation end-product*	Osx8Z	Osx8L
Carbon monoxide	+	+
Carbon dioxide	+	+
Hydrogen	+	+
Ammonia	+	+
Water	+	+
Nitrogen	+	+
Nitric oxide	-	+
Oxygen	-	+
Carbon (s)	+	+
Alumina (s)	-	+

Notes *Products produced at the end of the isentrope (100 kPa = 1 bar ≈ 1 atm), (s) – solid

3.1.3 Site access

Factors that affect access to the project area include terrain, land use and the presence of designated or protected areas. The terrain in the project area ranges from steep hills and mountains to flat valleys. Where access is good, shot holes will be drilled with tractor mounted rigs fitted with oversized tires to minimize damage to agricultural lands. Use of truck mounted rigs will be limited due to mountainous terrain. These areas will be accessed for shot hole drilling by portable drill rigs mounted on several different platforms such as all-terrain vehicles and buggy-mounted drill rigs or by helicopter (Heli- portable rigs). In places where vehicle access is difficult or where there are sensitive receptors (e.g. natural or cultural protected monuments, habitats) potentially susceptible to environmental, social or health impacts, the cables and geophones will be hand carried into position by the front crew. In mountainous terrains or where access is difficult, the shot hold method will be used. The vibroseis method will be used where access is unobstructed. Where sensitive or fragile features are present, the seismic acquisition method may vary depending upon the ground features (e.g. subsurface lithology).

3.1.4 Logistics and accommodation

The accommodation for the project work force will be either in camps or hotels or a combination of the two. The locations of the camps will be defined by the seismic contractor and will consider the biological, physical and social environmental sensitivities. For the purpose of the ESHIA, the impact assessment will consider these options recognizing that the estimated workforce will be approximately 190 people, including up to 40 expatriate technical staff from the Seismic Contractor and local staff to fill skilled, semi-skilled and unskilled positions. The local workforce will be sourced from the adjoining villages.

A Base will be required to provide logistical support during the seismic campaign, and is likely to be located close to the town of Gjirokastër (in an industrial area). The seismic contractor may also consider Tepelene, Permit or Kylcera as a location for the base. The Base will utilize existing facilities with the possibility of a camp only if there is not sufficient accommodation and existing infrastructure is not suitable. Smaller “fly” camps will also be temporarily established closer to the seismic lines to accommodate the working crew for a short duration (days-weeks). Generic impacts from both types of accommodation options are considered in the ESHIA.

4 Environmental and Social Baseline Description

4.1 Introduction

4.1.1 Project area

The project area where baseline conditions have been investigated is considered in this assessment to be synonymous with the overall Project “Area of Influence” as defined by IFC Performance Standard 1 (IFC, 2012)⁶³.

Different types of Project activities (planned and unplanned) may have impacts at differing distances from the direct footprint of project activities and locations and therefore buffer zones have been defined. Given the localised nature of the Project and its anticipated impacts, for the purpose of this assessment, these buffer zones have been defined as follows:

- An outer 500 meter wide seismic corridor within which seismic lines (not exceeding 5m in width where seismic activities will be executed) will be defined and along which the main activities will take place.
- An inner 200 meter buffer zone around the seismic corridor to which the majority of project effects (i.e. noise, dust, habitat or human disturbance) may extend.
- The road network and infrastructure (i.e. hotels, waste facilities) used by the Project.

In addition, as indicated above, there will be the wider Area of Influence associated with potential direct and indirect impacts such as social issues (i.e. employment; community perception) or accidental events (spills or fires). For the purposes of this assessment it has been assumed that this coincides with the Block 4 Project Area. It should be noted that there are no associated facilities that are built or will be expanded for the purposes of the Project. The total area of Block 4 is 2,272.8 km² (227,280 ha). A map of the Project Area is shown in Figure 4-1.

4.1.2 Desk Based Research

A desktop study was undertaken to collate available data for the Project Area, with particular emphasis on the below topics:

- Climate and topography
- Air quality / Noise
- Geology and soils
- Water resources
- Socio-economics
- Cultural heritage

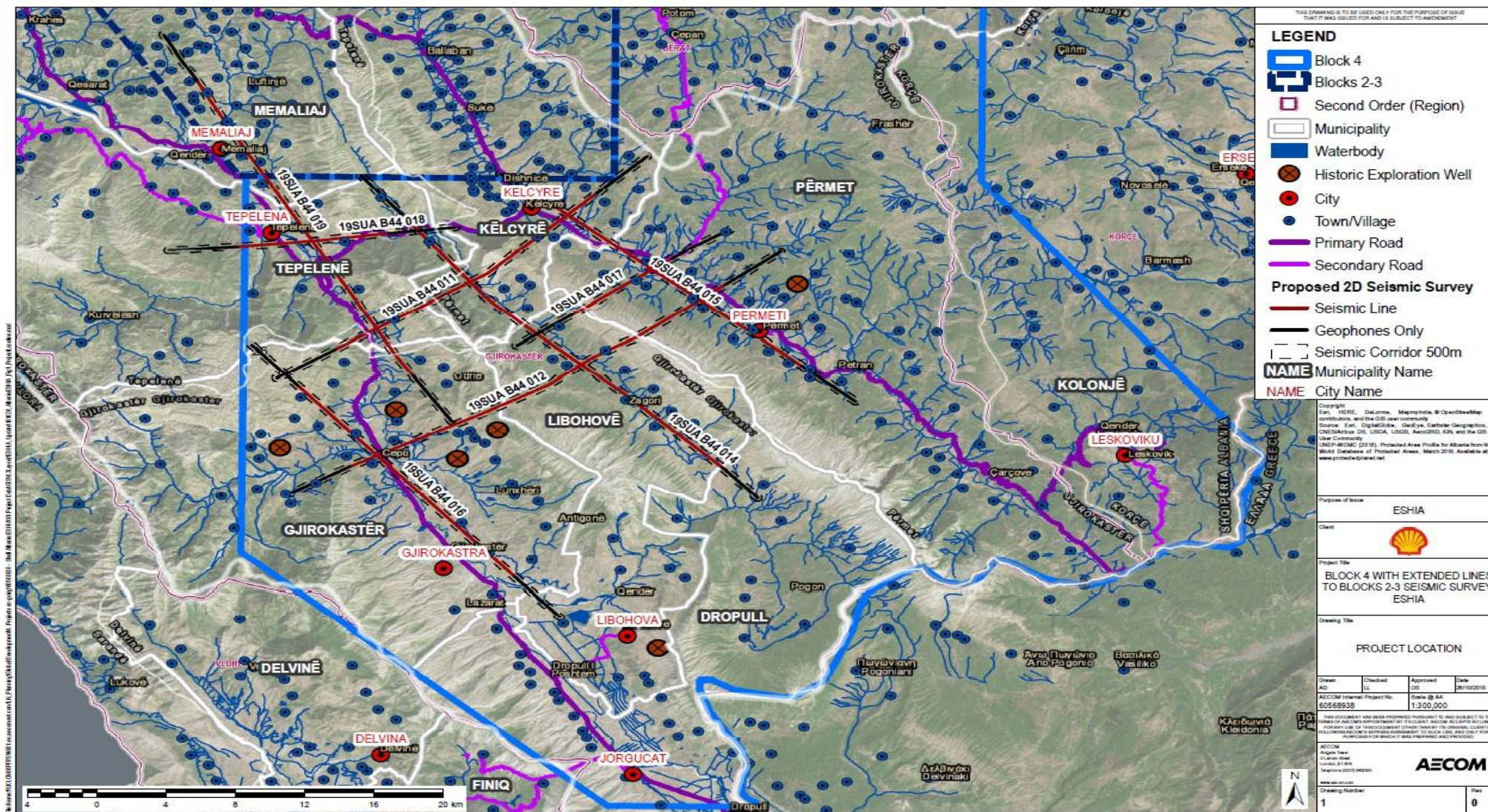
⁶³IFC Performance Standard 1 (IFC, 2012) defines Study Area of influence as the area affected by:

The project activities and facilities that are (i) directly owned, operated or managed by the proponent (and subcontractors) and are a component of the project; (ii) impacts from unplanned but predictable developments caused by the project that may occur later or at a different location; or (iii) indirect project impacts on biodiversity or on ecosystem services upon which peoples' livelihoods are dependent;

Associated facilities, which are facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable; and

Cumulative impacts that result from the incremental impact, on areas or resources used or directly impacted by the project, from other existing, planned or reasonably defined developments at the time the risks and impacts identification process is conducted.

Figure 4-1: Project Area



- Biodiversity (including designated sites, habitats and notable and/or protected species)

The desktop data was collected from published sources (previous ESIA's, online information and publications) and through engagement with various stakeholders specified in the SEP (see **Annex 2**). The stakeholders consulted at the national and regional level are also listed in Table 4-1 below.

Table 4-1: Stakeholders Consulted at National and Regional Level

Stakeholder

National Agency of Protected Areas (NAPA)

National Agency of Environment (NEA)

Environmental Inspection Authority (Department of NEA)

Ministry of Tourism and Environment (Department of EIA)

Regional Agency of Environment (REA)

Regional Directory of Cultural Heritage (RDCH)

Regional Directory of Protected Areas (RDPA)

Regional Directory of Transport

Regional Directory of Road Infrastructure

4.1.3 Field Surveys

The desk study activities were supplemented by field surveys undertaken between May and September 2018 at selected locations along the seismic lines. The survey objectives and methodology were defined based on the results of the desktop study which identified data gaps for the following baseline components protected areas, biodiversity, sociology, and cultural heritage.

Biodiversity field surveys

Given the extent of the scheme and challenging nature of the terrain, surveys were focused on identifying “the distribution of protected or endangered species that are: i) potentially to occur within the zone of influence; and, ii) could be adversely affected by the project”. Consequently, areas that were considered likely to support protected species along with designated sites and the affected parts of protected sites were prioritized. The site survey plan identified survey stations (waypoints) with proportional coverage of expected and known habitats along each seismic line and areas of intersections between lines.

Field surveys were conducted during the period of high biodiversity activity from 29 May to 2 June 2018, as well as during 7-8 September in the northern part of the project area. Survey methods included visual observations of biodiversity (using binoculars where necessary). Field guides for species were also available for use as needed. Transects were walked at each of the selected survey points (with a buffer of 100m on either side of the seismic corridor). An overview of the field survey methodology is included in **Annex 5** of this report.

Collected information was recorded on a standard form and complemented with pictures of interest. Specific site survey reports for biodiversity and habitats were prepared and used to consolidate the baseline description of this report.

Cultural heritage field survey

Initial data on cultural heritage sites was collected through desktop study. Information on the location of protected cultural heritage sites was gathered from official data sources including the State Authority for Geospatial Information (ASIG platform). All cultural sites were identified within the 500m seismic corridors and 200m buffer area. This approach allows flexibility in positioning seismic lines in relation to the sites with their respective protection zones of 200m.

Based on the available desktop data assessment a site survey plan was prepared and implemented in July and September 2018. The surveys were focused on the reconnaissance of identified and mapped cultural heritage sites where possible given the difficult terrain. A rapid visual inspection was made and data complemented with

digital photographs. During the field survey, locations of cemeteries intersected by the seismic corridors were also identified in consultation with local communities and mapped. Meetings with the Regional Directorate of Cultural Heritage as well as village heads were held to collect data on intangible heritage and cemeteries. The field survey methodology is included in **Annex 5** of this report.

Socio-economic field surveys

Socio-economic field data collection was conducted following the compilation of available secondary data, including information from national and international organizations. To supplement this secondary data, primary data was collected from field work conducted during July and September 2018. The field work was based on a semi-structured interview approach that used prepared questions on key topics while also allowing open-ended discussion to collect insight from village heads and community members.

Secondary data were compiled from two main sources: i) *statistical data* from the national Institute of Statistics (INSTAT); ii) *administrative data* from different international and governmental institutions, including but not limited to the Ministry for Agriculture, Civil Registry Offices, and relevant Municipalities; General Local Plans data and publication from other institutions at the central and local level.

Field data collection was conducted during meetings with different representatives and community members at the local level, including community representatives (at the Municipality, Administrative Unit and village level), village elders and other village members using interview techniques. This included interviews with i) representatives from the municipalities of Gjirokastrë, Memaliaj, Tepelene, Permet, Kelcyre, Libohovë, and Dropull; ii) selected Heads of Administrative Units which are intersected by the seismic lines; iii) selected community leaders from the villages which are intersected by seismic lines and direct interviews with villagers. The social survey methodology is included **Annex 5** of this report.

4.2 Topography

The project area lies in the Southern region of Albania approximately 150 km southeast of Tirana and is bordered to the north by Tomorri Mountain (Poliçan), to the east by Kolonja region, to the west by Labëria and Upper Kurveleshi highlands and, to the south by the Mali (mountain) i Gjerë and Greece. The area is characterized by the presence of limestone mountain ranges and valleys running in parallel to each other from northwest to southeast and linked through narrow gorges. Most of the mountain peaks are 2000 m above the sea level; and some valleys descend down to the sea level. The highest point of the region is Papingji peak (2,486 m) in the Nemerçkë Mountains, near the Greek border⁶⁴ (see Figure 4-2). The topography of the Project Area is shown in Figure 4-3.

⁶⁴Physical Geography of Albania, Volume II (1991) Academy of Sciences of Republic of Albania, Geographical Research Centre, Tirana, 287-372

Figure 4-2: Nemërçkë mountain range view with the highest Papingji peak



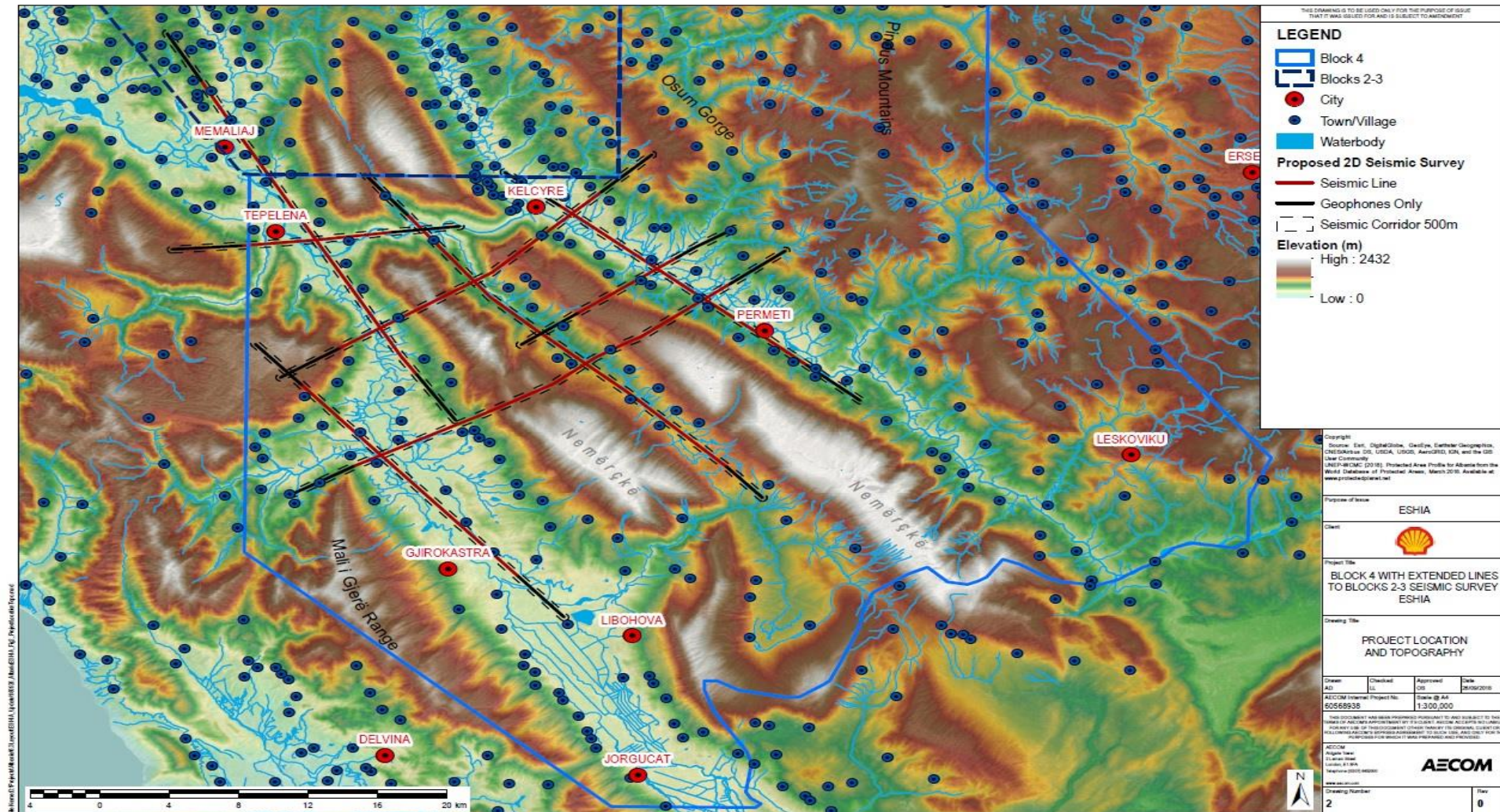
The project area extends over the mountain ranges of Trebeshinë-Dhëmbel–Nemërçkë, Shëndëlli - Lunxhëri – Bureto and Mali i Gjerë-Stugarë and partially Kurveleshi highland.

Trebeshinë-Dhëmbel–Nemërçkë and Shëndëlli-Lunxhëri–Bureto mountain ranges are situated between the upper part of Vjosa River and its tributary Dëshnica in the east and Drinos River in the west, and separated by the Zagori-Pogon valley. Their overall length is approximately 60 km.

Mali i Gjerë-Stugarë mountain range extend for 25 km in the southwest of the project area, on the left bank of the Drinos valley. The eastern slope descends gradually toward the Drinos valley and is characterized by the strong development of karst phenomena. Another characteristic of this mountainous area is seasonal streams which are dry for most of the year.

Kurveleshi highland lies between Vjosa and Drinos valleys to the east and Shushica valley to the west.

Figure 4-3: The project area and Topography



The main valley of the project area is the Vjosa River valley which also represents one of the most notable valleys of the country. The Vjosa valley lies between 120-150 m above sea level (Poçëm) and 600 - 800 m above sea level (Mesare – Greece), but most of it has an average elevation of 400 to 600. The valley is wider at the southeastern part of Block 4, narrowing as it extends towards Këlcyrë where it forms the famous Këlcyrë gorge, 13 km long and about 1000 m deep. Downstream of the gorge, near Dragot, the valley widens again until it reaches the Myzeqeja area in the coastal lowlands. Its upper part (up to Këlcyrë) contains farm land and settlements.

The second valley of importance within the project area is the Drinos valley located between Lunxhëri-Bureto mountain range in the east and Mali i Gjerë in the west. It has an overall length of 60 km and elevation between 200 to 250 m above sea level. Its central sector crosses the Albanian border between Kakavia and Hundëkuq and is characterized by a wide cross section.

Between the Trebeshinë-Dhëmbel-Nemërçkë and Shëndëlli-Lunxhëri-Bureto mountain ranges the valleys of Zagori and Pogoni are located. Both are characterized by a tectonic background and a very fragmented relief. The Zagoria valley is located on the west side of the Lunxhëri Mountain and on the east side of Dhëmbel. The valley has a V-shaped transverse profile with narrow base and inclined slopes. Unlike the other valleys of the Southern Mountains, which extend to the lower part, the Zagoria valley narrows in the same way as the Zagoria synclinal.

Within the Zagoria synclinal lies also the Pogoni valley, which has the shape of an irregular basin formed by the flysch⁶⁵ and Quaternary deposits. Its relief is mountainous and quite rugged. The upper part of the valley from its beginning to the Suha gorge, with a length of 10-12 km and a width of 3-8 km, is distinguished for the irregular base and asymmetrical slopes. The eastern slopes are very fragmented by the river of Suha and its tributaries.

The Kurveleshi highland unit within the project area extends from the south-eastern corner of Block 3 southward into Block 4 and lies along the Bënça valley of a tectonic-erosive and karstic origin. It has a length of 15 km and is characterized by a longitudinal profile with curves, narrowings and enlargements that replace each other.

The project area is characterized by high mountain ranges separated by valleys running in parallel to each other and linked through narrow gorges. The elevation varies between 100 m ASL (in valley) and 2486 m ASL with most of mountains peaks above 2,000 m. The given terrain travel can be challenging and time consuming and there is the risk of accidents.

4.3 Climate

Albania is located within the Mediterranean climatic belt characterized by hot dry summers and mild rainy winters. The climate varies with the topography: hot and dry summers with frequent thunderstorms, wet and mild winters are common in the coastal plains; higher precipitation and colder winters with heavy snow in the mountains.

The annual mean temperatures in the country vary from 7°C in the highest zones up to 15°C in the coastal zone although maximum temperatures can be as high as 21.8°C in the mountains. January is typically the coldest month with mean temperatures ranging between 3°C and 10°C depending on the altitude and winter conditions. July is the warmest month with a mean temperature of around 25-26°C.⁶⁶

The total mean annual precipitation in Albania is approximately 1,485 mm/year and varies substantially across the country. The southeast part of the country receives the least amount of precipitation (up to 600 mm/year). The highest level of precipitation (2800-3000 mm/year) is recorded in the Albanian Alps; followed by the mountainous southwest zone, with a precipitation up to 2,200 mm/year. The highest amount of precipitation (about 70%) is recorded during the cold months peaking in November⁶⁷ with the lowest rainfall in July-August. During the winter snow is characteristic for inland mountainous regions, i.e. the Albanian Alps, and the Central and Southern Mountainous regions.

⁶⁵ Flysch is a sequence of sedimentary rock layers that progress from deep-water and turbidity flow deposits to shallow-water shales and sandstones. It is deposited when a deep basin forms rapidly on the continental side of a mountain building episode. [<https://en.wikipedia.org/wiki/Flysch>]

⁶⁶ <https://www.climatechange.gov.al/albania/climate-change/>

⁶⁷ Ministry of Environment (Tirana, June 2016) Third National Communication of the Republic of Albania under the United Nations Framework Convention on Climate Change

Albania is divided into four main climatic zones: Mediterranean Plains, Mediterranean Hills, Pre-Mountainous Mediterranean, and Mountainous Mediterranean⁶⁸. The project area can be characterised by two climate regimes: Mountainous Mediterranean in the mountainous of the project area including the Zagoria and Pogoni valleys, and Mediterranean Hills in the Vjosa and Drinos valleys.

The Mountainous Mediterranean climatic regime is strongly influenced by the high mountains and atmospheric masses from the interior of the continent. Temperatures vary with elevation. In January, the coldest month, the average temperatures range from 5°C to 7°C in open areas and between 6°C to 12°C in forested areas. The absolute minimum temperature reported is -15°C, but in general, although typically it doesn't fall below -5°C. The average annual precipitation is approximately 2000 mm (Pogoni valley)⁶⁹, 80% of which falls during the autumn/winter season⁷⁰. The winter season is generally from the middle of December to the end of February. Snow may cover the ground for short periods in the winter which may persist for a slightly longer period on mountain slopes and an even longer period in the Zagoria valley. Cold winds blowing through this valley reduce the air temperatures that may cause ice over the ground. The average wind speed for the mountain ranges is 2.5 to 3.5 m/s, and the prevailing direction is from the northwest.

Daily maximum temperatures in the river valleys that have a Mediterranean Hills climate regime tend to be high, but the nights are generally cooler. This climatic regime shows influences of a Mediterranean Plains climate, but the dominance of the marine climate declines with elevation. The annual average temperature varies from 14.1°C for the Drinos valley to 15.1°C for Vjosa valley (Tepelenë). The average temperature of January varies from 5.2°C at Drinos valley to 6.3°C at Vjosa valley (Tepelenë). In July the average range temperature is between 23°C at Drinos valley and 24.1°C for Vjosa valley. The mean annual precipitation varies from 1200 mm for the Vjosa valley to 1845 mm for Drinos valley (Gjirokastër station) that is distinguished for the high rainfall. The month with the highest precipitation is December with 314 mm. In the Drinos valley there is a frequent (35 days/year) occurrence of fog and mist ranking second in the country for these meteorological conditions⁷¹.

Generally, the climate of the project area is of Mediterranean regime strongly influenced by the hilly to mountainous terrain and atmospheric masses from the interior of the continent. The entire project area is characterized by abundant rainfall with average annual precipitation vary from 1,200 mm for Vjosa valley to 2,000 mm in Pogoni valley. Most rainfall (70%) occurs during the cold months. Snow is also a common event in high mountains during the winter time.

4.4 Air Quality

Air quality data for Albania is limited Monitoring under the National Environmental (NEA) Monitoring Program is carried out only in major cities and hasn't been consistent due to lack of funds⁷² as well as technical challenges. Urban air quality is monitored for the main pollutants comprising PM₁₀, PM_{2.5}, NO₂, SO₂, O₃, CO and BTEX. In the cities of Tirana, Elbasan, Durrës, Shkodër, Vlorë and Korçë air quality monitoring is performed by NEA through automatic fixed and mobile stations and one manual station (in Tirana). Other parameters such as heavy metals are monitored by the Public Health Institute (PHI) and the Institute of Nuclear Physic. The PHI conducts monitoring of PM_{2.5}, Pb, Cd, Zn, and Cu in the cities of Kukës, Fier, Gjirokastër (within the project area) and at Berat.

Even though monitoring throughout the country is neither comprehensive nor consistent, the data published by NEA in the annual Report on Environmental State indicate that urban air quality continues to represent an environmental concern in Albania. The main sectors contributing to air pollution are transport, industrial and agricultural sectors as well as heating. All these sectors produce a variety of pollutants such as: sulphur dioxide, nitrogen oxides, ammonia, volatile organic substances and particulate matter. The latest air quality data published by NEA in June 2018 shows urban air quality being poor due to elevated concentrations of PM₁₀ and PM_{2.5}⁷³.

⁶⁸ Institute of Hydrometeorology, Albanian Climate, the data for 1985–2000 after Mustaqi V.

⁶⁹Physical Geography of Albania, Volume II (1991) Academy of Sciences of Republic of Albania, Geographical Research Centre, Tirana, 287-372

⁷⁰ WALSH (1998) EIA for Petroleum Exploration Activities in Blocks 4 and 5 Onshore Albania OMV (ALBANIEN) onshore Exploration GmbH

⁷¹Physical Geography of Albania, Volume II (1991) Academy of Sciences of Republic of Albania, Geographical Research Centre, Tirana, 287-372

⁷²NEA, Report of Environmental State 2017(2018), pg.34

⁷³NEA, Report of Environmental State 2017 (2018), pg.47

Within the project area, last year (2017) was the first time the air quality was monitored for the concentration of PM_{2.5} in Gjirokastër. The measurements were carried out during the period of June to November and data obtained showed elevated concentration of PM_{2.5} comparing to the EU standard (25 µg/m³), except for October. The highest level was measured in August, 54.61 µg/m³.⁷⁴ This is attributed mainly to the traffic during the tourist season through Gjirokastër passed the main road axes connecting the western part of Albania with Greece, more specifically, the national roads of Fier-Tepelenë-Gjirokastër-Kakavia (Custom office) and Fier-Tepelenë-Gjirokastër-Sarandë (Port of Saranda). Both roads support considerable traffic during the summer time especially due to intensive tourist travel. Additionally, Kakavia Custom is one of the main border crossings with Greece for land transport. Air emissions from vehicles along these roads represent one of the main sources of air pollution for the area.

For the rest of the project area, data on air quality is lacking since most of it represents rural settlements not included in the monitoring network of state institutions. Key sources of atmospheric emissions within the project area are likely to comprise small enterprises, agricultural activities, transportation, uncontrolled burning of wastes and use of firewood from households in the winter (mainly in villages). Use of unpaved roads during the dryer seasons can also generate elevated levels of dust. Other sources of air pollution within the project area are emissions from transport vehicles along the national road between Memaliaj-Përmet-Tre Urat where another Custom office with Greece has been established.

However, due to low industrial development and rural settings of the major part of the project area air quality is expected to be predominantly good.

4.5 Ambient Noise

The national noise monitoring program also comprises major cities of Albania and is carried out by the Public Health Institute. However, Albania still lacks adequate standards for noise levels in various environments. DCM No. 8, dated 27.11.2007 *"On limits of noise levels in certain areas"* that support Law No. 9774, dated 12.07.2007 *"On the evaluation and management of environmental noise"*, sets threshold levels during the day outside residential buildings at 50 to 55 dB(A).

In the last two years Gjirokastër has been included in the noise monitoring programme. Noise levels recorded at two stations were higher than respective WHO limits for both day and night measurement periods. The average noise level recorded during 2016 was 60.6 70 dB(A) during the day (WHO standard of 55 dB(A)), and 48.67 dB(A) at night (WHO limit of 45 dB(A))⁷⁵. The major noise sources in this town include vehicle traffic within the town and other usual social and economic activities within the town such as services (bars, markets) and construction. The data recorded in Gjirokastër town during 2017 indicates the noise levels exceed the WHO standards during the night (50.11 dB (A) in comparison to the WHO standard of 45dB (A)). The level of noise during the day was 58.35 dB (A), exceeding the WHO limits only by 6.9%⁷⁶.

The above constitutes the only official noise monitoring data within the project area. For the remaining mostly rural areas there is no data, but noise levels are expected to be predominantly within the limits due to limited economic activities and traffic.

The main noise source is vehicle traffic and most exposed areas and settlement are those along the main road corridors connecting the towns from Memaliaj to Tepelena, Gjirokastër and Libohova and Kelcyre to Permet. Noise levels along these corridors during the daytime are slightly higher than WHO standards. For the remaining mostly rural areas there is no data, but noise levels are expected to be predominantly within the limits due to limited economic activities and traffic.

4.6 Geology and Geomorphology

Generally, Albania belongs to the Dinarides, the geological structure of the southern branch of the Alpine folded belt (associated to the Mediterranean Alpine orogenic belt). The main geological structures called "Albanides" represent a link between the Dinarides to the north and the Hellenides to the south. They can be sub-divided into two main tectonic domains: the Internal Albanides, which were affected by pre-Cretaceous compressional

⁷⁴NEA, Report of Environmental State 2017(2018),pg.38

⁷⁵NEA, Report of Environmental State 2016 (2017), pg.101-102

⁷⁶NEA, Report of Environmental State 2017 (2018), pg. 62

deformation and are dominated by ophiolitic nappes; and the External Albanides, characterized by compressional deformation beginning in the Eocene (Figure 4-4).

The *Internal Albanides* are located south of the Shkoder-Peja transversal fault. The main zone of this domain is the Mirdita zone, which is characterized by the largest ophiolitic complex in Europe (Langora&Bushati, 1990)⁷⁷ linked to the west with Krasta-Cukali (Pindos) zone through Listna–Spiteni unit (Peripheral Complex of Robertson&Shallo (2000)⁷⁸. East of the Mirdita zone is located the *Korabi zone* strongly deformed in several tectonic slices (Melo, 1970)⁷⁹. A weakly metamorphosed sequence of sandstones and conglomerates, with typical Verrucano facies, overlies the Paleozoic basement.

The *External Albanides* are an external fold-and-thrust belt, which covers about half of Albania and consists of westernmost unit (Sazani), the Ionian zone overthrust by the Kruja zone that is overthrust by the Krasta-Cukali zone.

North of the Shkoder-Peja transversal fault, the Alps zone represent the southern continuation of the Dinaric nappe system; the lowermost nappe shows a Permian-Middle Triassic terrigenous formation (Verrucano), a thick Middle Triassic-Cretaceous platform carbonate sequence, and a Paleocene-Lower Eocene flysch (Robertson&Shallo, 2000⁸⁰; Meço&Aliaj, 2000⁸¹).

The project area, comprising Block 4 and the south-eastern corner of Block 3, is located within the Ionian tectonic zone of Albania (Figure 4-4). The main structural characteristic of the zone is the presence of a series of anticlinal and synclinal belts, both extending parallel and sub-parallel almost the entire length of the zone in a submeridional position⁸². The contact between anticlines with neighbouring synclinals is tectonic.

⁷⁷Langora LI. & Bushati S. (1990). Geotectonical position of the ophiolites in inner Albanides according to gravity field data. *Ofioliti*. 5, 52-64.

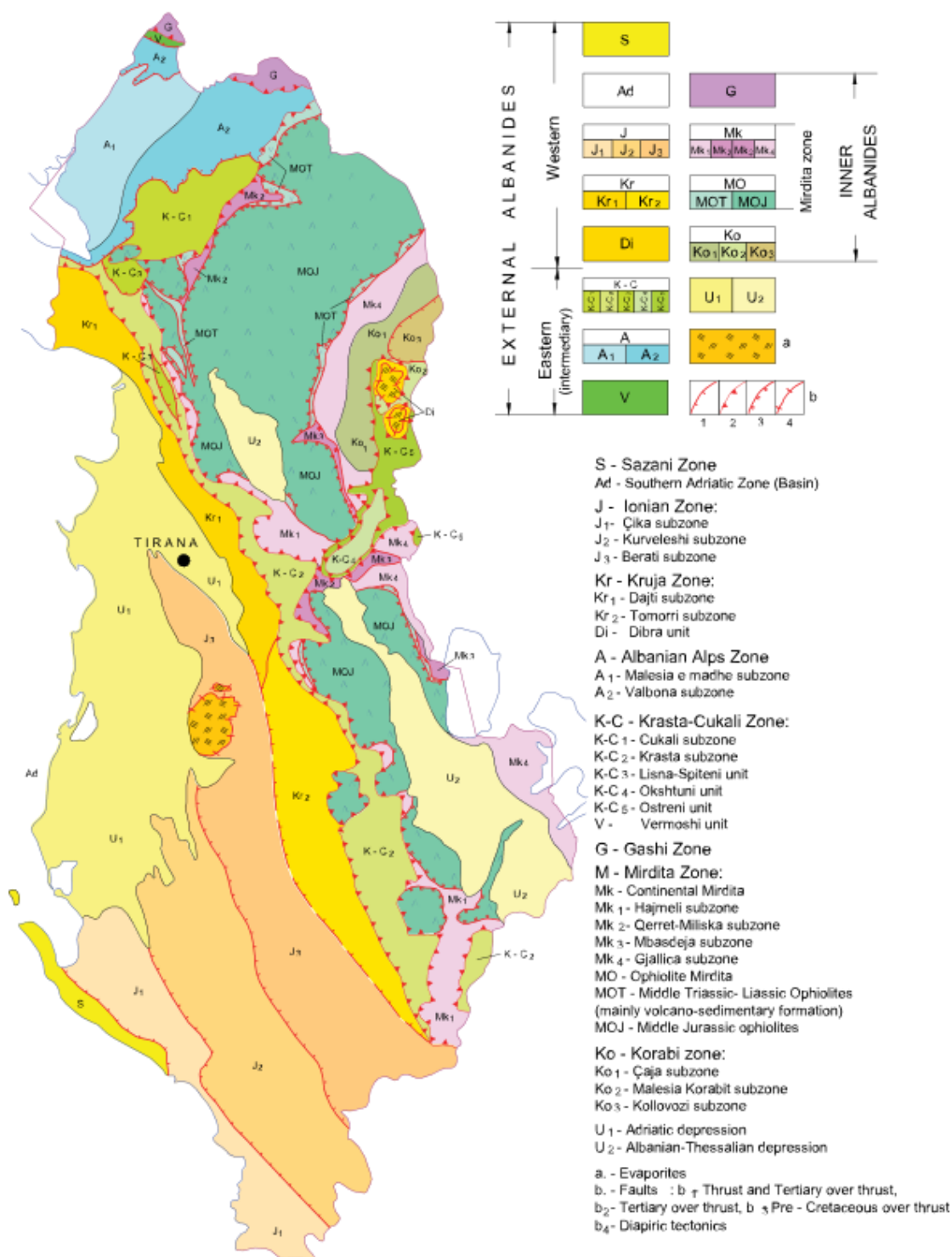
⁷⁸Robertson A. & Shallo M. (2000). Mesozoic-Tertiary evolution of Albania in its regional Eastern Mediterranean context. *Tectonophysics*. 316, 197-254.

⁷⁹Melo V. (1970) On the spread of Silurian-Devonian within Korab zone. State University of Tirana, Newsletter of Natural Sciences 2, 61-70.

⁸⁰Robertson A., & Shallo M. (2000). Mesozoic-Tertiary evolution of Albania in its regional Eastern Mediterranean context. *Tectonophysics*. 316, 197-254.

⁸¹Meço S., & Aliaj Sh. (2000) Geology of Albania. *Beiträge zur Regionalen Geologie der Erde*. Bd. 28, Borntraeger. 246

⁸²WALSH (2012) Petromanias ESIA for Seismic Exploration Activities (Blocks 2-3 Extensions) in Blocks Dumre, 1, 4, 5, 6 Onshore Albania

Figure 4-4: Tectonic map of Albania⁸³

Throughout the southern part of this area there are outcrops of Permo-Triassic evaporates, Upper Triassic dolomites, and Oligocene/Miocene flysch deposits. To the northwest, the structures dip below the Periadriatic Depression molasses, which is most pronounced north of the Vjoses River⁸⁴. These structures include: Postenani

⁸³Geologic Map of Albania, Scale 1:200,000⁸⁴Aliaj Sh. (1991) Neotectonic structure of Albania, Albania Journal of Natural and Technical Sciences, 4, 79-98

Anticline, Permeti Syncline, Berati Anticline, Drinos Syncline and Kurveleshi Anticline⁸⁵. To the west the area is bordered by Shushica syncline to the west of which, the Ionian zone comes in contact with Sazani zone.

This block occupies a large surface where all types of sedimentary deposits are met, from the oldest ones of Late Triassic age to the Pliocene molasses. The sedimentary sequence of the Ionian Zone was thrust west to southwest over evaporites during compression and structural deformation⁸⁶. Diapirs appear also in the anticlinal belt, for instance at Kurveleshi, on the western flanks⁸⁷.

Lithologically, the stratigraphical profile in the Ionian zone consists of an evaporitic Permo-Triassic sole, an Upper Triassic-Middle Liassic carbonate platform, a pelagic basinal sequence (Dogger-Late Eocene), and an Oligocene-Miocene foreland complex.

⁸⁵Meço S. & Aliaj Sh. (2000) Geology of Albania, Baiträge zur Regionalen Geologie der Erde, Bd.28, Borntraeger, 246

⁸⁶Aliaj Sh. (1991) Neotectonic structure of Albania, Albania Journal of Natural and Technical Sciences, 4, 79-98

⁸⁷Velaj T., Davidson I., Serjani A., Alsop I. (1999) Thrust Tectonics and the Role of Evaporites in the Ionian Zone of the Albanide, American Association of Petroleum Geologists (AAPG) Bulletin 83(9): 1408 -1425

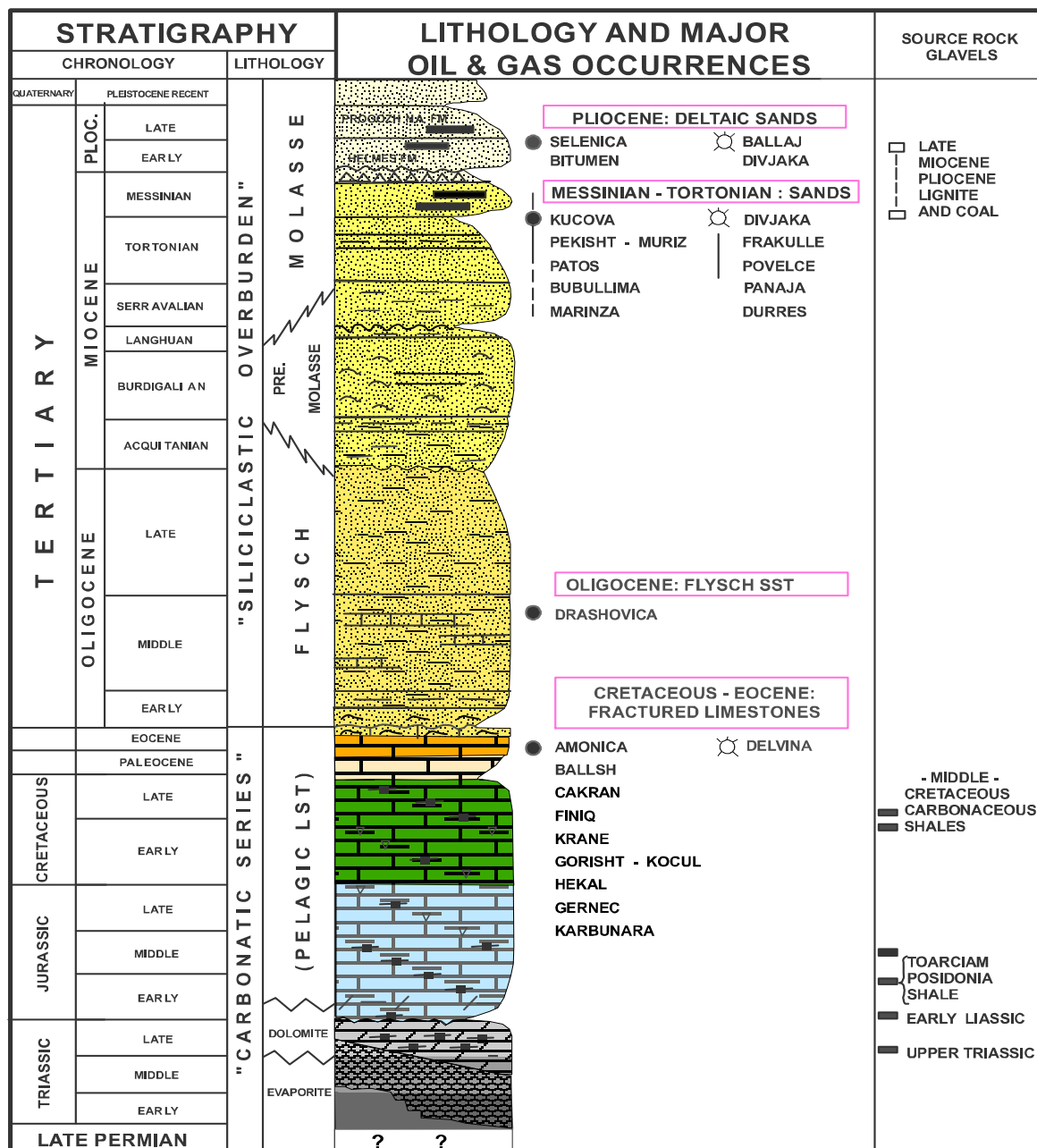
Figure 4-5: Stratigraphic column of the Ionian Zone⁸⁸

Table 4-2 lists the geologic formations within the project area, ages and a short description of the types of rocks in each formation.

Table 4-2: The geologic formations within the project area

Geologic Formations within and near the project area

⁸⁸ Velaj T. (2015), New ideas on the Kurveleshi anticlinal belt in Albania, and the perspective for exploration in its subthrust, Petroleum SWPU, Mar 11, 2016 (https://www.researchgate.net/publication/297735838_New_ideas_on_the_tectonic_of_the_Kurveleshi_anticlinal_belt_in_Albania_and_the_perspective_for_exploration_in_its_subthrust)

Map Code	Geologic Symbol	Geologic Age	Formation/Description
6	Qh	Holocene	Alluvial deposits
7	Qp-h	Pleistocene-Holocene	Mixed alluvial-proluvial deposits
17	N ₂	Pliocene	Clays, sandstones, gravelites, conglomerates, coals -
21	N ₁ ^{2s}	Serravalian	Clays, sandstones and Lithothamnium limestones from Ionian Zone and Adriatic Depression
22	N ₁ ^{2l}	Langian	Marly clays, clays and sandstones
24	N ₁ ^{1b}	Burdigalian	Marls, marly-clays, alevrolites and Lithothamnium and macroforaminiferal limestones
25	N ₁ ^{1a}	Aquitanean	Sandstones, alevrolites, clays and conglomerates
28	Pg ₃ ³	Upper Oligocene	Clayey-sandy flysch with limestone layers, massive sandstones and massive sandstones,
29	Pg ₃ ²	Middle Oligocene	Clayey-alevrolite-sandy flysch slump horizons and conglomerates, massive sandstones
30	Pg ₃ ¹	Lower Oligocene	Clayey-alevrolite-sandy flysch with slump horizons and olistolithic limestones
32	Pg ₂	Middle Eocene	Intercalations of micritic and biomicritic limestones with turbidites and some thin siliceous layers and lenses, micritic and biomicritic limestones and clayey-marly limestones.
35	Pg ₁	Palaeocene	Mainly turbiditic limestones with slump horizons; micritic limestones with intercalations of siliceous lenses.
40	Cr ₂	Upper Cretaceous	Stratified limestones with Globotruncana, turbiditic and siliceous limestones;
44	Cr ₁	Lower Cretaceous	Porcelaneous limestones with siliceous lenses and concretions; the turbidite limestone and the clayey-marly limestone, the so called "Cretaceous schists" with intercalation of cherts layers.
47	J ₃ t-Crv	Upper Tithonian - Valanginian	Ophiolitic conglobreccia, marly-sandy-conglomeratic intercalations
53	J ₃	Upper Jurassic	Siliceous rocks, argillous schists and limestones; Radiolaritic siliceous limestones, argillaceous schists from Cika sub-zone; Melange " block matrix"
55	J ₂	Middle Jurassic	Limestones with pelagic bivalves, siliceous radiolaritic rocks
57	J ₁	Lower Jurassic	Siliceous limestones, dolomitic limestones, algal limestones, marly schists with Posidonia, red limestones with Ammonites in "Ammonitico rosso" facies
60	T ₃	Upper Triassic	Intercalations of cristalina dolomites, limestone and dolomitic limestone with micro fossils
67	T	Triassic	Evaporites (Gypsum, anhydrite and salts)

Due to the intense limestone presence in the three anticlinal belts, is also possible to meet the old karst, which is generally linked with the limestones of Cretaceous Eocene that outcrops mainly in the centre of the project area. The karst is also characteristic of evaporates of Triassic lithology within project area found south of Libohova.

The characteristic features of the geomorphology in the project area are steep slopes and flat mountain ridges. The karst forms are widely distinguished especially in the eastern slopes of mountains. There is no map of karst forms and no survey performed to provide information on location, extent and fragility of these features. The surface and bottom erosion is extended in areas with clayey or clayey-alevrolite-sandy deposits.

4.6.1 Petroleum Geology of the project area

Based on the geological-geophysical data complex, their interpretation and the conclusions reached for the tectonic-structural construction of the project area oil and gas prospect areas that have been mapped^{89, 90}.

The *Selca* structure is located over the neck that divides two structures, Libohova and Lunxhëria. Based on the interpretation of surface geological data and the seismic ones, the *Selca* structure is presumed to be the continuation of Libohova Paleogene flysch to its west. The cross-section with the separating neck also realizes the southern periclinal closure, while the northern closure is towards Erind-Nokove. The structure's extend according to the closure at 3700 m isoline is 8 x 2.8 km and the highest sector is at 3 000 abs.

In the north of the *Selca* structure the *Labove and Zhaba prospect* is located, slightly in the form of a step. The southern closure is conditioned by the Erind-Nokovo fault, while the northern closure is generally dipping with a tendency towards the north. It is anticipated that the most elevated part of the two structures are: Luxheria in the south and Golikos in the north. The prospect area is 7 x 2.7 km with the highest elevation at 3600 abs. It is presumed that on the top of structure represented by a massive gas source there is oil bearing strata, at a level of 600m.

The *Picari structure* was mapped differently by previous studies. The seismic data has shown a trap of limestone with a flysch cover and evaporites on other side. The presumed stratification is a carbonate structure covered by flysch deposits and tectonically screened by evaporitic deposits.

4.6.2 Seismicity

Albania is one of the most earthquake-prone countries in the Mediterranean region and is periodically subject to moderate and severe earthquake activity. Data on the Seismicity of Albania cover a 2000-year period and are presented in different earthquake catalogues⁹¹. A complete earthquake catalogue for Albania was compiled in 1975 and has been revised during the period 2000-2005.⁹² The catalogue covers a time span from 58 BC to 2005 and an area between 18.5-21.5°E and 39-43°N. The intensity of the earthquakes is classified in terms of surface-wave magnitude (M). From 1900 to 1990, over 211 earthquakes of magnitude 4.5 or greater were recorded⁹³. Over 70% of these earthquakes occurred during the wet season (November-April)⁹⁴. On average, an earthquake causing damage occurs every two years⁹⁵.

Major earthquake epicentres are indicated with active faults in Albania⁹⁶. Three longitudinal and two transverse active fault zones are present in the Albanian orogenous (Figure 4-6), as follows⁹⁷:

Ionian-Adriatic thrust fault zone, NW up to nearly NNW trending:

- Shkodër-Mat-Librazhd graben fault zone, NW trending
- Peshkopi-Korçë graben fault zone, N-S trending
- Shkodër-Tropojë normal fault zone, NE trending
- Elbasan-Dibër normal fault zone, NE trending

⁸⁹ Denis E., Miiller Ph.D., Fili I., Dulaj A., Bitri A. (1993) The Petroleum Potential of Albania, Fund of National Scientific Hydrocarbon Centre, Fier

⁹⁰ Misha V., Bandilli L. (1998) Study on the structural model and oil and gas prospective extent in Albania, assessment of expected reserves, Fund of National Scientific Hydrocarbon Centre, Fier

⁹¹ Sulstarova E., Koçiu S. (1975) The catalogue of Albanian earthquakes. Academy of Sciences, Tirana, 170 pp (in Albanian)

⁹² AliajSh, Koçiu S., Muço B., Sulstarova E (2010) Seismicity, seismotectonics and seismic hazard assessment in Albania. Academy of Sciences of Albania, 310 pp (in Albanian with an extended summary in English).

⁹³ Koçiu S. (1993) Some Aspects of Seismic Hazard Assessment in National and Local Levels in Albania Comprehensive Approach to Earthquake Disaster Mitigation, 85-117

⁹⁴ Muço B. (1995) The seasonality of Albanian earthquakes and cross-correlation with rainfall, Article in Physics of the Earth and planetary Interiors, 88 (3): 285-291

⁹⁵ Koçiu S. (1993) Some Aspects of Seismic Hazard Assessment in National and Local Levels in Albania Comprehensive Approach to Earthquake Disaster Mitigation, 85-117

⁹⁶ AliajSh, Koçiu S., Muço B., Sulstarova E (2010) Seismicity, seismotectonics and seismic hazard assessment in Albania. Academy of Sciences of Albania, 310 pp (in Albanian with an extended summary in English).

⁹⁷ AliajSh, Koçiu S., Muço B., Sulstarova E (2010) Seismicity, seismotectonics and seismic hazard assessment in Albania. Academy of Sciences of Albania, 310 pp (in Albanian with an extended summary in English).

Referring to the neotectonics, within the project area one longitudinal and one transverse seismogenic zones have been identified: Ionian-Adriatic longitudinal and Lushnja-Elbasani-Dibra seismogenic zones. This zone generally trends NW to SE in the external area of the compressional regime. This fault zone contains numerous active longitudinal thrust faults and rare back-thrust faults, cross-cut by strike-slip faults⁹⁸. Microtectonic studies and focal mechanism solutions of the earthquakes demonstrate that this fault zone is now in a compressional stress regime with a SW-NE trend, perpendicular to the Adriatic collision. The faults are still active and seismogenic⁹⁹.

Earthquakes with expected magnitude M_{max} between 6.0 and 6.9 may occur¹⁰⁰ in this area. According to the Albania seismicity map, this area is included in Zone VII¹⁰¹ (to the east) and experiences VIII degrees of MSK – 64^{102,103} seismic intensity scale (Figure 4-6).

⁹⁸AliajSh, Koçiu S, Muço B, Sulstarova E (2010) Seismicity, seismotectonics and seismic hazard assessment in Albania. Academy of Sciences of Albania, 310 pp (in Albanian with an extended summary in English).

⁹⁹WALSH (2012) Petromanas ESIA for Seismic Exploration Activities (Blocks 2-3 Extensions) in Blocks Dumre, 1, 4, 5, 6 Onshore Albania

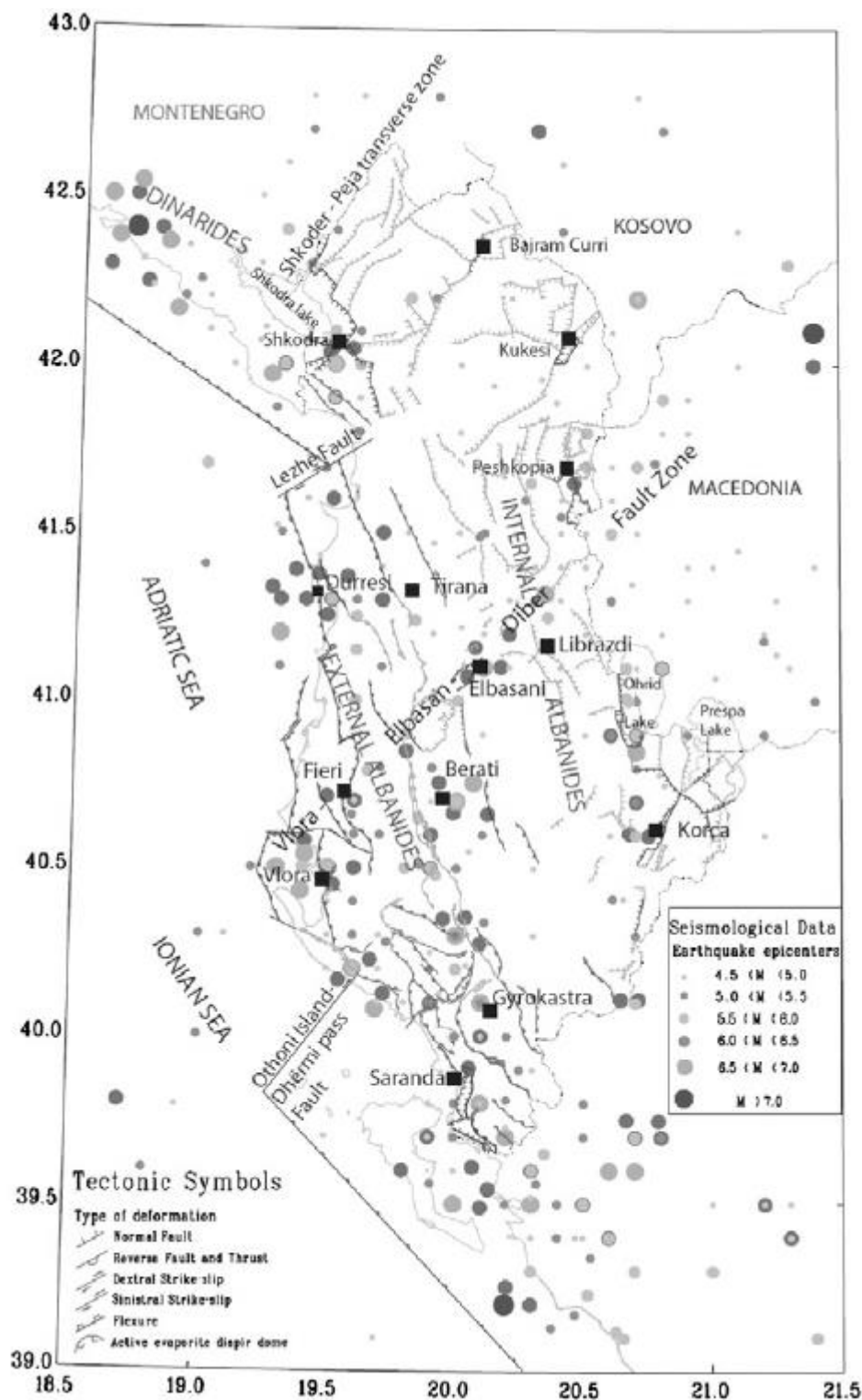
¹⁰⁰AliajSh, Koçiu S, Muço B, Sulstarova E (2010) Seismicity, seismotectonics and seismic hazard assessment in Albania. Academy of Sciences of Albania, 310 pp (in Albanian with an extended summary in English).

¹⁰¹VII degree (equivalent to the 6 scale Richter) – Very strong - Most people are frightened and try to run outdoors. Furniture is shifted and may be overturned. Objects fall from shelves. Water splashes from containers. Serious damage to older buildings, masonry chimneys collapse. Small landslides

¹⁰²The Medvedev–Sponheuer–Karnik scale, also known as the MSK or MSK-64, is a macroseismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the earthquake occurrence.

¹⁰³VIII degree (equivalent to 6.7 scale Richter) – Damaging - Many people find it difficult to stand, even outdoors. Furniture may be overturned. Waves may be seen on very soft ground. Older structures partially collapse or sustain considerable damage. Large cracks and fissures opening up, rockfalls.

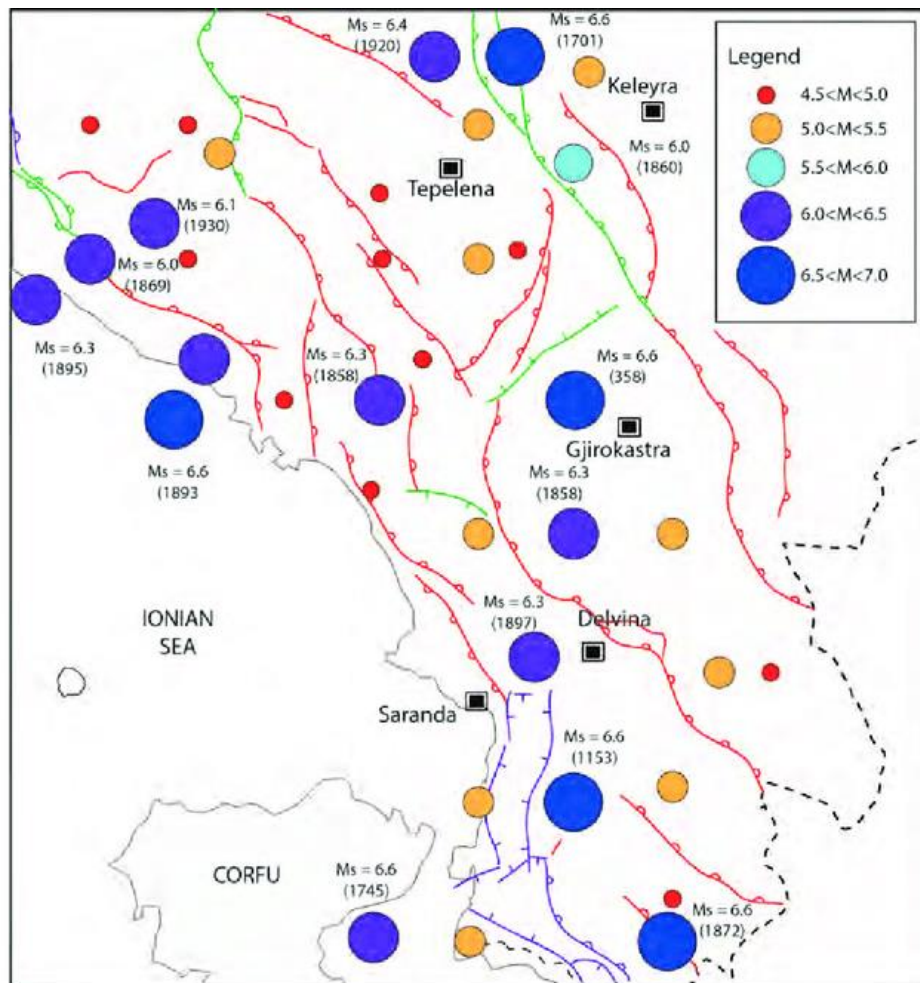
Figure 4-6: Neotectonics map of Albania with plio-quaternary faults and folds, with location of historical seismicity¹⁰⁴



¹⁰⁴Neotectonics map of Albania with plio-quaternary faults and folds from Aliaj et al., 2004, with location of historical seismicity re-drawn after Aliaj et al. (2004).

A recent published study on the seismicity of the Southwestern Albania gives detailed data for the seismic activity within the Kurveleshi belt (J2) that represents almost the south and western parts of the project area (Figure 4-7). The study has confirmed that this part of the project area is characterized by intense microearthquake activity ($0.1 < M < 3.0$) and shallow crustal seismicity¹⁰⁵. Most of registered seismic events are located in the north part of the tectonic belt, thus outside the project area. According to the study conclusion, the seismicity is rather shallow, concentrated to the upper 10 km of the crust and is slightly dipping to the East. Fewer than 30 events were located in depth shallower than 1 km clearly associated with sites evaporite outcropping, not present in the project area.

Figure 4-7: Active faults in the Gjirokastrë site area and its vicinity¹⁰⁶



4.6.3 Estimated hazard across the project area

A suite of national seismic hazard maps provides an opportunity to assess seismic risk in Albania, where seismic risk is defined in terms of seismic hazard (3 probability of damaging ground motion * city population) vulnerability. The latest probabilistic seismic hazard model for Albania comprises ten seismic source zones (see Figure 4-8):

- Three coastal zones including: Lezha-Ulqini (LU), Periadriatic Lowland (PL), Ionian Coast (IC);

¹⁰⁵ Serpetsidaki A., Tselentis G-A., Martakis N., Sokos E. (2012), Seismicity and Seismotectonics Study in Southwestern Albania Using a Local Dense Seismic Network, Bulletin of the Seismological Society of America (2012) 102 (5): 2090-2097, <https://doi.org/10.1785/0120110139>

¹⁰⁶ Aliaj, SH., Adams J., Halchuk, S., Sulstarova, E., Peci, V., & Muco, B. (August 1-6, 2004). Probabilistic Seismic Hazard Maps for Albania. Vancouver, B. C. Canada: 13th World Conference on Earthquake Engineering. 2469.

- Five inland zones along active graben structures including: Peja-Prizreni (PP), Kukesi-Peshkopia (KP), Ohrid-Korca (KO), Shkodra-Tropoja (ST), Elbasani-Dibra-Tetova (EDT);
- An eastern background zone Eastern Albanian Background (EAB); and,
- A source in Macedonia to represent earthquakes near Skopje (SK)¹⁰⁷.

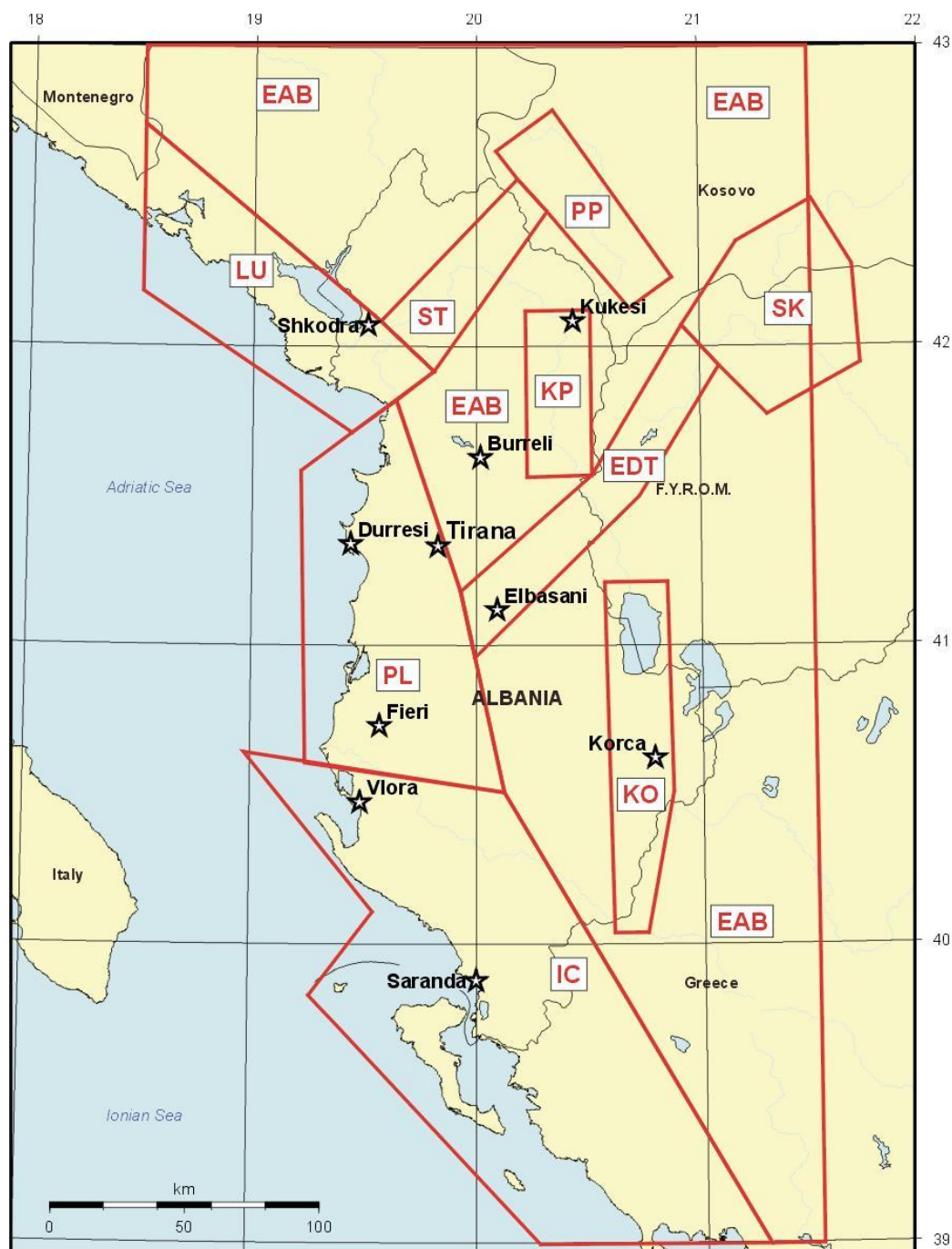
Earthquakes recorded in Albania in the last 5 years above a magnitude of 4.0 are summarized in Table 4-3¹⁰⁸:

Table 4-3: Earthquakes in Albania from 2003 to 2018

Date	Epicenter	Magnitude
5.19.2014	Belsh	5.1
4.16.2007	Tirana	4.5
6.13.2006	Tepelene	4.5
7.10.2005	Tropoje	5.2

¹⁰⁷ Aliaj, SH., Adams J., Halchuk, S., Sulstarova, E., Peci, V., & Muco, B. (August 1-6, 2004). Probabilistic Seismic Hazard Maps for Albania. Vancouver, B. C. Canada: 13th World Conference on Earthquake Engineering. 2469.

¹⁰⁸ <https://www.worlddata.info/europe/albania/earthquakes.php>

Figure 4-8 Seismic source zones used for the hazard¹⁰⁹

Seismic hazard values were calculated for a grid extending over Albania and neighbouring regions using the four spectral values for some important cities to illustrate the range and period dependence of seismic hazard across Albania. The results are shown in the Table 4-4. None of these cities is located within project area.

Table 4-4: Hazard at 10%/50 year probability for selected Albanian cities and towns (%g).¹¹⁰

City	Lat N	Lon W	Sa (0.1)*	Sa (0.5)*	Sa (1.0)*	Sa (2.0)*	PGA**

¹⁰⁹ Aliaj, SH., Adams J., Halchuk, S., Sulstarova, E., Peci, V., & Muco, B. (August 1-6, 2004). Probabilistic Seismic Hazard Maps for Albania. Vancouver, B. C. Canada: 13th World Conference on Earthquake Engineering. 2469.

¹¹⁰ Aliaj, SH., Adams J., Halchuk, S., Sulstarova, E., Peci, V., & Muco, B. (August 1-6, 2004). Probabilistic Seismic Hazard Maps for Albania. Vancouver, B. C. Canada: 13th World Conference on Earthquake Engineering. 2469.

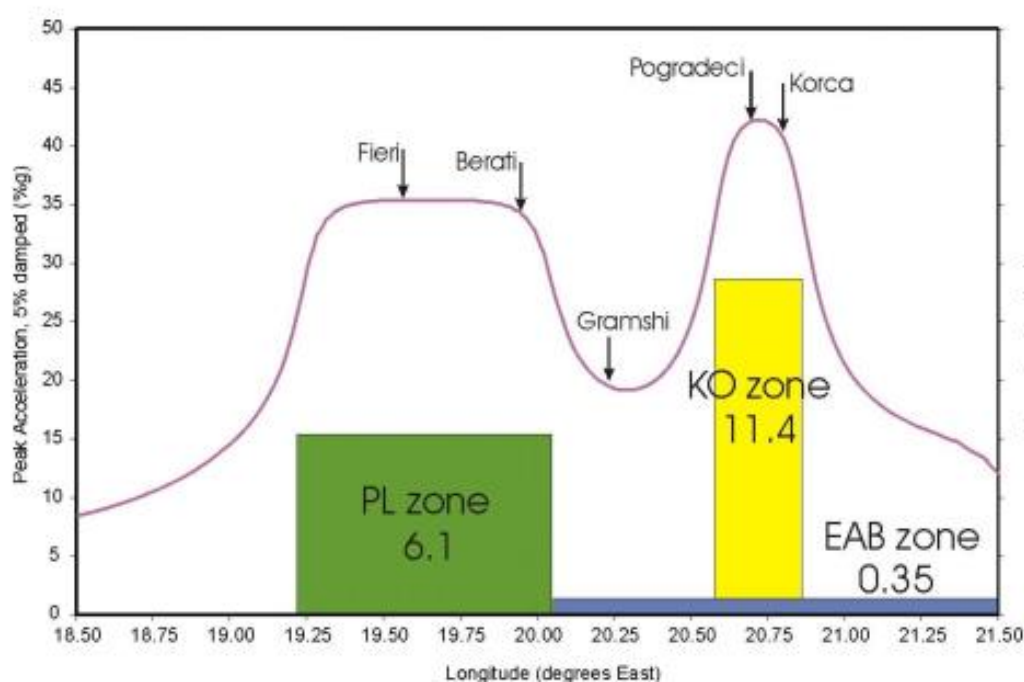
Tirana	41.33	19.83	77	58	28	9.6	32
Durrësi	41.34	19.44	86	66	31	10.3	35
Elbasani	41.12	20.09	90	66	30	10.1	38
Shkodra	42.07	19.52	75	57	28	9.3	30
Vlora	40.47	19.48	88	69	33	11.0	36
Fieri	40.73	19.57	86	68	32	10.8	35
Korça	40.62	20.79	99	75	34	11.0	41
Kukësi	42.08	20.43	81	58	26	8.6	34
Burreli	41.63	20.02	48	40	20	7.6	18

* Levels of ground shaking at periods of 0.2, 0.5, 1.0 and 2.0 seconds (equivalent to frequencies of 5, 2, 1, and 0.5 Hertz)

** Peak Ground Acceleration (known as an intensity measure plotted on seismic hazard maps)

The seismic hazard maps reveal that the region of highest hazard is the Korca-Ohrid zone. Hazard is high to moderate in the coastal regions and near the named interior seismic zones. In other places the hazard is relatively low, as in central and northern Albania. The project area is located partially in the coastal regions (IC – Ionian coast) and eastern background zone (EAB) with level of hazards from high to moderate for IC to very low for EAB (Figure 4-9).¹¹¹ Figure 4-9 shows the cross section of Albania along 40.8N showing the position of the source zones, their activity rate, and the resulting S_a (0.2) hazard.

Figure 4-9: Cross section of Albania along 40.8N



Generally, the current available data and information on seismicity highlight that the western part of the project area is characterized mostly by micro earthquake activity, concentrated to the upper 10 km depth, excluding the events in depth shallower than 1 km. While, according to the historically data, the project area falls under Zone VII where earthquakes with expected magnitude M_{max} between 6.0 and 6.9 may occur. The seismic zone used for the hazard assessment also show that the project area has a level of hazards from high to moderate for Western and South-western parts to very low for the Eastern and North-eastern ones.

¹¹¹Ibid

4.6.4 Geomorphology

The project area is located over a series of anticlinal and synclinal belts (of the Ionian zone) that constitute a hilly-mountainous geomorphology of the project area, where anticlines are associated with higher altitudes, and synclines with low altitudes¹¹². These structures have been subjected to tectonic movements such as uplifting and seeping, faulting and thrusting, which have played a major role in today's morphological configuration of the region.

The characteristic features of the geomorphology in the project area are steep slopes and flat mountain ridges. The steep slopes are related to the tectonic faults and overthrust structures toward the west. Thus the western slopes are steeper than the eastern ones giving way to the asymmetric developments of the relief.

Factors such as lithology, relief, weathering, and anthropogenic activities influenced the geodynamic phenomena including¹¹³:

- Extensive development of surface and bottom erosion in areas with clayey or clayey-alevrolito-sandy deposits;
- The karst phenomena distinguished in the form of karstic hopper or springs in erosive deep fissures; and
- Flooding and landslides.

The geomorphology is represented by two units: hills and mountains ranges, and river valleys. The dominant unit in the project area is mountainous ranges. Most of the mountains are characterized by rounded edges (even flat) edges as a result of the structural features and old erosive residues, remodelled by the activity of karst.

The karst forms are widely distinguished in the area especially on the eastern slopes of the Nemërçkë and Lunxhëri mountains, above 1700 m, where traces of quaternary ice are preserved in the form of circles and periglacial deposits. The eastern slope of Mali i Gjerë which descends gradually toward the Drinos valley is also characterized by the intense development of karstic action as a result of which many ridges and other complex forms have been formed. This intense development of the karstic action is linked, among others, to the simple topography of Mali i Gjerë.

The valleys are developed along the main rivers and named after the respective rivers name. Their cross sections vary from tens to hundreds of meters. Usually they have low gradient, terrigenous background and a very fragmented relief. Morphological features of valleys vary depending on the geological structure and lithology of intersected deposits.

4.7 Soils and soil quality

Albania presents of a large variety of landscapes and soil types. Formations of soils types are influenced by various factors such as; climate, natural vegetation, elevation and slope, presence of water (alluvial) and parent rocks¹¹⁴.

According to the National Soil Classification System, the soils of Albania are divided into four belts (zones). These belts illustrate the distribution of soils types and are related to elevation (from sea level) and vegetation type. The soils that have developed within each belt are also cited or grouped as "zonal soils" due the fact that the formation of such soils follows a vertical sequence (elevation from sea level). The formation of zonal soils occurs under specific, biological, geological, topographic, and climatic conditions.

Soils types within a belt do not occur in any other belts. Distribution of zonal soils belts according the elevation are as follows:

2. I. Subalpine pasture belt at 1600-2700 m high.
3. II. Beech and pine forest belt at 1000-1600 m high.

¹¹²ERM (2016), Regional ESIA Report for Oil and Gas Exploration Activities Blocks 2-3 Onshore Albania, Final report.

¹¹³Albanian Geological Survey, Geological-engineering regionalisation of Gjirokastra area, at scale 1:10,000 (Scientific report), December 2006

¹¹⁴Zdruli, P. (1997). Benchmark Soils of Albania. Alabama, USA: Internal monograph of the USDA Natural Resources Conservation Service, Washington DC and the International Fertilizer Development Center, Muscle Shoals. 2 Volumes. 293.

4. III. Oak forest belt at 600-1000 m high.
5. IV. Mediterranean shrubs belt at 0-600 m high.

In areas where soil formation is not solely related to natural vegetation and elevation, they are considered to be azonal and include alluvial, peat, saline, and undeveloped or primitive soils. These soils can occur in all of the above mentioned soil belts¹¹⁵. A description of the zonal and azonal soils, the percentage of the agricultural land by soil type and the corresponding area of agricultural land in Albania are summarized in Table 4-5.

Table 4-5: Albanian soil types and their surface areas versus total agriculture land of the country¹¹⁶

	Belts	Type	Explanation	%	Area* x 1.000 Ha
Zonal Soils					
I	Mountain meadow	LM	Subalpine pasture	0.5	3.2
II	Dark mountain forest	MP	Beech and pine forest	3.0	20.2
	Dark meadow forest	LMP		0.6	3.4
III	Cinnamon mountain	KM	Oak forests	17.7	121.3
	Cinnamon meadow	KL		5.4	37.0
	Meadow cinnamon	LK		7.5	51.3
IV	Grey cinnamon	HK	Mediterranean shrubs	25.7	176.2
	Grey cinnamon meadow	HKL		6.4	50.7
	Meadow grey cinnamon	LHK		18.5	127.1
Azonal soils					
	Alluvial	AL	Fluviatile soils	11.8	80.9
	Peat	LT	Boggy soils	1.4	10.0
	Saline	LKr	Solonchak, so-lonetz	1.4	9.7
	Primitive mountain soils	PM	Undeveloped soils	0.1	0.4
	Sand beaches	PL	Undeveloped soils		0.2
TOTAL				100.0	

*Area refers to total agricultural land of the country

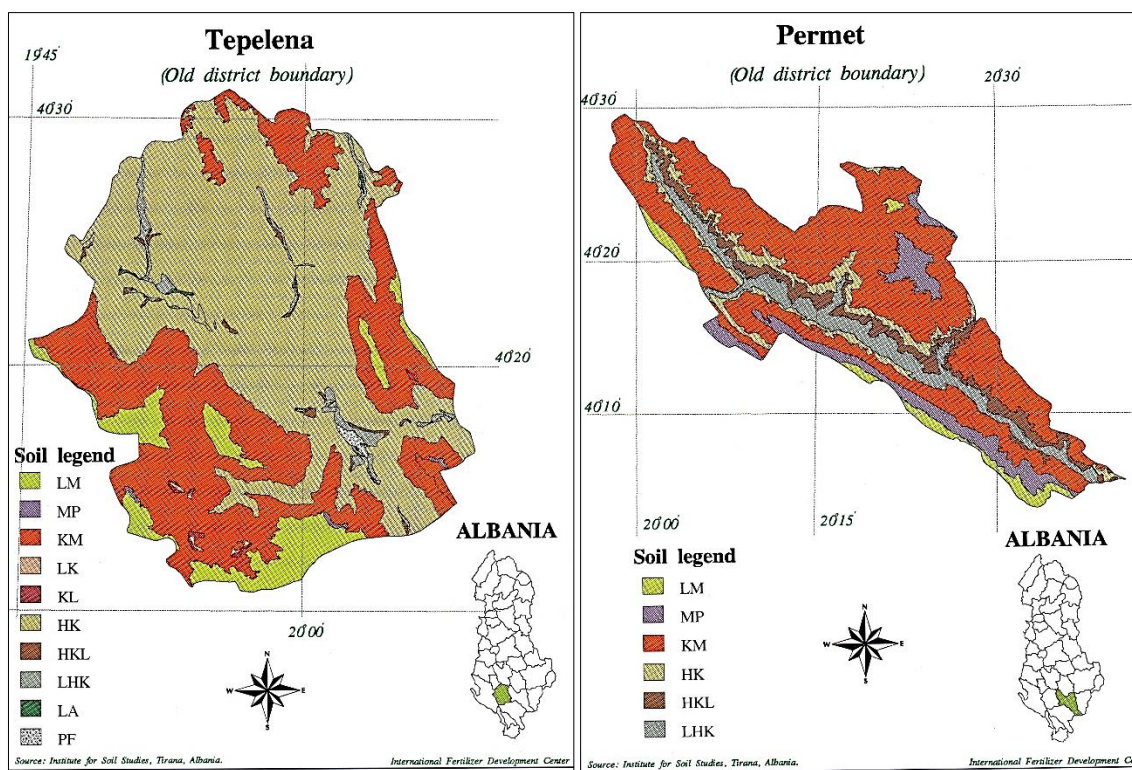
Based on this classification system (vertical altitude) almost all types of soils occur within Block 4 and extends into Block 2&3. According to available topographic information, in Tepelena District the dominate soil type is Grey cinnamon (HK), followed by Cinnamon mountain (KM) and Mountain meadow (LM) soil types. Whereas in Përmeti district, the dominate soil type is Cinnamon mountain (KM) followed by Meadow grey cinnamon (LHK) and Grey cinnamon meadow (HKL) (Zdruli & Lushaj, 2001)¹¹⁷

¹¹⁵ Zdruli P., Lushaj Sh. (2001) The status of soil survey in Albania and some of its major environmental findings, in Zdruli P. (ed.), Steduto P. (ed.), Lacirignola C. (ed.), Montanarella L. (ed.). Soil resources of Southern and Eastern Mediterranean countries. Bari: CIHEAM, Options Méditerranéennes: Série B. Etudes et Recherches; n. 34, pages 69-89

¹¹⁶ Zdruli P., Lushaj Sh. (2001) The status of soil survey in Albania and some of its major environmental findings, in Zdruli P. (ed.), Steduto P. (ed.), Lacirignola C. (ed.), Montanarella L. (ed.). Soil resources of Southern and Eastern Mediterranean countries. Bari: CIHEAM, Options Méditerranéennes: Série B. Etudes et Recherches; n. 34, pages 69-89

¹¹⁷ Zdruli P., Lushaj Sh. (2001) The status of soil survey in Albania and some of its major environmental findings, in Zdruli P. (ed.), Steduto P. (ed.), Lacirignola C. (ed.), Montanarella L. (ed.). Soil resources of Southern and Eastern Mediterranean countries. Bari: CIHEAM, Options Méditerranéennes: Série B. Etudes et Recherches; n. 34, pages 69-89

Figure 4-10: Soils maps prepared from Former National Institute of Soils



Maps legend:

LM - Mountain meadow

MP - Dark mountain forest

KM - cinnamon Mountain

LK – Meadow cinnamon

KL – Cinnamon meadow

HK – Grey cinnamon

HKL – Grey cinnamon meadow

LHK - Meadow grey cinnamon

LA – Alluvial meadow

PF –Undeveloped soils (or PM)

Limited soil surveys in Block 4 were conducted as part of the ESIA study 1998¹¹⁸ for the for previous seismic survey programs. During ESIA study 1998 two soil samples were taken and analysed. The first of the samples (referred as no.5 in this ESIA study 1998) was collected in the mountains near Labova e Madhe Village at 800m ASL, the soil range from 0.5 to approximately 2m deep It is dark to light greyish brown (2.5Y4-5/2) clay loam; rooted zone (0 to 0.2m)is darker. The soil contains numerous angular limestone fragments from very fine pebble (2mm) size to 10 cm. The soil is developed on weathered flysch comprised with silty shale and silty clayey limestone which comprises approximate 35-40% of the soil.

The second sample (referred as no.6 in this ESIA study 1998) was collected in a valley west of Drino River near Palokastra village at 230m ASL. Based on the presence of poplar trees, the depth of the soil is at least 3m and possibly more. The soil is light greyish brown to greyish brown (10YR5-6/2) silt loam. The rooted zone extends

¹¹⁸ WALSH (1998) EIA for Petroleum Exploration Activities in Blocks 4 and 5 Onshore Albania OMV (ALBANIEN) onshore Exploration GmbH, pg.50-51

approximately to a depth of 25cm from the surface whereas the tree roots extend to a depth of 3m. No coarse particles were noted in the sample.

Figure 4-11: Abandoned agricultural land in Drinosi river valley



The main causes of soil degradation and pollution in project area are summarised below:

- **Soil erosion** - The NEA reported¹¹⁹ circa 167,646 ha of land being affected, of which 25% is exposed to medium level erosion and 75% at high risk (exposure/potential) of erosion. In Gjirokastër region the erosion index is estimated at level 3, considered as medium to high level of erosion. A specific study¹²⁰ indicates annual erosion rates are estimated at 10 tons plus per ha per annum, especially in the southern and central parts of the country. In three areas (two in Gjirokastër, and one in Sarandë) the annual erosion rate is more than 100 tons per ha per annum. Erosion rates are more intensive during the cold and wet season which lasts from October to February. The most erosion prone areas include exposed slopes areas along the Luftinja Sub/Municipality, especially the hill system at Zhapokika village. Other areas prone to erosion include the abandoned agricultural land along the Drinosi river valley. Abandoned agricultural land lack of proper drainage systems and is prone to overgrazing as well. Overexploitation of the forest and pastures and fires are also factors that induce land erosion especially in hilly system along Drinosi river valley.
- **Agriculture fertilizers** - Use of chemical fertilizers without adequate planning and monitoring remains a source of soil pollution especially in cultivated areas close to villages and river plains.
- **Inappropriate waste management** - Waste disposal remains one of the main sources of soil pollution. Solid waste management is not at an adequate level and waste is being dumped in open pits and left to be degraded releasing contaminants into the environment.
- **Widespread agricultural land abandonment** - There are several factors leading to this abandonment such as immigration and migration of the local population, low quality lands and adverse climate for extended agricultural production, high costs of agricultural services, plot fragmentation, lack of developed local market and lack of irrigation infrastructure.

High soil erosion is actual phenomena in the project area. Erosion rates are more intensive in hills along Drinosi valley and areas close by the human settlements such as hills or agriculture areas. The most erosion intensive period is in wet season (and lack of vegetation) which lasts from October to February. Based on site surveys the most erosion prone areas include exposed slopes areas along the Luftinja Sub/Municipality, especially the hill system at Zhapokika village. Other areas prone to erosion include the abandoned agricultural land along the Drinosi river valley.

¹¹⁹ NEA (2015), Report on Environmental State 2014, http://akm.gov.al/wp2014_ok/wp-content/uploads/2014/12/Toka.pdf

¹²⁰ Grazhdani S. and Shumka S. (2007), An approach to mapping soil erosion by water with application to Albania.

4.8 Water Resources

4.8.1 Surface water

The water resources in Albania are distributed, hydrographically, across six watershed basins, and all flow in westerly or north-westerly direction across the country and into the Adriatic and Ionian Seas. The major river systems, from north to south, are as follows: Drini and Buna, Mati, Ishmi and Erzeni, Shkumbini, Semani, and Vjosa rivers.¹²¹

The rivers are characterized by irregular seasonal flow which peaks in autumn or winter¹²² and reduces in summer, sometimes to 10% of the average winter flow¹²³. The flow gradient in the uplands is steep and the sediment loading results in braided channel morphology. The upland rivers are known for their torrential flows and periodic flooding caused by substantial variations in rainfall, particularly during the winter months, when precipitation is highest. In the summer months the smaller rivers and streams can dry out completely¹²⁴.

The project area is situated in the Vjosa River watershed basin, the characteristics of which are presented in Table 4-6.

According to Hydrographical Division of Albania, the Vjosa River Basin includes the Vjosa River and its tributaries, as well as Bistrica, Kalasa, Pavllo and other smaller streams catchments. The hydrogeological network of the project area is shown in Figure 4-13.

The main rivers crossing the seismic corridors include the Vjosa River and its tributaries Drinos, Suha, Zagoria, Bënça, as well as the Luftinja stream.

Vjosa is one of the largest rivers in Albania originating from springs in the Timfli Plateau (Greece). On its first 80 kilometres the river flows through Greece and is named Aoos. After entering into Albanian territory Vjosa flows north-westward through the valleys between the Nemërçkë and Dhembël mountains to the Adriatic Sea. Along its entire course of over 270 kilometres it is untamed and free flowing and characterized by beautiful canyons, braided river sections, islands, oxbows and meandering stretches. In some areas the riverbed expands over more than 2 km in width. Vjosa catchment provides a dynamic, near-natural ecosystem, and is European natural heritage feature.¹²⁵

Table 4-6: Vjosa river basin characteristics^{126, 127}

Characteristics

Catchment of the river basin:	4,365 km ² in Albania
Basin mean annual discharge:	5,550 million m ³
Specific discharge:	26 l/km ²
Ratio wettest month to driest month:	10.8 l/km ² (April/August)
One in 10-year high flow:	about 24 times the river module

¹²¹ http://www.erru.al/doc/NATIONAL_STRATEGY_OF_WS.pdf

¹²² Lushaj et al., 2016 Bashkim LUSHAJ, Fatos HOXHAI, Miriam NDINI, Agim SELENICA, Arben PAMBUKU, Ira DAFA, Albana HASIMI, Klodian ZAIMI, Metodi MARKU, Elvin ÇOMO, Entela VAKO, Spahi ISUFAJ, Bledar MYRTAJ (2016): General overview of the transboundary waters of rivers, lakes, groundwater and trend of them, in Albania. Online International Interdisciplinary Research Journal, {Bi-Monthly}, ISSN 2249-9598, Volume-VI, Issue-I, JanFeb 2016 Issue, pp. 418-446. ISSN 2249-9598. Available online at www.oijrj.org

¹²³ DCM no.73 dated 07.02.2018 "On the approval of the National Strategy for Integrated Management of Water Resources, 2018-2027"

¹²⁴ Zickel, R.E., and W.R. Iwaskiw, (eds), 1994, Albania - a country study: Washington, D.C., Federal Research Division, Area Handbook Series, 288p

¹²⁵ RiverWatch & EcoAlbania & EURONATUR (2015), The Vjosa River, beautiful, unknown and threatened (http://www.ecoalbania.org/wp-content/uploads/2015/03/Vjosa-Aoos_FactSheet.pdf)

¹²⁶ Agim Selenica (2001/1): "Water resources of Albania" (2001/1): In: Hydrometeorological Institute; Hydrotechnics Department, Faculty of Civil Engineering, Polytechnic University of Tirana; INWEB (International Network of Water Environment Centers for the Balkans)/MED-HYCOS MED-HYCOS (Mediterranean Hydrological Cycle Observing System) joint meeting-Belgrade 25-28 April 2001, Report n° 16, pp. 1-11

¹²⁷ Agim Selenica (2008): Water resources of Albania (2008): In: Department of Technologies of Energy, Department of Climate and Environment & Department of Water Economy, Institute of Geosciences, Energy, Water and Environment, pp. 1-11.

Within the project area the Vjosa flows through the Përmet area narrowing its bed near Këlcyra and forming the Këlcyra gorge. After crossing Dragot the riverbed expands again¹²⁸. The Vjosa River catchment is characterized by connection to a deep karsts reservoir, which ensures abundant source of underground water supply during dry season¹²⁹. Figure 4-12 is photograph of River Vjosa valley.

The largest tributary of the Vjosa River is Drinos, the second largest river within the project area, flowing on the north-eastern flank of the Gjerë Mountains. It originates from Greece and after crossing Albanian border, is joined by Kseria stream which flows from the mountain of Murgones (1806 m). As it flows towards Gjirokastër, it extends its valley even more, forming the Dropulli plain. Near Lazarat, Suha River originating from Nemerçka Mountain joins Drinos downstream of the Palokaster village Babica River which also drains into Drinos.

Figure 4-12: River Vjosa valley view in Block 4



The annual average flow of Suha River is 0.5 l/s. In this place Drinos River narrows its valley until it flows into the Vjosa River near the town of Tepelene. Drinos River has an annual average flow 42.5 m³/sec, maximum flow 94 m³/sec and minimum flow 7.6 m³/sec. During summer, the river's flow decreases by approximately 50%, however the sector Kakavije – Hundëkuq is almost dry¹³⁰.

The Bënça River is 26 km long and drains an area of approximately 188 km². Its annual average flow is 8.8 m³/sec and prior draining into Vjosa it collects waters of various karstic springs like those that flow down the village of Bënçë.

Other smaller rivers, also tributaries of the Vjosa River, flowing through the project area include Shushica (Vlora/Suhës) and Lengarica, each one having a complex network of tributaries. Figure 4-13 shows the river network within the project area.

In summary, the project area is situated in the Vjosa River watershed basin. The main rivers crossing the seismic corridors include Vjosa River and its tributaries Drinos, Suha, Zagoria, Bënça, as well as the Luftinja stream. The rivers are characterized by irregular seasonal flow which peaks in autumn or winter and reduces in summer,

¹²⁸Physical Geography of Albania, Volume II(1991) Academy of Sciences of Republic of Albania, Geographical Research Centre, Tirana,287-372

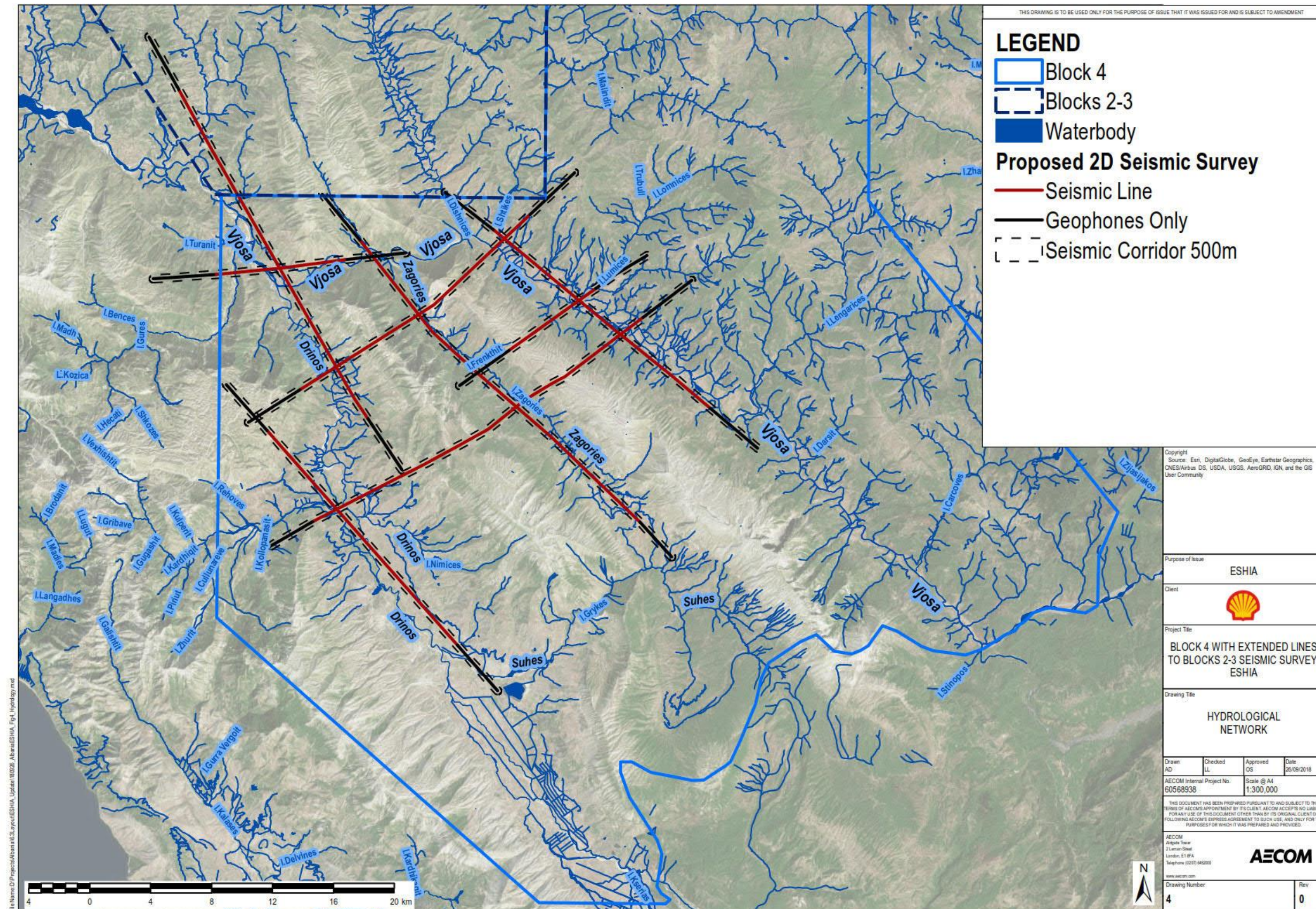
¹²⁹Agim Selenica (2001/2): "Water resources of Albania" (2001/2): In: MED-HYCOS (Mediterranean Hydrological Cycle Observing System) joint meeting in Montpellier, June 2001, MED-HYCOS Phase 2, period 2002-2005. Project Proposal Montpellier, June 1, 2001, Report n° 17, pp. 1-9

¹³⁰Albanian Geological Survey, Geological-engineering regions within Gjirokastra area, at scale 1:10,000 (Scientific report), December 2006

sometimes to 10% of the average winter flow. The upland rivers and feeding streams are known for their torrential flows and periodic flooding caused by substantial variations in rainfall, particularly during the winter months, when precipitation is highest. In the summer months the small rivers and upland streams can dry out completely.

Many springs occur within the project area and especially along the Vjosa and Drinosi River Valleys and distributed in several altitudes from the valleys up to the high mountains. These springs are the main source of drinking water supply for the towns and villages. There are few wells (artificial) along the main road Gjirokaster – Jorgucat. Avoiding the operations close by these springs and water wells is important.

Figure 4-13: Hydrological network within the project area



Surface water quality

Monitoring of surface water quality is carried out by the NEA under the National Environmental Monitoring Program¹³¹. The assessment of water quality is based on the periodic measurements of the main chemical and physico-chemical parameters including dissolved oxygen (DO), Biochemical Oxygen Demand (BOD₅), nitrate (NO₃-), nitrite (NO₂), ammonia (NH₄+), total phosphorus (P), phosphate (PO₄-) and Total Suspended Solids (TSS)¹³² following the provisions set at the EU Water Framework Directive (WFD)¹³³.

The WFD classification for surface water quality status includes five categories: high, good, moderate, poor and bad¹³⁴ (although this should take into account factors such as physical modification and biological status, in addition to chemical status). According to this classification NEA Agency characterised the status of the Vjosa basin as 'Good' (Table 4-7).

In 2017, the surface water quality could not be classified because according to the WFD the classification of river water quality can be done only if the monitoring is being carried out four times a year, which was not realized due to lack of funds¹³⁵. The National Strategy of Water Resources Management 2018-2027 (DCN No. 73 dated 07.02.2018) recognised the fact that "water quality monitoring has not been carried out systematically over the past two decades, and water quality data is only reliable to a certain extent"¹³⁶.

Table 4-7: Classification of the ecological river status in Albania

Water quality	Drini-Buna basin	Ishëm – Erzen basin	Shkumbini basin	Semani basin	Vjosa basin	Mati basin
Category I – High						
Category II – Good					II	
Category III – Moderate			III			III
Category IV – Poor	IV					
Category V – Bad		V		V		

Source: Report of Environmental State 2016, NEA, pg.136

The Vjosa basin water quality monitoring network comprises five stations, four of which are located along the main River Vjosa, and one on its tributary, the Drino River. The monitoring stations are situated at Çarshova, Përmeti town's bridge, Memaliaj's bridge, Mifol's Bridge along the Vjosa, and monitoring station of the Drinos river is located near Lekli Bridge. With the exception of the monitoring station at Mifol's bridge, all four remaining stations are located within the project area. The water quality monitoring stations are shown on Figure 4-14.

Chemical analyses of samples taken from the Vjosa indicated that the water quality is generally good although elevated concentrations have been observed for iron or hardness in the mainstream of the Vjosa River and elevated levels of chlorine in the torrent of Langarica, were noted.

According to the results of annual monitoring published by NEA¹³⁷ the water quality of Vjosa river basin is classified in the second category (good), except for the Çarshova station, which is considered as the reference station and falls under the first category for all monitored parameters.

The water quality of Vjosa and Drinosi within project area is of good quality and adequate to be used for seismic operations (as drilling of shooting holes) and sanitation purposes (for camps sanitation). Ground water is of good quality and the main source of drinking water for the project area.

131 DCM No. 1189, dated 18.11.2009 "On rules and procedures for compilation and implementation of National Environmental Monitoring Program"

132 DCM No. 1189, dated 18.11.2009 "On rules and procedures for compilation and implementation of National Environmental Monitoring Program", Appendix 1/point 4

133 NEA, Report of Environmental State 2017, (2018), pg.72

134 EU Publications, The EU water framework directive, ISBN 978-92-79-36449-5, DOI 10.2779/75229, Catalogue number KH-04-14-216-EN-C

135 NEA, Report of Environmental State 2017, (2018), pg.73

136 DCM no.73 dated 07.02.2018 "On the approval of the National Strategy for Integrated Management of Water Resources, 2018-2027", Official journal, Year 2018 - Number 52, pg.2994

137 http://www.akm.gov.al/cil%C3%ABsia-e-mjedisit.html#raporte_publicime

Figure 4-14: Water Quality Monitoring stations in Vjosa River basin¹³⁸

Note: Green points indicate good water quality; blue points represent high water quality

¹³⁸ <http://www.akm.gov.al/lumenjt.html> Access date: 09/05/18

4.8.2 Groundwater

Public water supply in Albania is reliant predominantly on groundwater resources. Approximately 75% of drinking water supply is provided by 90 wells and 110 natural springs, and the remaining of 25% from surface water sources. Moreover, there are undefined numbers of water wells that receive water from the shallow aquifers and which are used for irrigation and drinking purposes¹³⁹.

Thanks to the geology with developed karst formations and highly permeable gravel aquifers in the lowland areas, groundwater resources are abundant and of good quality.¹⁴⁰ The main recharge of aquifers occurs by infiltration of surface water.

The hydrogeology and main aquifers that traverse the project area are shown in Figure 4-16. The key features of the classified aquifers in the project area are described below¹⁴¹.

- Porous aquifers – Intragranulated and fissure porous aquifers with variable levels of permeability. Course intergranular aquifers are highly productive aquifers developed mainly on the Quaternary alluvial plain characterized by very high to high permeability and comprising sands, conglomerates and marley clays. Intragranulated porous aquifers of average to low permeability are characterized by clay, sand and marley clays. The fissure porous aquifer is characterized by average to low permeability and comprises sandstones, clay and conglomerates. The depth of groundwater wells in Albania usually ranges from 30 m to about 130 m. Water quality generally has a low mineral content (i.e. soft to moderately hard water).
- Karst aquifers – karst aquifers and fissured carbonate aquifers discharge to local springs. Intensively karstified lithology at surface and at depths, often form sinkholes, karst plateaus and caves. Discharge flow of the springs corresponds to climatic conditions show two maxima and two minima: the main maxima are in April/May in connection with snowmelt, and the second in December is in connection with rainfall. During the summer spring discharges subsequently diminish (the recession period), and the minimum is mainly in October. The second smaller minimum of February is caused by the freezing of the ground in high elevation karst water recharge areas.

The karst and porous aquifers are the main groundwater resources in the project area, supplying drinking and irrigation water to the local communities. The aquifer along the lower valley of the Vjosa supplies the city of Fier with more than 1 m³/s of good quality water from the wells of Kafaraj and is unaffected by the polluted water carried by the nearby Semani. The well fields of Novosele near Vlora, on the other bank, have also high yield (up to 80 l/s) and good quality water, although sometimes nitrites and nitrates have been found in fairly high amounts. The aquifer in the Drino valley around Gjirokastër supplies part of the drinking water to Gjirokastër. The water is of very good quality and extraction is around 40-90 l/s for Gjirokastër only¹⁴².

There are 47 large springs estimated in the Vjosa basin, including some of the largest karst springs in Albania - the Syri i Kalter (Blue eye), with a discharge of about 20 m³/s. Small to average sized springs (10 m/s to 100 ml/s) are located in a close proximity to the proposed seismic acquisition corridors (Figure 4-16), and are predominantly associated with the porous acquirers¹⁴³. However, the document of National Strategy for Integrated Management of Water Resources, 2018-2027, states that “the figures for groundwater can be unreliable”¹⁴⁴.

Groundwater quality

Groundwater monitoring is undertaken by the Albanian Geologic Service (AGS) and has been continuously performed from 2000 to the present for the main Quaternary gravel deposition aquifers, including karst and porous aquifers of the Vjosa basin.

¹³⁹ DCM no.73 dated 07.02.2018 “On the approval of the National Strategy for Integrated Management of Water Resources, 2018-2027”

¹⁴⁰ The World Bank Albania – Water Supply and Sanitation Sector Strategy – June 2003

<http://siteresources.worldbank.org/INTALBANIA/Resources/NWSFinal29June04.pdf>

¹⁴¹ https://www.bgr.bund.de/EN/Themen/Wasser/Veranstaltungen/workshop_gwbodies/Poster_01_Albania_pdf.pdf?__blob=publicationFile&v=2

¹⁴² Selenica Agim (2008): Water resources of Albania (2008): In: Department of Technologies of Energy, Department of Climate and Environment & Department of Water Economy, Institute of Geosciences, Energy, Water and Environment, pp. 1-11.

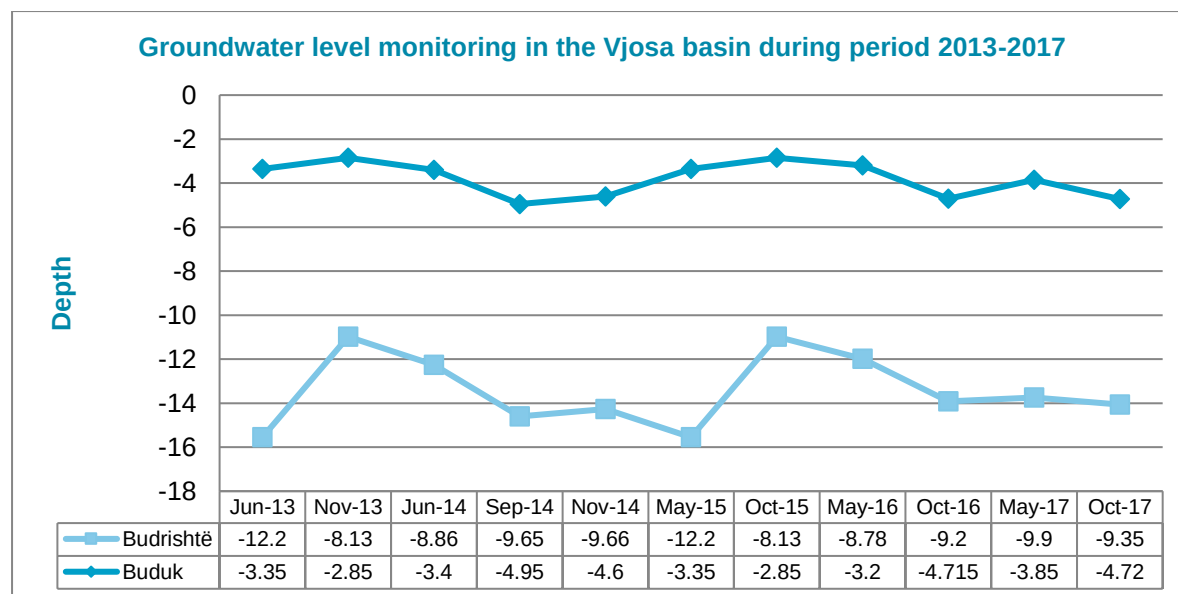
¹⁴³ Selenica Agim (2008): Water resources of Albania (2008): In: Department of Technologies of Energy, Department of Climate and Environment & Department of Water Economy, Institute of Geosciences, Energy, Water and Environment, pp. 1-11.

¹⁴⁴ DCM no.73 dated 07.02.2018 “On the approval of the National Strategy for Integrated Management of Water Resources, 2018-2027”, Official journal, Year 2018 - Number 52, pg.3040

The Quaternary aquifer of Vjosa is monitored at 6 locations: Buduk, Budrishtë, Vanistër, Kafaraj, Novoselë and Pish – Poro, with the first three located within the Block 4. The recorded data (physical and chemical parameters) indicates generally good water quality. Fluctuations of seasonal character were observed at specific stations for specific parameters, although this did not affect the overall water quality characterisation.

Hydrodynamic monitoring is also carried out to estimate groundwater levels. The measurements are recorded biannually (May/June and October/November) in Buduk and Budrishtë. The results obtained for the period of 2013-2016 are presented in the Figure 4-15. Groundwater level fluctuations are driven by seasonal climate changes, with the highest levels typically observed during the wet season.¹⁴⁵

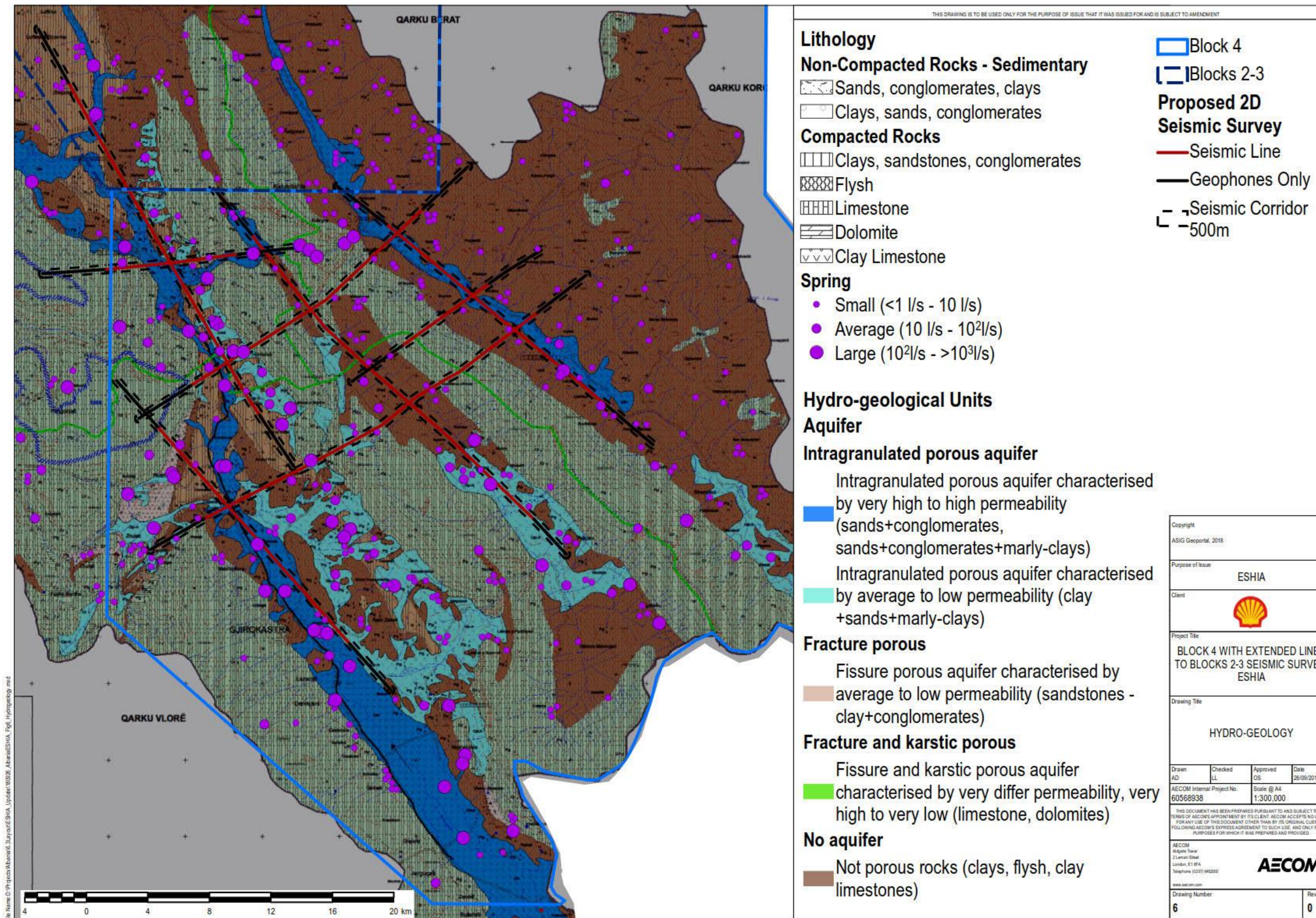
Figure 4-15: Groundwater level monitoring in the Vjosa basin for the period 2013-2017¹⁴⁶



¹⁴⁵ NEA (2018), Report of Environmental State 2017, pg.169

¹⁴⁶ NEA (2018), Report of Environmental State 2017, pg.169

Figure 4-16: Hydrogeology of the Project area



4.9 Protected and Designated Areas

There are a number of different types of designated areas in Albania. There is a network of sites which are defined and protected at the national level and these may be designated for reasons of ecology, cultural or other types of protection. These sites will have an international conservation status as defined by the International Union for Conservation of Nature (IUCN). In addition, there are designated sites which do not have protection under national law, such as Important Bird Biodiversity Area (IBA). The IUCN definition of a Protected Areas (PA) is: “An area 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 or other effective means”.

IUCN PA management categories classify such areas according to their management objectives. The categories are recognised by international bodies such as the United Nations and by many national governments as the global standard for defining and recording protected areas and as such are increasingly being incorporated into government legislation. The categories present in the project area are summarised in the Table 4-8.

Table 4-8: UCN Protected Area Categories in the project area

Category System	Definition
Strict Nature Reserve (Category Ia)	Strictly protected areas set aside to protect biodiversity and also possibly geological/geomorphic features, where human visitation, use and impacts are strictly controlled and limited to ensure protection of the conservation values.
National Park (Category II)	Large natural or near natural areas set aside to protect large-scale ecological processes, along with the complement of species and ecosystems characteristic of the area, which also provide a foundation for environmentally and culturally compatible, spiritual, scientific, educational, recreational, and visitor opportunities.
Natural Monument or Feature (Category III)	Protected areas set aside to protect a specific natural monument, which can be a landform, sea mount and submarine cavern, geological feature such as a cave or even a living feature such as an ancient grove. They are generally quite small protected areas and often have high visitor value.
Species Management Area (Category IV)	The protected area aim to protect particular species or habitats and management reflects this priority. Many Category IV protected areas will need regular, active interventions to address the requirements of particular species or to maintain habitats, but this is not a requirement of the category.

Source: <https://www.iucn.org/theme/protected-areas/about/protected-area-categories>

In Albania, the establishment and management framework of protected areas is stipulated by Law No. 81/2017 “On Protected Areas”. In order to strengthen PA management the Government established the National Agency for the Protected Areas in 2015. The agency has branches in 12 regions across Albania.

Nationally protected areas include National Parks, Managed Reserves (with various levels of protection) and Nature Monuments. Internationally recognized areas include Ramsar sites, Key Biodiversity Areas (KBA) and BAIBA. Natural monuments comprise several distinguished features of the nature such as geological (caves), geomorphological land formations such as terraces, water wells, and canyons as well as ecological features (trees and forests).

The designated and protected areas of ecological significance within the project area include:

- Kardhiqi Strict Nature Reserve;
- Bredhi i Hotovës-Dangelli National Park;
- Gërmenj-Shelegurë Managed Nature Reserve;
- Zheji Nature Monument;
- Piskal-Shqeri Managed Nature Resources Area;
- Uji i Ftohtë-Tepelenë Nature Monument;
- Lengarica Canyon Nature Monument;
- Zagori Nature Park and Butrint Key Biodiversity Area (KBA).

- Butrint KBA is recognised as internationally protected located in the project area; however, no national designation has been assigned to it.
- Fourteen protected areas are intersected by the 500m seismic corridor and 200m buffer zone. These are:
 - Bredhi i Hotoves-Dangelli National Park (Category II under IUCN), comprising a large and diverse area supporting a range of game species and mature woodlands (proposed Special Area for Conservation);
 - Zagoria Natural Park (Category IV under IUCN), representing a natural habitat with biological diversity and species of conservation interest: and
 - 11 Nature Monument areas (Category III under IUCN), including Zheji (an important area for ecotourism).

It should be noted that the category designation does not necessarily define the level of protection afforded to a PA. In practice the protection level (or levels) is determined by the specific decision that proclaims the PA; furthermore, a PA may have several zones and each of them may have different protection level.

The law stipulates that the management plan of a PA should specify the activities allowed or prohibited in each zone of a PA. However, currently only one of the PA has a Management Plan (MP). The MP of Bredhi i Hotoves-Dangelli National Park adopted by Order no.2025 dated 31.12.2014 of Minister of Environment. The MP sets out the conservation objectives for the PA and determines several objective led actions to be implemented by 2020.

The twenty year objective for Bredhi i Hotoves – Dangelli National Park is for an area which has a unique and immediately recognizable sense of place. Where: "Native biodiversity and cultural heritage, forests, freshwater, thermal waters and canyons and ecosystems are maintained and/or restored with the involvement of the local communities, while visitors are encouraged to appreciate, enjoy and understand the park by minimizing and mitigating stress factors to ecosystems".

Guiding principles are the manner in which the management of the protected area will occur, and provide for a sound basis of PA management. Of particular importance are the principles of:

- Local community participation and collaboration
- The importance of protection of wildlife and habitats
- Transparent decision making
- Effective and adaptive management, and
- Applying the "precautionary principle"

The management objectives, which have been formulated in consultation with all relevant stakeholders, will contribute to the achievement of the vision, and address specific actions. The short term objectives provide statements of desired social and environmental conditions, recreational opportunities, and benefits from managing the area. These objectives derive from legislative or administrative policy direction over a five years' time frame.

- Strengthen the protected area management system
- Increase habitats and biodiversity protection and conservation
- Develop the recreational and touristic uses
- Develop sustainable agriculture and socio-economic activities
- Promote scientific research and education

4.9.1 Protected Areas Baseline

The designated areas within the 500m seismic corridor and 200 m buffer zone are summarised in Table 4-9 and shown in Figure 4-17. The 200m protection zone is based on Albanian legislation for a buffer zone of 0 to 200m for natural monuments; 200 m being the maximum distance that could be imposed by NAPA. An overview of these areas is provide in Table 4-10.

Table 4-9: Designated areas within the 500m seismic corridors and 200 meters protection zone

Map Label	Name	Seismic Corridor (500m)	Protection Zone (200m)
1	Lisat e Manastirit Nivan	No	Yes
2	Pylli i Gurtë – Ndëran	No	Yes
3	Rrapi i Hormovës	Yes	Yes
4	Rrapi i Ndëranit	Yes	Yes
5	Rrepet e Kuqarit	No	Yes
6	Selvia e Kishës në Leusë	Yes	Yes
7	Shpella e Mezgoranit	No	Yes
8	Tarraca e Ndëranit	No	Yes
9	Uji i Ftohte	Yes	Yes
10	Vënjat e Konckës	Yes	Yes
11	Zhej	Yes	Yes
12	Bredhi Hotoves-Dangelli National Park	Yes	Yes
13	Zagori Natural Park	Yes	Yes
14	Gjirokastër Important Bird Area	Yes	Yes



Figure 4-17: Protected/Designated areas with the 500m seismic corridor and 200 protection zone

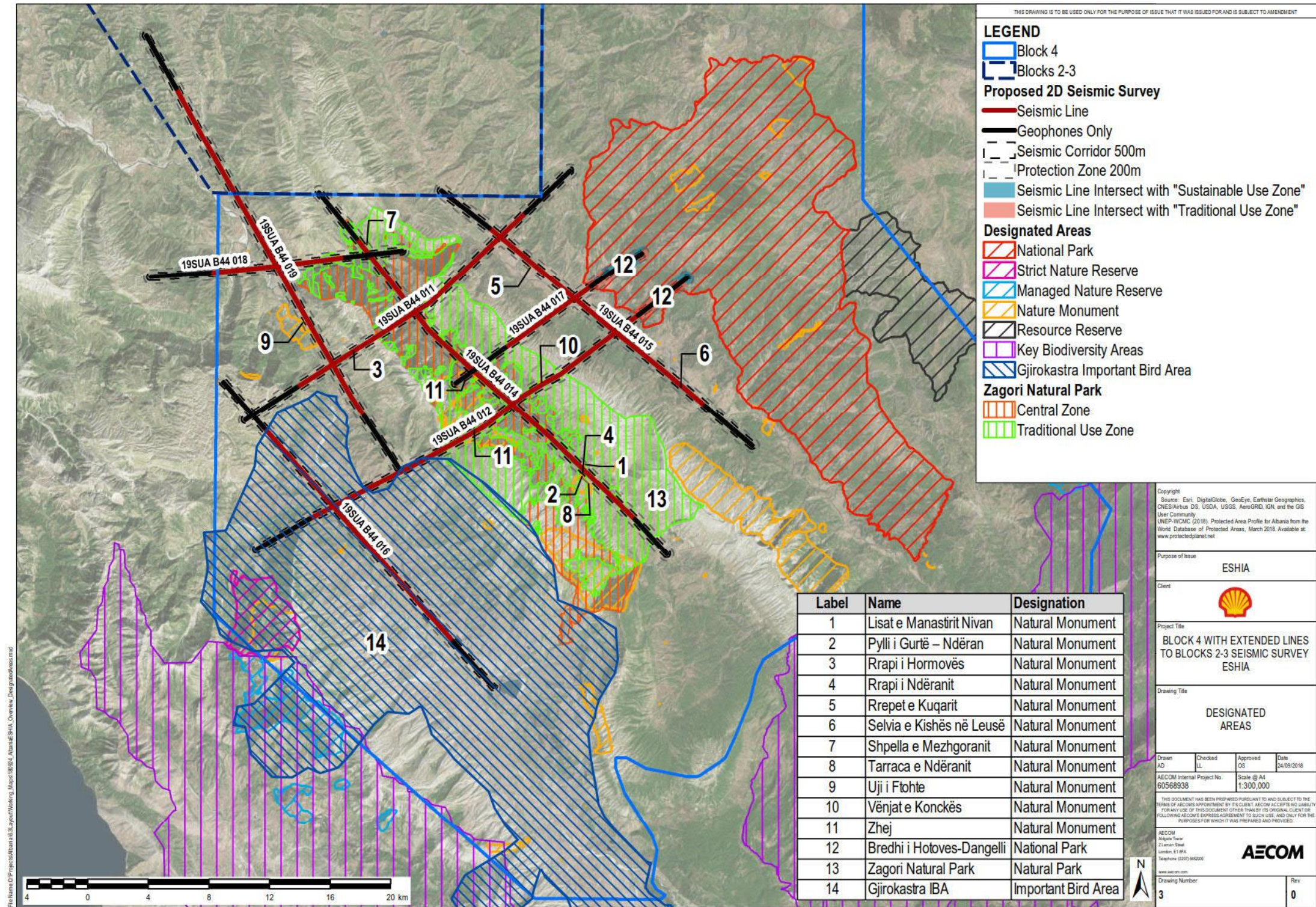


Table 4-10: Description of the protected areas within the seismic corridors and protection zone

Map Ref.	Protected Area	Designation Status
1	Lisat e Manastirit Nivan	Natural Monument
This natural monument known as Oaks of Nivan Monastery is a stand of oak trees located within Zagoria Natural Park. They are located close to the village of Zagorie, 710 m above sea level. These oaks are 200 years old and are distinguished for the regular form of oak because the crown is on average 17 m, while the maximum height is 20 m. Furthermore, the average bole diameter is 80 cm, while the maximum is 180 cm.¹⁴⁷ They have average vegetative status and aesthetic, didactic, touristic, biological values. Qualifying features for Albanian Protection Status: Trees (Biological) located inside the Zagori Natural Park		
2	Pylli i Gurtë – Ndëran	Natural Monument
This monument is located near the village of Ndëran, 1000 m above sea level, in front of the homonymous terrace. It represents stones with strange shapes and so close to each other, leaving the impression of a dense forest, from where it has also named the "Rocky Forest". Erosion and the wind have acted in different ways sculpting the rocks into unusual shapes. These rocks come on the back of the terrace in the form of trunks, deluvions, but also fluvioglyphic from the slope and the eastern elevations of the Lunxhëri Mountain. These deposits have cement, hence uneven strength. As a consequence, the erosion and the wind have acted in different ways: the soft sectors and the least cemented ones were eroded more strongly and even more resistant. Therefore, special forms of stones have been created under the modelling of wind and erosion. They are up to 2 m wide and several dozen centimetres wide. There are scientific (geological, geomorphologic), didactic, cultural and tourist values. The site is valuable for scientific (geological, geomorphologic), learning, cultural and tourist reasons¹⁴⁸. Qualifying features for Albanian Protection Status: Geological monument		
3	Rrapi i Hormovës	Natural Monument
This large tree is located in the centre of the Hormova village in the district of Tepelena. Its height is about 20 m and the trunk diameter is about 1.2 m. It is a traditional meeting place for the village and the site therefore has scientific (biological), didactic, historical and tourist values of local importance¹⁴⁹. Qualifying features for Albanian Protection Status: Trees (Biological)		
4	Rrapi i Ndëranit	Natural Monument



¹⁴⁷ http://www.akzm.gov.al/apps/akzm_cd/Gjirokaster/Gj_Mon/Gj046.htm

¹⁴⁸ http://www.akzm.gov.al/apps/akzm_cd/Gjirokaster/Gj_Mon/Gj002.htm

¹⁴⁹ http://www.akzm.gov.al/apps/akzm_cd/Gjirokaster/Gj_Mon/Gj075.htm

Map Ref.	Protected Area	Designation Status

This Oriental plane tree species is located within Zagoria Natural Park in the centre of the village of Zagorie, at 900 m above sea level and is distinguished for regular umbrella form of crown. The tree is thought to be 500 years old and has aesthetic, didactic, touristic, and biological values¹⁵⁰.

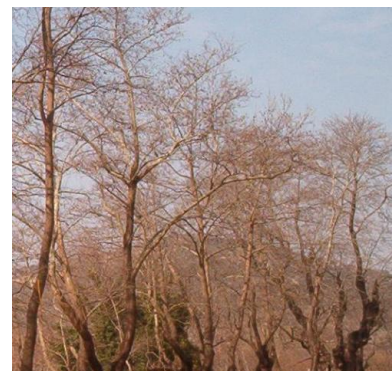
Qualifying features for Albanian Protection Status: Trees (Biological)



5	Rrepet e Kuqarit	Natural Monument

This natural monument consists of a wooded area located near the Kuqari village, about 400 m above sea level. It is represented by a number of Oriental plane trees around 150 to 200 years old. The average height of trees is about 20 to 25 m and the trunk approximately 60 - 80 cm. The perimeter varies from 1.5m to 2m. They have biological, aesthetic, and tourist value¹⁵¹.

Qualifying features for Albanian Protection Status: Trees (Biological)



6	Selvia e Kishës në Leusë	Natural Monument

This natural monument consists of two cypress trees located behind the Leusa church in a village in the Përmet district. The trees have a height of over 20 m and are characterized by a very regular wreath shape in the form of a cone. Their ages are estimated to be 150 years old. The monument represents biological, aesthetic, and tourist value¹⁵².

Qualifying features for Albanian Protection Status: Trees (Biological or bio-monument)



7	Shpella e Mezhgoranit	Natural Monument

Shpella e Mezhgoranit is a cave formation in the village of Mezhgoran included within Zagoria Natural Park, on the northern slope of the Kelcyres gorge, about 850m above sea level. This karstic cave is result of karst processes and but specific studies for this site are lacking. The known part is over 150 m long, while the average width reaches 7 - 8 m. It is horizontal with narrowing and enlargement. There are scientific (geomorphologic, geological), didactic and tourist values¹⁵³.

Qualifying features for Albanian Protection Status: Caves (Geological)



¹⁵⁰ http://www.akzm.gov.al/apps/akzm_cd/Gjirokaster/Gj_Mon/Gj042.htm

¹⁵¹ http://www.akzm.gov.al/apps/akzm_cd/Gjirokaster/Gj_Mon/Gj103.htm

¹⁵² http://www.akzm.gov.al/apps/akzm_cd/Gjirokaster/Gj_Mon/Gj101.htm

¹⁵³ http://www.akzm.gov.al/apps/akzm_cd/Gjirokaster/Gj_Mon/Gj060.htm

Map Ref.	Protected Area	Designation Status
8	Tarraca e Ndëranit	Natural Monument
The terrace was formed by the Zagori River and is located, near the village of Ndëran. The terrace represents a magnified deluxe particle fragment of a diluvia terrace with alluvium deposits originating from the slopes of the Lunxhëria Mountain and the fluvio-glacial material from circles on the upper part of it. The terrace is approximately 1000m long and 200m wide. The upper part of the terrace is confined by a hazelnut tree forest of Zagoria. As a result of these morphological and natural features this monument is of special values and its use is dedicated to scientific research, ecological conservation and tourism¹⁵⁴. Although this site was established as stand-alone natural monument with the establishment of Zagoria Natural Park this monument is included within the area of this park as well. Qualifying features for Albanian Protection Status: Geological features		
9	Uji i Ftohte	Natural Monument
The Cold Water natural monument is a hydro – monument located 8 km south of the city of Tepelena and along the national connection road Tepelena – Gjirokaster. The spring flows into the Drinosi River and is situated in the natural forest which is vital for the microclimate and biodiversity of the area. The site is an important tourist attraction. In addition, the mineral water company "Tepelena" has an associated water production plant in this site¹⁵⁵. Qualifying features for Albanian Protection Status: Hydro-monument		
10	Vënjat e Konckës	Natural Monument
The natural monument is located near the village of Konckë in Zagoria, circa 1,100m above sea level. Within this monument is included a forest of trees with a pyramid crown shape and heights of circa 15 m and a diameter of circa 16 cm. They are over 100 years old and are rare plants at risk of extinction. This tree assemblage is considered to be of great interest and is thought only to exist at this site due to its specific edaphic and ecological conditions. Risks to this site come from human activities because the wood is used for the production of incense. The trees therefore have scientific (biological and ecological), cultural, didactic and tourist values.¹⁵⁶ Qualifying features for Albanian Protection Status: Biological feature		
11	Zheji shkëmb në pyll Zhej	Natural Monument
Zheji Rock is positioned circa 1,300m above sea level and included within Zagoria Natural Park. The current size of this monument is circa 1,500.00ha, located near the village of Zhej, in Zagoria sub-municipality. As a geological feature it represents a detachment from limestone at the time of fly ash deposit in marine substrate. Covered by fly ash for an extended period, it spurred the erosion processes on the surface. The limestone block was subjected to erosion, which has given it a special shape that dominates the entire surrounding area. It is 200m long, 100m wide and 500m high. On its rugged slopes it is habitat to wild pigeons, hawks and eagles. The site represents complex values and interest such as; scientific (geological, geomorphological), didactic, cultural, ecological and tourism. Qualifying features for Albanian Protection Status: Biological and geological		

¹⁵⁴ http://www.akzm.gov.al/apps/akzm_cd/Gjirokaster/Gj_Mon/Gj005.htm

¹⁵⁵ <http://www.albania-discover.com/events/uji-ftohte-tepelene/>

¹⁵⁶ http://www.akzm.gov.al/apps/akzm_cd/Gjirokaster/Gj_Mon/Gj018.htm

Map Ref.	Protected Area	Designation Status
12	Bredhi i Hotoves-Dangelli	National Park
The Decision of Council of Ministers No. 1631 dated 17.12.2008 proclaims the protected area Bredhi i Hotoves – Dangelli as a National Park" (Category II) with a surface area of 34,361ha. The park is entirely included in the districts of Permet, Kolonjë and Skrapar, and includes seven communes and eleven nature monuments. This is an area of high biological and landscape diversity. diversity. Large mammals such as bear (<i>Ursus arctos</i>), wolf (<i>Canis lupus</i>), wild boar (<i>Sus scrofa</i>), roe deer (<i>Capreolus capreolus</i>) are present in the area. Large areas of old growth fir forest mixed with oak are found in its lower levels, as well as typical Mediterranean woodlands and shrubs inside the area. Historical and cultural sites are also present here. Its natural and biological values and distinguished features as well such as Benja's thermal sources and the canyon of Kamencka provide opportunities to develop touristic and recreational activities for the benefit of the local community. Four management zones are designed inside the territory of the park. The zoning map of the "Bredhi i Hotoves-Dangelli Natonal Park" is indicated as part of the Management Plan. Qualifying features for Albanian Protection Status: Natural habitat with biological diversity and species of conservation interest.		
13	Zagori Natural Park	Natural Park
In 2015 the park of Zagoria area was declared a state protected area and added to the list of regional natural parks of the country. A proposal of the Municipality Council of Libohova to proclaim the whole Zagori area as a Nature Park has been filed in the Ministry of Tourism and Environment and a Decision of the Council of Ministers (DCM) was issued in May 2018 (DCM no.354, dated 02.05.2018). The Nature Park "Zagori" has two management zones: • Core zone – includes the main forest habitats within the park and it is considered of high biodiversity values. • Traditional Use Zone - includes agriculture lands and water bodies where traditional activities are allowed, such as cropping, grazing, and collection of medicinal and aromatic plants. The zoning map of the Nature Park "Zagori" is indicated as part of this DCM. Zagoria Natural Park is located about 35km on the east of Gjirokaster city. It is situated about 700m above the sea level and is bordered by Mount Lunxheri in the west and by Mount Dhembeli in the east. Zagorie commune comprises of 10 villages and is one of the communes of Gjirokaster county. The area is known as a unique ecosystem of rare animals as the brown bear and the wild goat and pig and a diverse flora¹⁵⁷. Qualifying features for Albanian Protection Status: Natural habitat with biological diversity and species of conservation interest.		
14	Gjirokastër IBA	Important Bird and Biodiversity Area (IBA)
This IBA covers an area of 36,790ha and is defined under the global IBA criteria A1, A4ii and the European IBA criterion B1iii (2016), which are explained as follows¹⁵⁸: A1. Globally threatened species (global) Criterion: The site is known or thought regularly to hold significant numbers of a globally threatened species. A4. Congregations (global) Criterion: The site is known or thought to hold congregations of ≥1% of the global population of one or more species on a regular or predictable basis. B1. Congregations (European) iii. The site is known or thought to hold ≥ 1% of a flyway or other distinct population of other congregatory species Qualifying features for Albanian Protection Status: none Qualifying features for International designation: Egyptian Vulture <i>Neophron percnopterus</i> (IUCN EN) A1 Lesser Kestrel <i>Falco tinnunculus</i> (IUCN LC) A4ii & B1iii¹⁵⁹		

¹⁵⁷<http://invest-in-albania.org/weekend-destination-zagoria-regional-natural-park/>

¹⁵⁸<http://datazone.birdlife.org/site/factsheet/gjirokastra-iba-albania/refs>

¹⁵⁹BirdLife International (2018) Important Bird Areas factsheet: Gjirokastra. Downloaded from <http://www.birdlife.org> on 07/09/2018.

4.10 Biodiversity

4.10.1 Ecological Context

Albania is located in the western part of the Balkans Peninsula and is characterised by a Mediterranean climate in lowlands areas and in the valleys, and by continental and cold climate in the north and east. The country therefore has a highly variable climate, hydrology and geomorphology, which has resulted in the development of a diverse array of ecosystems.

In the course of this ESIA available information especially reports and studies for the Hotova Fir National Park and other sources (cited in the report) are reviewed and used to guide the gaps and needed surveys. Two complementary site surveys missions (May and September 2018) were undertaken by biodiversity experts in pre-determined sampling sites representative of the habitat types in the project area.

In total 33 biodiversity (combined flora and fauna) survey sites (see specific map) were performed along the project area enabling to identify 11 types of habitats (based on EU Habitat Directive Nomenclature) and several species with national and international conservation importance prescribed in the following sections below and listed in Annex 3 of this ESIA report.

The project area comprises a diverse terrain comprised from river valleys and agriculture areas, hill systems especially along Drinosi river valley, steep rocky slopes, and vast areas of forests (shrubs, oaks, coniferous and alpine meadow). The project area has a diverse geomorphology and relief extending from lowland 100m ASL to mountains chain of Nemercka – Dhembeli, 2,400m ASL.

Within the project area are two national parks; specifically, Hotova Fir National Park and Zagoria Nature Park. Both parks comprise diverse terrain with distinguished natural features and limited human access ensures shelter for many fauna species. The Vjosa and Drinosi rivers are the main permanent water sources and important ecological corridors. While Drinosi River and several other such as Zagoria and Suha feeds the Vjosa River the latest flows into the Adriatic Sea (circa 60km west of the project area).

The Vjosa river delta has established and flows along the Narta Lagoon and important wetland and IBA of Albanian coastline. Located in trans-boundary zone the project area borders with north-western Greece a mountain area with distinguished natural and ecological features.

All these diverse terrain and landscape supports large areas of forests with remote areas lacking or limited human access providing important shelter for fauna species. They support chains, gorges, valleys and Vjosa river that flows from Greece to project area constitute an natural movement corridor for fauna in wide area along both countries.

A general description of landscape diversity in the project area and that provide more information for the ecology profile of the area is described below and it is based on the Albanian Forest Inventory of 2003.

Mediterranean evergreen sclerophyllous Scrubs (Maquis) and forests

This habitat is widespread in Albania and could potentially occupy greater than 40% of Albania but is being impacted due to anthropogenic interference and over exploitation. Currently, these areas are limited to a narrow and interrupted belt, principally along the coastline and in south -west - Albania it is stretched in to hilly areas of up to 900m ASL, however in north Albania it only extends to 600m. This habitat is also encountered further inland but is largely restricted to river valleys.

Currently, this habitat is represented by relatively small woodlands and maquis. Although the original type of vegetation comprises of evergreen *sclerophyllous* forest (where plant species typically have hard leaves, short internodes (the distance between leaves along the stem) and leaf orientation parallel or oblique to direct sunlight, which are adaptations to conserve water), it now largely exists in varying stages of degradation.

Figure 4-18: Mediterranean forest and scrub

The strong influence of Mediterranean climate that comes from the lower part of the Vjosa valley has created favourable conditions for growing of maquis. This vegetation type dominates the lower part of the project area, along the Vjosa River, up to an altitude about 600m ASL. The Maquis formation begins near Fir of Hotova National Park and extends to the border with Greece. *Arbutus andrachne* is an important element of this maquis that in Albania is found only on this part of territory.

The most characteristic species of this vegetation assemblage are: Strawberry Tree (*Arbutus unedo*), Smoke-bush (*Cotinus coggygria*), and Wild madder (*Rubia peregrina*), Mastic Tree (*Pistacia lentiscus*), Cyprus Turpentine (*Pistacia terebinthus*), Evergreen rose (*Rosa sempervirens*), Tree heath (*Erica arborea*), Spanish broom (*Spartium junceum*), Wild olive (*Olea sylvestris*), Spiny broom (*Calicotome villosa*) and Italian buckthorn (*Rhamnus alaternus*). Common herbaceous species are: White violet (*Viola alba*), Betony (*Stachys officinalis*), Ivy-leaved Cyclamen (*Cyclamen hederifolium*), (*Campanula lingulata*¹⁶⁰), Orchard grass (*Dactylis glomerata*), Bristly dog-stail grass (*Cynosurus echinatus*), Greater quaking-grass (*Briza maxima*), and Wall germander (*Teucrium chamaedrys*), Grey sun-rose (*Cistus incanus*) etc.

Forest formations dominated by a mix of deciduous oak species

This habitat type includes thermophilous deciduous oak forests that occur in hilly and sub-montane areas, so termed because due to localised or micro-climate conditions the forest consists of generally more temperate species that can tolerate elevated temperatures. The climate is therefore a determining factor in the maintenance of this habitat, as it requires colder winters and high precipitation with characteristic hot dry periods.

Consequently, although the vegetation assemblage is ostensibly similar to Mediterranean forest and shrub belt, the zone differs ecologically and floristically. Oak or mixed-oak woodlands are a large and important natural forest. These forests appear in floodplains in both lowland and hilly regions. The vertical and horizontal distributions of oak species are dependent on temperature and moisture gradient respectively.

This forest type present in the project area has also a large distribution throughout Albania, largely centred on the central and southern parts, occurring in the hilly and sub-montane areas below 800m. These forests generally require exposed and extremely dry habitats with shallow calcareous soils. These extreme conditions often mean that the forests are fragmented and low-growing. The thermophilous oak forests are broadly divided into two belts varying in species composition.

¹⁶⁰ no common name <https://eunis.eea.europa.eu/species/165147>

Beech forest belt

This zone has established to a greater extent inland, in the supra and mountain Mediterranean region, on higher altitudes, between 800–1800(2000)m ASL, where the harsher Mediterranean mountain climate is dominant. The vegetation is under pressure from human activity (mainly logging, fires and grazing), this is the richest area with forests in Albania. The main species located in the forest's vegetation include the common beech (*Fagus sylvatica*), black pine (*Pinus nigra*), and fir (*Abies alba*).

Alpine Pasture Belt

The alpine pastures in Albania are widespread above the upper tree line up to the highest peaks of the mountains, especially on north and north-eastern mountainous range of Albania, where the alpine climate is more pronounced. They are characterised by the domination of herbaceous plants, while shrubs, distributed in small patches, are very rare.

4.10.2 Project NaturAL

Since 2015 the project “Strengthening capacity in National Nature Protection - preparation for Natura 2000 network¹⁶¹” is being implemented in Albania. The project is financed from EU funds within the IPA¹⁶²2013 program. .

The project will invest in protected areas and initiate the process of establishing a Natura 2000 network in Albania. Strengthening the national capacity of biodiversity conservation, the project NaturAL will improve the knowledge and experience in protected areas planning and management.

The project aims to halt the loss of biodiversity in Albania through improved management of its protected areas and setting the basis for the future implementation of the European Natura 2000 network.

Albania has made significant progress in expanding the network of protected areas. Despite this progress, the investments in the protected areas, in particular infrastructure, equipment and technical capacities of protected area staff, have been inadequate. The project will therefore:

- Implement management plans in at least five protected areas, and;
- Prepare a preliminary list of Natura 2000 sites.

The project aims to inform, communicate and educate young people, protected area visitors, local communities, nature resource managers and all the interested in the importance of nature conservation in Albania and the role of its protected areas. Its ultimate goal is to raise general awareness and inspire the public to get involved with nature protection. The focus of the project is put on five protected areas:

- Lake Shkodra Managed Nature Reserve;
- Korab-Koritnik Managed Nature Reserve;
- Divjaka-Karavasta National Park;
- Tomorri Mountain National Park; and
- Bredhi i Hotoves-Dangelli National Park.

As a consequence of this project, Bredhi i Hotovës-Dangëlli National Park is proposed as Special Area of Conservation (SAC). In addition, the mountain range Trebeshinë-Dhëmbel-Nemërckë and Lunxheri-Bureto is also proposed as a potential SAC and the Vjosa river section from the Greek border to Përmet is also proposed as SAC. Drinos valley is proposed as Specially Protected Area (SPA) for its importance as stop-over and transition area of Lesser Kestrel (*Falco naumanni*) this area is being included in Gjirokastër IBA (BirdLife). Other proposed SAC have not being named yet and will undergo the national decision making process led by NAPA.

¹⁶¹<http://www.natura.al/page.php?lang=en&section=albaniatowardsn2000>

¹⁶²Instrument for Pre-Accession Assistance (IPA) replaces a series of European Union programmes and financial instruments for candidate countries or potential candidate countries, namely PHARE, PHARE CBC, ISPA, SAPARD, CARDS and the financial instrument for Turkey

4.10.3 Main forests and habitat types in the project area

The project area altitude ranges from 100m to 2,440m ASL. The differences in ASL directly influence the formation of climate variations (micro-climate) within the project area. The main types of forests (vegetation cover) are observed to be present within the Project area as follows:

Project area

- Mediterranean forest and scrub; and
- Thermophilous deciduous oak forest.

Additionally, relatedly small patches of riparian vegetation are present along most rivers and streams as well as open hayfields and mixed habitats. This includes areas of open water and ponds are present within the project area and survey sites. Forests formations/types present in the project area are illustrated in Figure 4-19.

The **Mediterranean forest** and scrub vegetation is the second most dominant forest formation in the project area and mainly consists of evergreen shrubs (maquis) that represent degradation stages of the evergreen broadleaf forests and *pseudomaquis* (which comprises mixed evergreen and deciduous shrub thickets of the periphery of the range of Mediterranean sclerophyllous scrublands).

Figure 4-19: Mediterranean forest and scrub in the project area



The maquis occupies the forest at lower elevation of the project area, up to 800m - 1000m above mean sea level (amsl). Characteristic species of this vegetation assemblage are *Rubia peregrina*, *Smilax aspera*, *Pistacia lentiscus*, *P. terebinthus*, *Rosa sempervirens*, *Erica arborea*, *Spartium junceum*, *Olea sylvestris*, *Callycotome villosa* and *Rhamnus alaternus*.

Some common herbaceous species are: *Viola alba*, *Stachys officinalis*, *Cyclamen hederifolium*, *Campanula lingulata*, *Dactylis glomerata*, *Cynosurus echinatus*, *Briza maxima*, and *Teucrium chamaedrys*.

Deciduous broadleaf forests is the main and most widespread type of forest in the project area. This vegetation assemblage is situated above the Mediterranean shrub zone, at elevations up to 1600m – 1800m amsl. The oak forests are dominated by *Quercus cerris*, *Q. pubescens*, and *Q. frainetto*.

Figure 4-20: Old oak forest mixed with *Tilia cordata* in the project area



The shrub layer consisted of *Carpinus orientalis*, *Fraxinus ornus*, *Juniperus oxycedrus*, *Crataegus monogyna*, and *Colutea arborescens*. There is variation in species composition in the project area and mixed oak-coniferous forests of black pine (*Pinus nigra*), mountain pine (*P. leucodermis*), and Macedonian fir (*Abies borissi-regis*) can also be observed, particularly in the project area.

In certain areas the predominantly oak forest is mixed with other deciduous trees, such as *Tilia cordata*, *Carpinus orientalis* (often coppiced), *Acer monspessulanum*, *A. obtusatum*, *Ostrya carpinifolia*, *Fraxinus ornus*, etc.

This forest type is protected habitat defined also in the EU Habitats Directive as (internationally important) Annex I priority habitat type: 9180 Tilio-Acerion forests of slopes, screes and ravines.

Figure 4-21: Clearing within mixed broadleaved woodland



Forest formations in the project area are illustrated in the Figure 4-22.

Figure 4-22: Forest distribution according to vegetation type in the project area

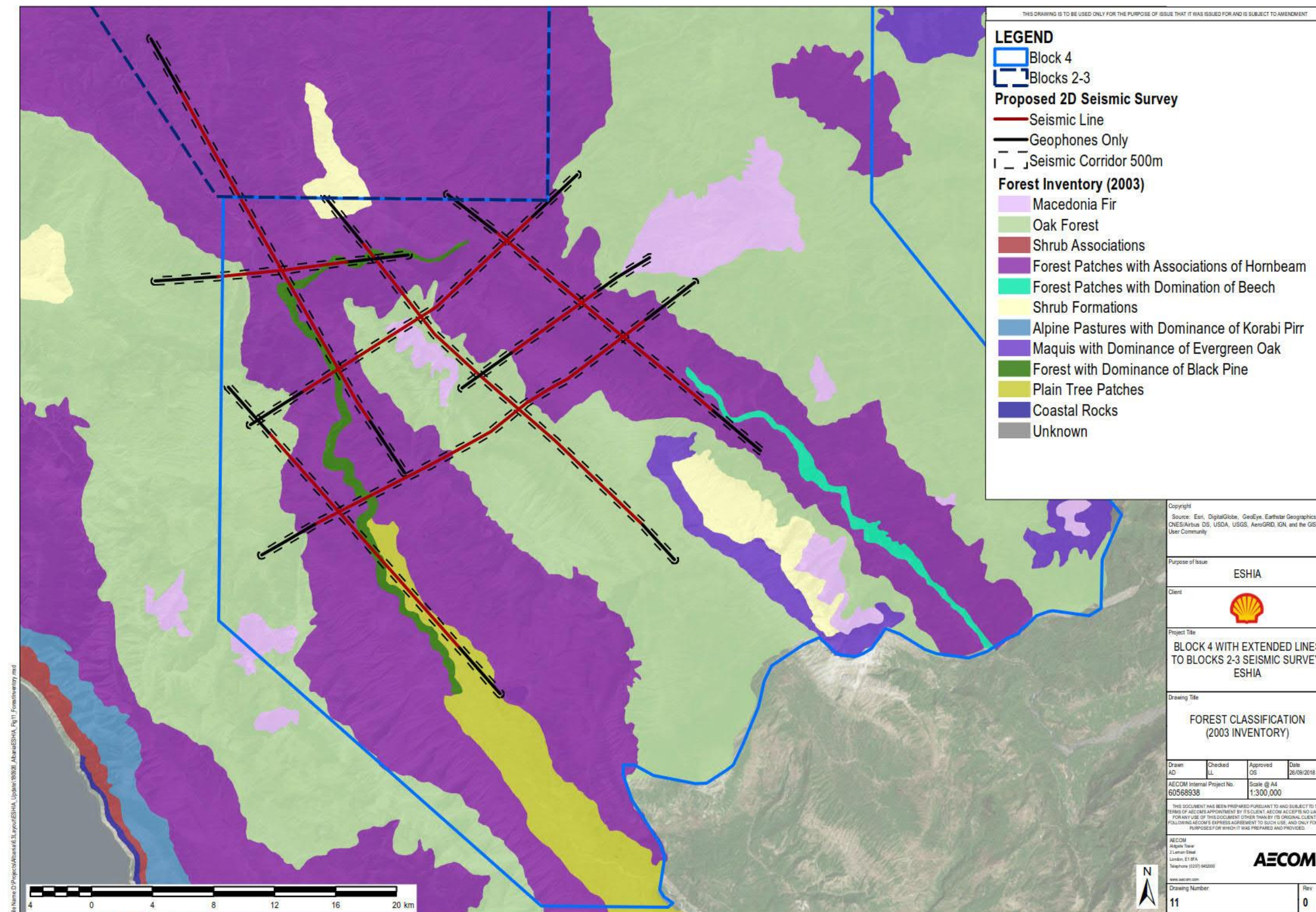


Figure 4-23: Mountain hay meadows with *Bromus erectus* in deciduous broadleaf forests openings

4.10.4 Annex I Habitat Types

Annex I Habitats are those defined in the Directive as “natural habitat types of community interest whose conservation requires the designation of SACs. Although these habitats do not currently have the precise status conferred by the Habitats Directive within Albanian (Protected area) law, these are defined as important areas (habitats) for conservation.

Annex I habitats of the EU Habitats Directive have been recognised in the national legal framework¹⁶³ but not yet being enforced in Albanian regulatory system. Proper mapping of the extension of this habitat within the project area is not available.

Within the current NaturaAI project and progress of Albania towards membership of the EU the SACs will probably be established as PA and therefore the conservation status of these sites will be enhanced.

The proposed seismic acquisition lines will intersect with several types of forest habitats which are listed in Annex I of the EU Habitats Directive. Identification of these habitats was based on dedicated field survey undertaken in late May and early September 2018. These habitats and the Annex I codes are described as follows:

- 91M0 Pannonian-Balkan turkey oak–sessile oak forests
- 91L0 Illyrian oak-hornbeam forests (*Erythronio-Carpinion*)
- 9340 *Quercus ilex* and *Quercus rotundifolia* forests
- 9250 *Quercus trojana* woods: old oak forest with *Q. trojana*
- 5330 Thermo-Mediterranean and pre-desert scrub (*Phlomis fruticosa*)
- 9540 Mediterranean pine forests with endemic Mesogean pines
- 5210 Arborescent matorral with *Juniperus* spp:
- 9180* Tilio-Acerion forests of slopes, screes and ravines
- 6520 Mountain hay meadows
- 92C0 *Platanus orientalis* and *Liquidambar orientalis* woods (*Platanion orientalis*)
- 92A0 *Salix alba* and *Populus alba* galleries
- 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp

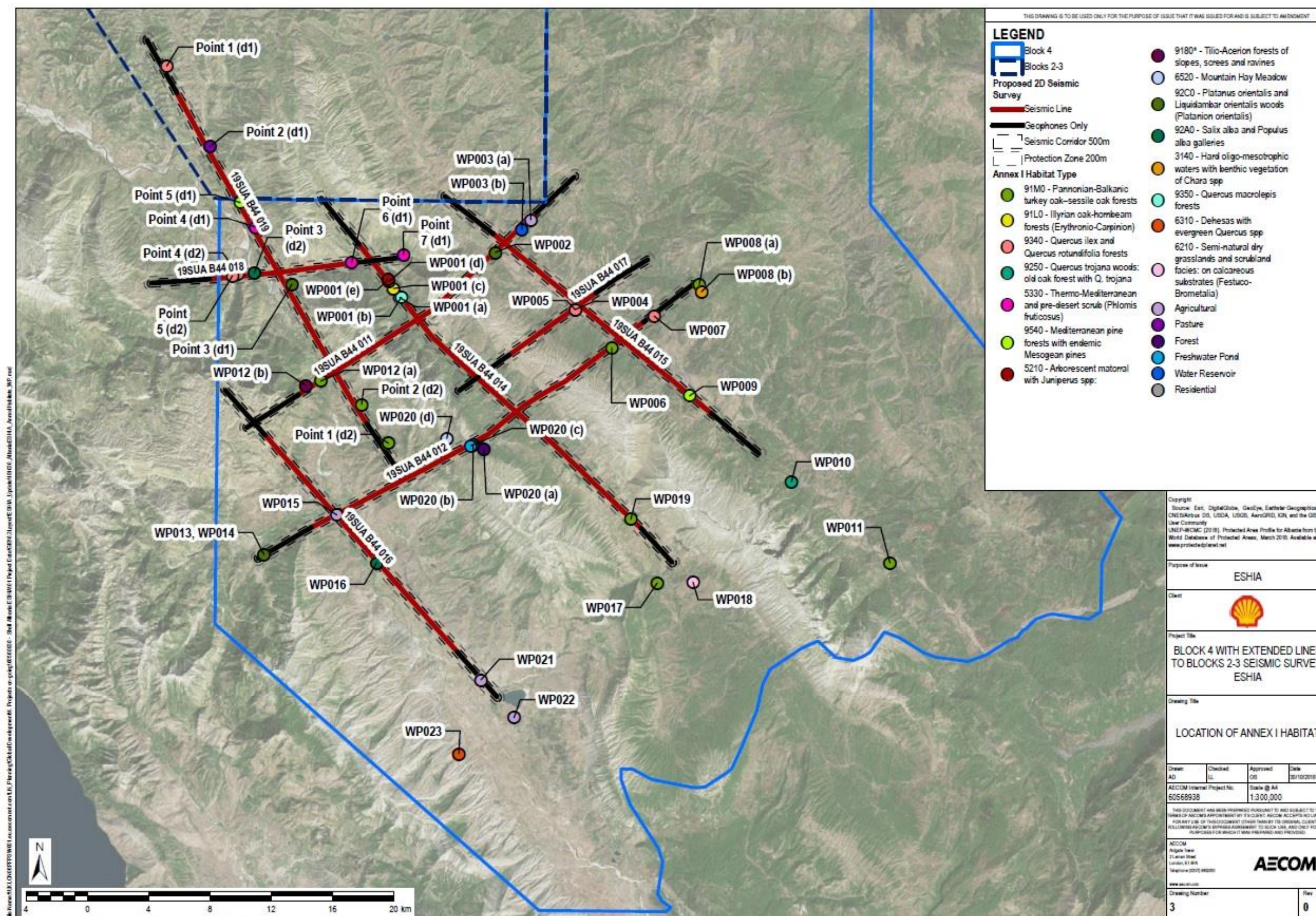
¹⁶³ As list of habitats with EU interest are recognised by DCM no.866 dated 10.12.2014 “List of habitats and species with EU Community interest”.

In addition, of these Annex I Habitats, 9180 * Tilio-Acerion forests of slopes, screes and ravines is defined in the Directive as an Annex I **“priority habitat”**. This category of habitat is considered to be particularly vulnerable and is mainly, or exclusively, found within the European Union¹⁶⁴.

The locations of the survey waypoints and the Annex 1 habitat types identified at those locations are shown on Figure 4-24.

¹⁶⁴See EU Habitats Directive, Article 1d.

Figure 4-24: Waypoint locations and Annex 1 Habitats



91M0 Pannonian-Balkan turkey oak–sessile oak forests: This habitat is dominated by a mix of deciduous oak species including *Quercus pubescens*, Turkey oak (*Quercus cerris*) and Hungarian oak (*Quercus frainetto*). This habitat type is very abundant in the project area and was observed during field surveys at wp 6, wp 8, wp 11, wp 12, wp, 17 and wp 19.

However, in some areas this habitat type is degraded and is characterised by plant species typical of common species of disturbed oak forest. The main elements of these forests are Pubescent oak (*Quercus pubescens*), Hungarian oak *Quercus frainetto*, Flowering ash (*Fraxinus ornus*), Prickly juniper (*Juniperus oxycedrus*), Hungarian maple (*Acer obtusatum*), Scorpion senna (*Coronilla emeroides*), Turkey oak (*Quercus cerris*), Oriental hornbeam (*Carpinus orientalis*), Wig tree (*Cotinus coggygria*), Annual false-brome (*Brachypodium pinnatum*), False brome (*B. sylvaticum*), hawthorn (*Crataegus monogyna*), Traveller's joy (*Clematis vitalba*), Ivy (*Hedera helix*), Dittany (*Dictamnus albus*), Odorous hellebore (*Helleborus odorus*), *Pteridium aquilinum*, Cocksfoot (*Dactylis glomerata*), Cowslip (*Primula veris*), Bulbous meadow-grass (*Poa bulbosa*), Wood-spurge (*Euphorbia amygdaloides*) etc.

Most of these oak forest are treated as coppice, used by the local population for firewood and for grazing and branch cutting for livestock food during the winter. The indicator of this degradation is the presence of higher frequency of species such as *Carpinus orientalis*, *Juniperus oxycedrus*, *Chrysopogon gryllus*, *Cistus villosus*, *Dorycnium hirsutum*, etc. Even though coppice activity is present everywhere, during the last 20 years, the oak forest of this area have regenerated quickly.

Figure 4-25: (91M0) Forest formations dominated by a mix of deciduous oak species



91L0 Illyrian oak-hornbeam forests (Erythronio-Carpinion): This habitat type, generally dominated by Oriental hornbeam (*Carpinus orientalis*), extends in a large part above the village of Peshtan (wp. 1), from 300 m to 500 m amsl, where human activity has been more present. This plant formation is the result of cutting, intensive grazing, and deforestation of oak forest habitats.

The dominant species of this habitat type are shrubs, such as Oriental hornbeam (*Carpinus orientalis*), Hazel (*Corylus avellana*), Wig tree (*Cotinus coggygria*), Christ's thorn (*Paliurus spina-christi*), Prickly juniper (*Juniperus oxycedrus*), Elm leaf blackberry (*Rubus ulmifolius*), Hawthorn (*Crataegus monogyna*), Dog rose (*Rosa canina*), and small trees, such as Turkey oak (*Quercus cerris*), Hungarian maple (*Acer obtusatum*), etc.

The main herbaceous species present are: Sage-leaved rock-rose (*Cistus salviifolius*), Heath false-brome (*Brachypodium pinnatum*), Hairy canary-clover (*Dorycnium hirsutum*), Germander speedwell (*Veronica chamaedrys*), Bladder campion (*Silene vulgaris*), Cow grass (*Trifolium medium*), Wild strawberry (*Fragaria vesca*), Venetian vetchling (*Lathyrus venetus*), Odorous hellebore (*Helleborus odorus*), Mouse-ear hawkweed (*Hieracium pilosella*), Maidenhair spleenwort (*Asplenium trichomanes*) etc.

Within this forest trees are generally less than 3m high and younger than 10 years old cover much of area. The vegetation is dominated by common plant species typical of disturbed forest, with low plant species diversity and is frequent throughout Albania. The biodiversity value of the vegetation and habitats encountered within the site is

generally low, due to the low plant species diversity and the absence of species that are considered rare in a local or national context.

Figure 4-26: (91L0) Plants formation dominated by Oriental hornbeam (*Carpinus orientalis*)



9340 *Quercus ilex* and *Quercus rotundifolia* forests: (or Maquis habitats) Represent one of the degraded stages of former Mediterranean evergreen sclerophyllous forests with *Quercus ilex*. This habitat is found in wp 3, wp 5 and wp 7. The most important species that define this formation are evergreen shrubs such as Strawberry tree (*Arbutus unedo*), Narrow-leaved phillyrea (*Phillyrea angustifolia*), Prickly juniper (*Juniperus oxycedrus*), Lesser sea spurrey (*Spartium junceum*), Judas tree (*Cercis siliquastrum*), Christ's thorn (*Paliurus spina-christi*), Almond pear tree (*Pyrus amygdaliformis*), Flowering ash (*Fraxinus ornus*) adapts to grow for a long period of low rainfall and warm temperatures..

Most of the herbaceous plants dry out during the summer time. Among the herbaceous plants are found: Narrow-leaved asparagus (*Asparagus acutifolius*), White-felted germander (*Teucrium polium*), Grey sun-rose (*Cistus incanus*), Sage-leaved sun-rose (*Cistus salviafolius*), Daisy (*Bellis perennis*), Cocksfoot (*Dactylis glomerata*) etc

In some area there is a significant impact from human activities such as cutting and burning. The indicator of this degradation is the presence of higher frequency of species *Juniperus oxycedrus*. The vegetation of maquis is dominated by common plant species typical of disturbed forest, with low plant species diversity but frequent throughout the Albanian territory.

Figure 4-27: (9340) Maquis or Mediterranean evergreen sclerophyllous forests dominated by *Arbutus unedo*.



9250 *Quercus trojana* woods: This habitat is found in wp 10, above Kaluth village. *Quercus trojana* woods, are result of degradation of the forest dominated by species of Pubescent oak (*Quercus pubescens*) and Turkey oak (*Quercus cerris*) and its adaptation. In the herb layer there is large presence of: Cocksfoot (*Dactylis glomerata*), Heath false-brome (*Brachypodium pinnatum*), White-felted germander (*Teucrium polium*), Bur medick (*Medicago minima*), Salad burnet (*Sanguisorba minor*), Rock thyme (*Acinos alpinus*), False-brome (*Brachypodium sylvaticum*), Field Forge (*Myosotis arvensis*), Thyme (*Thymus longicaulis*), Bulbous bluegrass (*Poa bulbosa*), Gray chickweed (*Cerastium brachypetalum*), etc.

These are considered to be degraded vegetation formations in Albania and within the project area Tree coverage is sparse and therefore the biodiversity value of the vegetation and habitat encountered within the project area is considered to be low, due to the low diversity of plant species and the absence of species that are considered to be rare in a local or national context.

Figure 4-28: (9250) *Quercus trojana* woods



5330 Thermo-Mediterranean and pre-desert scrub (*Phlomis fruticosa*): This habitat is found at wp 23, above Vanistër village as well as at wp 13, 14. It represents one of the most widely degraded stages of former Mediterranean evergreen sclerophyllous forests with Holm oak (*Quercus ilex*). This type of habitat is common throughout southern Albania. Vegetation is dominated by common plant species typical of disturbed forest with low plant species diversity. It is a good example of a specific degradation stage of vegetation under a long-term and permanent impact by human activities (tree cutting, deliberate forest fires, grazing by livestock). Thermo-Mediterranean and pre-desert scrub is a type of low, soft-leaved scrubland and plant community in the Mediterranean forests, woodlands, and scrub biome.

Jerusalem sage (*Phlomis fruticosa*) plays an important role in the composition of the Thermo-Mediterranean and pre-desert scrub on dry shallow soil over limestone in this area. Other plant species present in this type of vegetation are: Christ's thorn (*Paliurus spina-christi*), Spanish oyster thistle (*Scolymus hispanicus*), Cocksfoot (*Dactylis glomerata*), Immortelle (*Xeranthemum annuum*), Wood-spurge (*Euphorbia myrsinites*), White-felted germander (*Teucrium polium*) etc. The botanical value of the vegetation and habitats encountered within the project area is generally low.

Figure 4-29: (5330) Thermo-Mediterranean and pre-desert scrub (*Phlomis fruticosa*)



9540 Mediterranean pine forests with endemic Mesogean pines: Fragments of Aleppo pine forests (*Pinus halepensis*) mix with planted Black pine (*Pinus nigra*) occur on a limited area, mainly in slopes which are very exposed to erosion. This habitat is found in wp 9. Aleppo pine and Black pine were planted approximately 60 years ago to prevent erosion in this area. The shrubby and herbaceous layer is represented by elements of degraded stages of Maquis such as Prickly juniper (*Juniperus oxycedrus*), Oriental hornbeam (*Carpinus orientalis*), Bladder-senna (*Colutea arborescens*), Elm leaf blackberry (*Rubus sanctus*), Cock's-foot (*Dactylis glomerata*), Erect cinquefoil (*Potentilla erecta*), Large yellow vetch (*Vicia grandiflora*), European centaury (*Centarium erythrea*), White Prunella (*Prunella laciniata*) etc.

Mediterranean pine forests with endemic Mesogean pines (Planted Mediterranean Pine Forests) dominated by *Pinus halepensis* represent artificial forests which are extensive in Albania. The vegetation is dominated by common plant species typical of disturbed forest, with low plant species diversity but frequent throughout the Albanian territory.

Figure 4-30: (9540) Mediterranean pine forests with endemic Mesogean pines



5210 Arborescent matorral with *Juniperus* spp: This habitat type usually occurs around settlements with frequently intensive biogenetic influences, in areas with high grazing rates, e.g. roadsides, areas affected by erosion and forest fires etc. In the project area, this habitat is found on wp 1, near Peshtan village. In many cases the vegetation of these habitats is characterized by dominance of Prickly juniper (*Juniperus oxycedrus*) where it

forms characteristic patches. Other commonly found species are oriental hornbeam (*Carpinus orientalis*), *Putoria calabrica*, Grey sun-rose (*Cistus incanus*), *Micromeria juliana*, Wig tree (*Cotinus coggygia*), Cocksfoot (*Dactylis glomerata* subsp. *Hispanica*), Tunic flower (*Tunica saxifrage*), Needle grass (*Stipa bromoides*) etc., which are all indicators of the rate of degradation of the Maquis vegetation.

Figure 4-31: (5210) Degraded scrubland dominated by *Juniperus oxycedrus*



In Albania, this habitat type has a very large distribution; however, as they are located in residential areas they have been subject to heavy exploitation and highly modified by past land-use management practices. Consequently, most of the constituent plant species are typical of disturbed habitats. Plant species present in this habitat type are for the most part commonly occurring throughout the country. The value of the vegetation and habitats encountered within the project area is generally low, due to the low diversity of plant species and the absence of species that are considered to be rare in a local or national context.

9180* Tilio-Acerion forests of slopes, screes and ravines: This habitat is found at wp 1, above Peshtan village, from 500m to 900m amsl, and on the seismic line near wp 12. Forest formations are dominated by a mix of oak species, including Turkey oak (*Quercus cerris*), Hungarian oak (*Quercus frainetto*), Pubescent oak (*Quercus pubescens*), Macedonian oak (*Quercus trojana*) and Valonia oak (*Q. macrolepis*) mixed even with some other deciduous trees like Small-leaved lime (*Tilia cordata*), Oriental hornbeam (*Carpinus orientalis*) (coppice), Montpellier maple (*Acer monspessulanum*), Sycamore maple (*Acer obtusatum*), European hop-hornbeam (*Ostrya carpinifolia*), Flowering ash (*Fraxinus ornus*), European ash (*F. excelsior*) etc.

Generally, this forest is well preserved, with mature trees and very dense canopy cover. As a result of the high shade cast, there is an almost total absence of shrubby and herbaceous species in the ground layer (understorey) beneath the canopy formed by mature trees. Forest formations dominated by a mix of oak species, with *Tilia cordata* are not very common in the mountains of the Albania, are quite rare and limited to rather small areas. In some patches, forest is dominated by very old trees of *Q. macrolepis* that may be considered as another habitat type according to Natura 2000 (9350 *Quercus macrolepis* forests.)

Figure 4-32: (9180*) Old oak forest mixed with *Tilia cordata*

6520 Mountain hay meadows: This habitat type is present on alpine and sub-alpine levels (mostly above 600m). In the project area it is found on seismic line near wp 19, and on the seismic line near wp 20, at an altitude of 1.040m amsl nearby wp 20 developed in the forest belt of European beech (*Fagus sylvatica*), as replacements for those forests lost due to cutting, grazing and burning. The most important and characteristic species of this habitat include Erect brome (*Bromus erectus*), European feather grass (*Stipa pennata*), Fescues (*Festuca bosniaca*) etc., as well as some lower shrub dominated by *Astragalus rumelica* and *Acantholimon ulicinum* which is a rare plant species in Albania. It is worth mentioning in this area also the presence of a good population dominated by Stinking Juniper (*Juniperus foetidissima*) and Mountain tea (*Sideritis raeseri*), which according to the Albanian Red List has conservation status endangered (EN A1b).

Figure 4-33: (6520) Mountain hay meadows



Additionally, riparian vegetation is present along most rivers within the project area and survey corridors:

- 1) **92C0 *Platanus orientalis* and *Liquidambar orientalis* woods (*Platanion orientalis*)**, was observed on wp 2, wp 4 and wp 13, 14, along the Vjosa River and Prongji stream. The riparian woodlands are largely dominated by Oriental plantain (*Platanus orientalis*) often mixed with white poplar (*Populus alba*). Many old Oriental Plane trees have died due to 'cancer of Oriental Plane' (*Ascomycetes* fungi) but the seedlings of this species have started to regenerate quickly. In these habitats they form species-rich communities with the accompanying flora, including White willow (*Salix alba*), White poplar (*Populus alba*), Black poplar (*P. nigra*), Hawthorn (*Crataegus monogyna*), Dogwood (*Cornus sanguinea*), Chaste tree (*Vitex agnus-castus*), Elm (*Rubus* spp.), Ivy (*Hedera helix*), Traveller's joy (*Clematis vitalba*), Pilewort (*Ranunculus ficaria*), Soapwort (*Saponaria officinalis*) etc. These habitats also support a range of ferns, often dominated by *Pteridium aquilinum*. As a result of illegal exploitation (logging, grazing) as well as the fungal infection, most of the plantain forests are in very poor condition.

2) 92A0 *Salix alba* and *Populus alba* galleries

This habitat was observed on wp 16, along the gravel riverbed of Drinos River, where the riparian vegetation is dominated by White willow (*Salix alba*), mix White poplar (*Populus alba*) and a few Small-flower tamarisk (*Tamarix parviflora*). On alluvial deposits were observed Branched bur-reed (*Sparganium erectum*) and Lanceleaf water plantain (*Alisma lanceolatum*).

These species-rich habitats add much to the botanical diversity of the project area. Although most of the species recorded are relatively frequent in stream/river habitats elsewhere in Albania, the river and stream vegetation and habitats are, by nature, much more limited in extent than most of the vegetation types. Consequently, river and stream habitats are considered high value environments.

Figure 4-34: (92C0) *Platanus orientalis* and *Liquidambar orientalis* woods (Platanion orientalis) & (92A0) *Salix alba* and *Populus alba* galleries



3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

Some artificial water reservoirs and ponds are found near wp 3, wp 8 and wp 20. The aquatic vegetation there is dominated by green algae of the *Chara* sp. that is indicative of the good quality of these waters. This habitat is very important especially for fauna (amphibians and reptiles). According to Natura 2000 this habitat type could belong to:

Figure 4-35: Artificial water reservoir and ponds with oligo-mesotrophic waters



4.10.5 Threatened flora species in the project area

Botanical studies conducted in Albania have identified a diverse flora comprising over 3,600 species. Of these, approximately 10% (361) are listed in the Red List of Albania (RLA). Threatened species comprise those defined as Vulnerable (VU), Endangered (EN), or Critically Endangered (CR) is a rising order of conservation concern.

There are 405 plant species listed on the RLA. Based on the geographic location, altitude, climate and habitat types, the following RLA plant species may be present within the project area:

- 41¹⁶⁵ *Juniperus oxycedrus* VU
- 42 *Juniperus foetidissima* EN
- 357 *Dictamnus albus* VU
- 240 *Hypericum perforatum* EN
- 250 *Juglans regia* EN
- 258 *Origanum vulgare* EN
- 263 *Salvia officinalis* VU
- 265 *Sideritis raeseri* EN
- 169 *Sambucus nigra* VU
- 264 *Satureja montana* VU
- 171 *Viburnum tinus* VU

In addition, recent field surveys (May 2018) identified the following species (RLA) 310 Prickly thrift *Acantholimon ulicinum*¹⁶⁶ at one location (wp20), which is a rare plant species in Albania. This same area was also notable for the presence of species such as 42 Stinking Juniper (*Juniperus foetidissima*) and 265 Mountain tea (*Sideritis raeseri*), both of which according to the RLA are classed as EN. In addition, at wp21 another threatened species 240 St John's wort (*Hypericum perforatum*) was found and 250 walnut (*Juglans regia*) was present at wp01.

Of special importance is also Wild Marjoram (*Origanum vulgare*) listed under EN category of RLA (255 RLA). This species along with some other considered medicinal, aromatic or used as food in Albania such as Mountain tea (*Sideritis raeseri*) and Sage (*Salvia officinalis*) are considered under pressure and decline due to over exploitation and lack of enforcement rules.

4.10.6 Threatened fauna species in the project area

In total, 575 species of fauna are listed on the RLA, which covers terrestrial and marine species as well as birds and fish. Field surveys undertaken in May 2018 indicated the presence of signs of mole-rat (*Nannospalax leucodon*), which is not however listed in the RLA but is IUCN Data Deficient (DD), beech marten (*Martes foina*) (not listed in the RLA and is IUCN Least Concern (LC)) and badger (*Meles meles*) (Endangered, EN) with abundant feeding signs of wild boar (*Sus scrofa*, LRnt¹⁶⁷) as well as potential sites for brown bear (*Ursus arctos*, VU). The presence of otter (*Lutra lutra*, VU) and hazel dormouse (*Muscardinus avellanarius*, listed as DD in the RLA) were confirmed along the Vjosa valley during field survey undertaken in September 2018.

Of the terrestrial mammals present in Albania, in addition to numerous bat species, the following comprise the main threatened mammal species listed (with RLA reference number shown):

- 554 *Ursus arctos* (Brown bear) VU
- 569 *Cervus elaphus* (Red deer) EX¹⁶⁸
- 564 *Felis silvestris* (Wildcat) EN

¹⁶⁵Number at RLA

¹⁶⁶This species is considered a rare species in Albania; however, it is not included in the Albanian red list and therefore has no defined conservation status.

¹⁶⁷LRnt is an obsolete IUCN category that means "Low Risk – near threatened" and which is equivalent to NT.

¹⁶⁸ This species is no longer found in Albania

- 558 *Meles meles* (Badger) EN
- 559 *Mustela erminea* (Stoat) EN
- 560 *Mustela putorius* (European polecat) EN
- 556 *Canis aureus* (Golden jackal) VU
- 570 *Capreolus capreolus* (European roe deer) VU
- 557 *Lutra lutra* (Otter) VU
- 562 *Martes martes* (Pine marten) VU

In addition, there are numerous herpetiles (amphibians and reptiles) as well as fish and birds included in the RLA. Threatened terrestrial herpetiles included on the RLA comprise:

- 367 *Pelophylax kurtmuelleri* (formerly *Rana balcanica*) (Balkan water frog) VU
- 369 *Rana epeirotica* (Epirus water frog) VU
- 371 *Rana lessonae*¹⁶⁹ (Pool frog) VU
- 396 *Coluber gemonensis* (Balkan whip snake) CR
- 399 *Elaphe longissima*¹⁷⁰ (Aesculapian snake) EN
- 400 *Elaphe quatuorlineata* (Four-lined snake) CR
- 401 *Elaphe situla* (European rat snake) CR
- 406 *Typhlops[is]vermicularis*¹⁷¹ (European blind snake or European worm snake) CR

Numerous birds, such as the woodpeckers (*Dendrocopos syriacus*, *D. major* not listed in the RLA but are IUCN LC), Egyptian vulture (*Neophron percnopterus*, VU), Golden eagle (*Aquila chrysaetos*, EN), Short-toed eagle (*Circus gallicus*, VU), Buzzard (*Buteo buteo*, VU), White stork (*Ciconia ciconia*, CR), Grey heron (*Ardea cinerea*, VU), Little egret (*Egretta garzetta*, VU), Bee-eater (*Merops apiaster*, EN) were also observed.

During the transition period (July-August) the Drinos valley every year becomes an important refuge for lesser kestrel (*Falco naumanni*, VU), hosting several thousand individuals, which is the main reason the site has been proposed as Natura 2000 site for Albania, as an IBA (Specially Protected Area) as defined under the EU Birds Directive.

In summary, several habitats listed in Annex I of the EU Habitats Directive are potentially intersected by project operations. All of these habitats have a conservation value and the most sensitive of these is "9180 Tilio- Acerion forests of slopes, screes and ravines" defined in the Directive as an Annex I "priority habitat".

This category of habitat is considered to be particularly vulnerable and is mainly, or exclusively, found within Europe. In this habitat type several nationally endangered (EN-Alb) flora species have been identified within these habitats and include; Stinking juniper *Juniperus foetidissima*, Perforate St John's wort *Hypericum perforatum*, Walnut *Juglans regia*, Wild oregano *Origanum vulgare*, Mountain tea *Sideritis raeseri*. All of these plants have conservation importance and local economic and cultural values collected, traded and used as food or medicinal plants.

The project area includes extensive natural areas hosting several fauna species. Out of these important nationally threatened species include: mammals (classified as EN under RLA) such as: wild cat *Felis silvestris*, badger *Meles meles*, stoat *Mustela erminea*, Polecat *Mustela putorius*; reptiles (classified as CR under RLA) such as: *Coluber gemonensis*, *Elaphe quatuorlineata*, *Elaphe situla* and *Typhlopsvermicularis*.

In addition, the project area has particular importance for birds of prey such as; Aquilachrysaetos (listed as EN in RLA), Egyptian vulture *Neophron percnopterus* (Listed as EN under IUCN) and Lesser kestrel *Falco naumanni* (VU under RLA). Both the two last species have been used as trigger species from Birdlife International to establish a specific IBA along the Drinosi River Valley (the Gjirrokastër IBA).

¹⁶⁹ This species is no longer found in Albania

¹⁷⁰ Recently renamed *Zamenis longissimus*

¹⁷¹ Correct spelling is *Typhlopsvermicularis*

4.11 Socio –Economics

4.11.1 Population Overview

Albania currently has a population of 2.9 million¹⁷², which is notably lower than the 3.1 million people registered in the 2001 census.¹⁷³ The population of Albania started to decline from 1990 as a consequence of large scale emigration. Albania currently has the highest rate of migration, relative to its population, in Central and Eastern Europe.¹⁷⁴ Many Albanians now live in EU countries, particularly Italy and Greece.¹⁷⁵

The change of the political structure in Albania in the beginning of the 1990's resulted in significant socio-economic upheavals across the country, particularly with respect to internal migration. Large numbers of people left rural areas to find work in the city. More than 60% of the population is now concentrated in the western lowlands, especially in areas in and around the main cities. Data from the 2011 census data show that 53.5% of the population lives in urban areas and 46.5% in rural areas¹⁷⁶.

The age structure of Albania is composed of 18% aged 0-14 years old, 16% 15 to 24 years old, 53% aged 25 to 64 and 14% aged over 64 years old¹⁷⁷.

According to Census 2011¹⁷⁸ the resident population of Albania is composed of 57% of Muslims, with significant numbers of Orthodox and Catholic (Table 4-11).

Table 4-11: Resident population by religious affiliation (2011 census)

Religion affiliation	Albania		Gjirokastr County	
	Resident population	% of resident population	Resident population	% of resident population
Muslims	1,587,608	57%	27,815	39%
Bektashi	58,628	2%	6,118	8%
Catholics	280,921	10%	1,493	2%
Orthodox	188,992	7%	12,583	17%
Evangelists	3,797	0%	59	0%
Other Christians	1,919	0%	50	0%
Believers without denomination*	153,630	5%	6,050	8%
Atheists	69,995	2%	4,550	6%
Others	602	0%	52	0%
Prefer not to answer	386,024	14%	10,945	15%
Not relevant/not stated	68,022	2%	2,461	3%
Total	2,800,138	100%	72,176	100%

Source: INSTAT Census Data Population (2011)

¹⁷² INSTAT Population 1 January 2018 <http://www.instat.gov.al/al/temat/treguesit-demografik%C3%AB-dhe-social%C3%AB/popullsia/publikimet/2018/popullsia-e-shqip%C3%ABris%C3%AB-1-janar-2018/>. INSTAT calculates the population of 1st January every year. It refers to 'resident population', which includes very resident in the territory of Albania during the reference period (of two sequential 1st January) regardless of their citizenship. The resident population considers international migrants (people who change their country of residence for a period of time longer than 12 months) adding to the number of population immigrants or returned migrants who satisfy the condition of usual resident and by deducting the number of emigrants, people who leave the country for a period of time longer than one year. Otherwise the estimated population doesn't consider the short-term migrants (people who move for a period of time less than 12 months).

¹⁷³ INSTAT Statistical data on Census 2001 <http://www.instat.gov.al/al/temat/censet/censusi-i-popullsise-c3%AB-dhe-banesave/publikimet-censusi-i-popullsise-c3%AB-dhe-banesave/2001/publikimet-censusi-i-popullsise-c3%AB-dhe-banesave-2001/>

¹⁷⁴ International Organization for Migration, Migration and Albania. <http://www.albania.iom.int/albania>

¹⁷⁵ INSTAT Population and Housing Census 2011

http://www.instat.gov.al/media/3058/main_results_population_and_housing_census_2011.pdf

¹⁷⁶ INSTAT Population and Housing Census 2011

http://www.instat.gov.al/media/3058/main_results_population_and_housing_census_2011.pdf

¹⁷⁷ INSTAT, Population 1 January 2018. <http://www.instat.gov.al/en/themes/demography-and-social-indicators/population/#tab2>

¹⁷⁸ INSTAT Population and Housing Census 2011

http://www.instat.gov.al/media/3058/main_results_population_and_housing_census_2011.pdf

According to INSTAT Census 2011 data, Albanian ethnic groups include: Ethnic Albanian 82.6%, Greeks 0.9%, and others 1%, the latter consisting of Aromanians, Romans, Serbs, Montenegrins, Macedonians, Balkan Egyptians, and Bulgarians, with the remaining percentage not providing an answer on ethnicity¹⁷⁹.

Migration is the phenomenon that is at the heart of economic, social and cultural change in Albania over the last decades. No other country in Eastern and Central Europe has been affected to such an extent over such a short period of time from migration. Migration in Albania has been a dominating process of everyday life, shaping the social and economic situation of the country and of the population. Albania currently has one of the world's highest emigration rates. The majority of Albanian emigrants are resident in Greece, Italy, United Kingdom, Germany, Switzerland, France, USA and Canada. Around 800,000 Albanian emigrants resided in Greece in 2014, compared to 503,000 residing in Italy.

The prevailing factor behind emigration of Albanian citizens is economic, including unemployment and poverty¹⁸⁰. Migration has been an effective solution to poverty and a rational strategy for survival and achieving modest prosperity. Remittances are significant both at the household level and at the national economy level, representing 22% of GDP.

The main peaks of migration have been in:

- 1990-1994, primarily associated with the collapse of the socialist system;
- 1997 linked to the collapse of the pyramid savings schemes;
- 1999, when half a million Albanians from Kosovo crossed the border into Albania;
- 2000 migration fluxes and intensity started to slow down;
- 2010 increase flows of return migration;
- 2013-2016 increased flows of asylum seekers.

Almost 22,000 Albanians sought asylum in the EU in 2017, decreasing from 66,000 in 2015¹⁸¹. A total of 189,000 applications for 367,000 Albanian citizens were registered for the US lottery in 2018 compared to 100,000 applications for 200,000 Albanian citizens in 2005¹⁸².

Within Albania, like in other developing countries, people have moved to urban areas to improve their livelihoods in search of better employment opportunities, education, healthcare, housing, and social life. In the process they have depopulated the countryside and created overcrowding in cities and particularly the larger cities.

4.11.2 Key socio-economic indicators

In the fourth quarter of 2017 the official unemployment rate in Albania for the population aged 15 years and over was 13.4 % (INSTAT, 2017)¹⁸³. In comparison to the fourth quarter of 2016, the official unemployment rate decreased by 0.8%. Over the year 2017, according to Labour Force Survey estimates, the total labour force is 1,385,000 persons. Females account for 42.6% of the labour force and males for 57.4%. A total of 1,195,000 persons are classed as employed, from which females account for 43.2% and males 56.8%. The number of unemployed is estimated at 190,000 persons, of which 39% are females and 61% are males. The employment rate for the population aged 15-64 years old is 57.4 %. The employment rate for females is 50.3 % and for males 64.3%. The gender gap in employment for this age-group is 14.0 percentage points. The agricultural and services sectors have the highest share of employees with 42.4% and 38.2% respectively of total employment. According to the 2017 survey estimates, 44.1% of working people are employees, 35.8 % are self-employed (with employees or without employees) and 20.1% are contributing family workers.¹⁸⁴ A summary of employment by sex, age, and gender between 2007 and 2017 is provided in Table 4-12.

¹⁷⁹ Statistical data on Census 2011 <http://www.instat.gov.al/al/temat/censuset/censusi-i-popullsis%C3%AB-dhe-banesave/#tab2>

¹⁸⁰ IOM [Albania Extended Migration Profile 2012-2014](http://www.albania.iom.int/publications/reports/Profili_i_zgjeruar_i_migracionit_ENG_web.pdf)

http://www.albania.iom.int/publications/reports/Profili_i_zgjeruar_i_migracionit_ENG_web.pdf

¹⁸¹ Reporter Albania Over 22,000 Albanians sought asylum in the EU in 2017 <https://www.reporter.al/mbi-22-mije-shqiptare-kerkuan-azil-ne-be-me-2017/>

¹⁸² Reporter Albania 367,000 Albanians dreamed America this year <https://www.reporter.al/367-mije-shqiptare-enderruan-ameriken-kete-vit/>

¹⁸³ INSTAT, Quarterly Labour Force Survey, Fourth quarter 2017 <http://www.instat.gov.al/media/3839/lfs-q4-2017.pdf>

¹⁸⁴ INSTAT Labour Market 2017 <http://www.instat.gov.al/en/themes/labour-market-and-education/employment-and-unemployment-from-lfs/publication/2018/press-release-labour-market-2017/>

Table 4-12: Employment rate by Sex, Age group, Gender and Year

		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Total	15-29	40.2	31.3	35.6	34.3	42.8	34.5	28.2	28.2	29.8	32.4	33.8
	30-64	67.5	64.6	65.6	66.4	68.2	66.4	61.8	62.7	65.2	67.2	68.7
	15-64	56.6	53.9	53.5	53.5	58.7	55.9	49.9	50.5	52.9	55.9	57.4
	15+	50.3	46.3	47.5	47.5	51.9	49.6	44.1	44.3	46.2	48.7	50.3
Male	15-29	44.1	35.9	41.1	39.3	48	38.8	33.7	33	35.8	36.3	38.5
	30-64	77.2	76.5	79.8	79.2	76.7	75.4	70.8	72.7	74.8	75.4	77.9
	15-64	64	63.3	64.5	63.1	65.7	62.2	57.3	58	60.5	61.9	64.3
	15+	57.3	54	57	55.9	58.6	55.9	50.7	51.4	53.3	54.7	57.1
Female	15-29	36.4	27.2	31	29.6	37.3	29.4	23	23.3	23.1	28	28.3
	30-64	58	54.1	52.5	54.4	60.1	58.3	53.9	53.6	56.3	59.3	60.0
	15-64	49.3	45.6	43.6	44.5	51.8	49.6	43.1	43.4	45.5	49.7	50.3
	15+	43.4	39.4	38.9	39.5	45.3	43.5	38	37.6	39.2	42.8	43.5

Source: INSTAT Labour Force Surveys 2007-2016

In 2017, the average monthly gross wage¹⁸⁵ per employee in Albania was 48,967 ALL (383.4 EUR); the official minimum monthly wage is 24,000 ALL (187.9 EUR). The average monthly gross wage is above the average for the following economic activities: financial and insurance activities; public administration and defence; compulsory social security; education; human health and social work activities. The average monthly gross wage is below the average for the following economic activities: wholesale and retail trade; repair of motor vehicles and motorcycles; transport and storage; accommodation and food service activities; and agriculture, forestry and fishing. In 2017, the highest paid occupations are: lawmakers, senior civil servants and executive directors; specialists with higher education (professionals); and technicians and specialists.

According to the World Bank Databank, levels of poverty¹⁸⁶ in Albania dropped from 25% in 2002 to 12.4% in 2008, before rising slightly to 14.3% in 2012¹⁸⁷. As economic growth and labour markets continue to pick up in Albania, poverty is estimated to have recently declined. Recent trends are linked to labour market improvements, with an increase in the employment rate in 2016 and 2017. For some households, the decline in nominal wages due to a public wage freeze that was in place until recently, likely muted some of the progress taking place on employment. While labour force participation declined for women and youth in early 2017, this change was more than compensated by reductions in unemployment for these groups, resulting in slightly higher employment.^{188, 189}

According to the Living Standards Measurement Study (LSMS) 2012 data, of all the counties in Albania, Vlore and Gjirokaster had the lowest poverty rates, while Kukes had the highest poverty rate among the counties¹⁹⁰.

Official education spending in Albania is around 3.5% of GDP¹⁹¹. This is a much lower figure than most high-growth emerging economies. Despite these tight financial resources Albania achieved an adult literacy rate of 97.6%¹⁹².

¹⁸⁵ The gross average monthly wage per employee is calculated based on the data of payrolls declared by economic enterprises to the General Directorate of Taxation

¹⁸⁶ The poverty rate referred to in these statistics is anyone earning less than 4891Lek (€35) a month.

¹⁸⁷ World bank, 2018 <http://povertydata.worldbank.org/poverty/country/ALB>

¹⁸⁸ World Bank Poverty and Equity Data Portal for Albania <http://povertydata.worldbank.org/poverty/country/ALB>

¹⁸⁹ World Bank Migration and Mobility, Europe and Central Asia Economic Update, October 2017. <http://documents.worldbank.org/curated/en/445651508415857577/Migration-and-mobility>

¹⁹⁰ INSTAT/World Bank, 2016 Portraits of Poverty and Inequality in Albania <http://documents.worldbank.org/curated/en/659991480409319302/pdf/110582-REVISED-PUBLIC-report-eng-complete.pdf>

¹⁹¹ <http://hdr.undp.org/en/countries/profiles/ALB>

¹⁹² <http://hdr.undp.org/en/countries/profiles/ALB>



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4.11.3 Economic performance and key sectors

Albania's economy expanded 3.4% in 2016, supported by robust domestic demand. Private investment in two large energy projects (the Trans-Adriatic Pipeline and Devolli hydropower plant) and a recovery in private consumption drove growth. Private consumption was helped by improvements in employment and credit growth. With the extractive industry affected by unfavourable commodity prices, services were the main driver of growth, followed by construction and agriculture. Recent data confirms stronger growth in early 2017; with strengthened business confidence, especially in services¹⁹³.

The fiscal deficit declined to 1.8% of GDP in 2016 (compared to 4.9% in 2015) in line with the country's fiscal consolidation efforts. Revenues increased by 1% of GDP, helped by all tax categories. Public spending (excluding arrears repayments) fell by 0.8% as consolidation efforts continued. The primary surplus of 0.7% of GDP helped lower the debt to GDP ratio for the first time since the global economic crisis, reaching 72.4% of GDP in 2016. Despite the parliamentary elections in 2017, revenues and expenditure remained within budgeted targets in the first half of 2017, consistent with constraints in the new budget law. Average annual inflation fell from 1.9% in 2015 to 1.3% in 2016, below the Bank of Albania's target of 3±1%. However, higher food prices then lifted inflation to 2.2% in the first half of 2017. Monetary easing stimulated the recovery of credit to households, although the high stock of nonperforming loans continues to deter lending to corporations. Despite the increase in investment related imports, the current account deficit (CAD) narrowed from 10.8% in 2015 to 9.6% in 2016. Lower electricity imports and higher services exports more than compensated for the increase in investment related imports. Remittances remained broadly stable despite weak growth in source countries (Greece and Italy). Net foreign direct investment increased to 8.9% of GDP from 8% in 2015, helped by inflows associated with energy projects, and financed 93% of the CAD. At the end of 2016, the stock of foreign exchange reserves was 2.9 billion euros, covering 5.7 months of imports. Stronger growth stimulated job creation in 2016.¹⁹⁴

Growth is projected at 3.5% in 2018 and 2019. The two large energy projects will continue to support growth, aided by private consumption supported by labour market improvements, and net exports supported by demand from the EU¹⁹⁵.

Fiscal consolidation and related structural reforms are expected to gradually reduce the fiscal deficit to 1.3% of GDP by 2019, and the debt-to-GDP ratio to 60% of GDP by 2022.

4.11.4 Land Ownership at National Level

Land fragmentation has been identified as one of the main obstacles to the development of the agricultural sector in Albania since the political transition. Law 7501 was adopted to ensure a fair division of land amongst agricultural families following the closure of the cooperative and state-owned farms. However, one of the ramifications of this law is highly fragmented land ownership. Families now often own several parcels of land spread over a wide area. Internal population movement has fuelled rapid urban development and absentee landownership in rural areas.

Uncertainty over land rights remains a crucial obstacle in the country's social and economic development. Registering property, despite some modest improvements, continues to be problematic. Albania ranked 103 out of 190 economies for ease of registering properties according to the World Bank 2018 Doing Business Report¹⁹⁶. Enforcing and ensuring property rights continues to be one of the major challenges facing the country. Cases addressing the breach of the principle of due process regarding property disputes are accumulated in the European Court of Human Rights, and some have been won by the claimants. Corruption and abuse in such cases are especially acute given the lucrative value of properties and the weak position of concerned individuals. Claimants often lack legal ownership documents.

¹⁹³The World Bank in Albania, Country Snapshot <http://pubdocs.worldbank.org/en/805501507748388634/Albania-Snapshot-Fall2017.pdf>

¹⁹⁴ World Bank Migration and Mobility, Europe and Central Asia Economic Update, October 2017. <http://documents.worldbank.org/curated/en/445651508415857577/Migration-and-mobility>

¹⁹⁵World Bank Albania <http://pubdocs.worldbank.org/en/172771524670378652/mpo-alb.pdf>

¹⁹⁶World Bank, 2018 <http://www.doingbusiness.org/en/data/exploreeconomies/albania>

4.11.5 Agriculture

Albania has a total surface area of 28,748 km², of which 24% is agricultural land (696,000 ha), 43% forest (1 237 000 ha) and 33% other such as, unproductive land, urban land, and waterways (Strategy of Agriculture and Rural Development)¹⁹⁷. While the rural population has decreased throughout the years, agriculture still supports 47% of the labour force either directly or indirectly.

Over 90% of agricultural land in Albania is now in private ownership as a result of the privatization process. Nearly 440,000 ha of former cooperative lands¹⁹⁸ are now owned individually by 353,718 families, divided into 1.5 million parcels with over 90% granted via formal documentation known as a Tapi.¹⁹⁹ Over 120,000 ha of former state farmland²⁰⁰ are now owned by 91,000 families and divided into 300,000 parcels.²⁰¹

Agriculture had traditionally been the leading sector of the economy until 1990. While it has now lost its dominant role the sector (agriculture, forestry and fishing) still contributes close to 19.91% of GDP and in 2016 generated almost US\$ 2.9 billion. Agriculture production (crop, animal, fruit trees) accounts for almost 75% of the total agriculture share of GDP, while agro-processing accounts for the remaining 25%.²⁰²

4.11.6 Health Services

The Albanian health system is mainly a publically funded system. The State ensures the majority of the services offered to the people in the area of promotion, prevention, diagnosis and treatment. The private health sector is still taking its first steps with regard to primary care and covers the majority of the pharmaceutical and dentistry service, as well as a number of specialized diagnosis clinics mainly concentrated in Tirana. The primary role in the public sector is played by the Ministry of Health, which drafts and is responsible for the implementation of the health system policies and strategies that regulate its functioning and for the coordination of all actors within and outside the system. Diagnostic and curative health service is organized into three levels: primary care, secondary hospital care and tertiary hospital care.²⁰³

When seeking medical care under the public health system, each insured citizen has a first meeting at the health centre they are registered at through their family doctor (selected voluntarily by them). The services offered at the health centre are detailed in the basic Primary Health Care package and include: care for emergency situations; health care in child upbringing; health care for women and reproductive health; health care for adults; health care for the elderly; mental health care; health promotion and education. Having presented the Health Booklet and certificate of residence, the family doctor refers them to the specialized doctor. If further qualified care is needed, the individual is referred to the regional hospital or to Tirana University Hospital Centre.

According to the Basic Package of Primary Healthcare Services, each municipality must have at least one key health centre, and every village should have an ambulance, which is served by at least one nurse. On average, at the national level, each health centre covers a population of 8,000 to 10,000 people. This figure fluctuates significantly between urban and rural areas.

Public expenditures in the health sector in Albania in 2016 accounted for 9.68% of total public spending for 2016. Public spending on health has increased by 8.36% compared to 2016. The number of visits for primary health care in year 2016 was approximately 8.1 million. The total number of visits to health centres has increased considerably in recent years: the number of visits has increased by 62.2% from 2005. The number of centres has decreased as a result of the focus on service centres with specialized medical personnel and equipment.²⁰⁴

A number of problems are reported with respect to and their ability to meet the needs of the population. Problems typically reported with respect to the general conditions of the hospitals and health centres include: insufficient funds to maintain infrastructure and facilities, decreasing number of doctors, poor quality of service, lack of

¹⁹⁷ DCM no. 709 dated 29.10.2014 "Approval of the crosscutting strategy for rural and agricultural development, amended with DCM no.21 dated 12.01.2018, section 1.4

¹⁹⁸ Cooperative lands were owned and run by a group of people who shared the property.

¹⁹⁹ Ministry of Agriculture and Food Annual Statistical Yearbook (2010).

²⁰⁰ State farms were state-owned and state-run enterprises on which people were allocated to work.

²⁰¹ World Bank Status of Land Reform and Real Property Markets in Albania 2006, pg.47.

<http://documents.worldbank.org/curated/en/815161468002656300/pdf/369281Status0o1y0Markets0in0Albania.pdf>.

²⁰² INSTAT, Gross Domestic Product, 2016. <http://instat.gov.al/media/3909/gross-domestic-products-final-2015-semi-final-2016.pdf>

²⁰³ Monitoring of the primary health care system in Albania - Research study 2014.

<https://www.usaid.gov/sites/default/files/documents/1863/KZLN-FinalReport-%20EN%20-%20FINAL%20LES%20.pdf>

²⁰⁴ INSTAT Albania in Figures 2016 <http://www.instat.gov.al/media/3583/abania-in-figures-2016-finale-alketa.pdf>

medical drugs, low salaries for doctors, and the cost of drugs is often prohibitive. Hospitals are often kept in unhygienic conditions and have a high number of patients in one room. Those staying in hospital for long periods of time may not have access to basic necessities such as blankets. At the national level it is estimated that 1.3 doctors treat 1,000 inhabitants. Comparatively, there are 3 doctors per 1,000 inhabitants in European Union member states and 2.5 doctors for other eastern European countries²⁰⁵. Albania has 1.3 doctors per 1,000 inhabitants.²⁰⁶

Table 4-13 shows the general fall in the level of service provision with respect to outpatient facilities between 1995 and 2012.

Table 4-13: Number of public outpatient health facilities (1995, 2000-2012)

Outpatient Facilities	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
Health Centres	622	580	671	682	605	580	616	475	456	421
Number of Health Centres/1,000 Persons	0.20	0.19	0.21	0.22	0.19	0.18	0.19	0.15	0.17	0.18
Total Number of Ambulances	1832	1505	1675	1690	1673	1877	1772	2079	1970	1946
Number of Ambulances/1,000 Persons	0.58	0.48	0.53	0.54	0.53	0.59	0.55	0.65	0.67	0.68
Polyclinics with Specialists, Urban	53	50	50	50	50	46	46	46	46	46
Number of Clinics/1,000 Persons	0.02	0.02	0.02	0.02	0.02	0.01	0.01	0.01	0.01	0.01
Total number of Health Centres, Ambulances, Clinics	2135	2048	2422	2328	2,503	2,434	2600	2135	2,472	2413
Total Health Centres, Ambulances, Clinics/1,000 pop	0.79	0.69	0.76	0.77	0.74	0.79	0.76	0.81	0.85	0.88

Source: INSTAT Activity of Health Centres, Ambulances and Policlinics (1999-2012)

4.11.7 Regional Administrative Structure

Albania is divided into counties, municipalities, administrative units, cities, villages and neighbourhoods (Table 4-14). There are 12 counties ('qark' is the official term in Albanian). Each county is divided into several municipalities, which in turn are divided into administrative units. Urban administrative units are comprised of cities, and rural administrative units are comprised of villages or in some cases a combination of both.

Table 4-14: Administrative governance at regional and local level

Organization	Definition	Composition	Type of unit	Leadership	No. of units
County	By law	A number of municipalities	Higher level unit of local self-government	County Council is the representative body. Chairman is the executive body.	12
Municipality	By law	A number of administrative units	Basic unit of local self-government	Head is the executive body. Municipality Council is the representative body.	61
Administrative Unit	By law	Cities and/or villages	Subdivision of the municipality	Administrator	381

²⁰⁵ The World Bank data on Albania <https://data.worldbank.org/indicator/sh.med.phys.zs>

²⁰⁶ <https://www.cia.gov/library/publications/the-world-factbook/fields/2226.html>

City	By law	A number of neighbourhoods	The smallest unit of the city	Community councils and Community Liaison Officers.	70
Village	By law	None – smallest unit	–	The presidency and village head.	Not known
Neighbourhood	With decision of the Municipal Council	None – smallest unit within a city.	Can only be created in territories with over 20,000 inhabitants	Neighbourhood's Administration and its administrator.	Not known

Source: Analysis prepared by the author based on the: Law no.115/2014 'On the administrative-territorial division of the local government units in the Republic of Albania' (amended); Law no.139/2015 "For local self-government".

With Law 115/2014, the Albanian Government started the implementation of the Administrative-Territorial Reform²⁰⁷ by changing local government from 373 into 61 municipalities. The new municipalities have larger competencies than previously. Each municipality is governed by the mayor and an elected municipality council headed by a chairman. Each village is represented by a village head, whose tasks are defined and approved by the municipality council. The village head is elected by the people of each village. Traditionally, village heads were wise elders, but with the new reform after 2014 there is no obligation to elect wise elders and it is increasingly common to select younger individuals respected for their professionalism and leadership ability. The mayors and the municipal council's members are elected in local elections, which take place every four years.

The second, larger level of local government is the counties. The County Council, which consists of the Head of Municipalities and by counsellors representing the municipalities in proportion to the population size²⁰⁸ elect the head of the County Council, while the Prefect is appointed by the national government (Council of Ministers).

With the exception of few kilometres of geophone lines, the seismic corridors are entirely within Gjirokaštër County. The seismic corridors are within the following seven municipalities of Gjirokaštër County: Gjirokaštër, Tepelenë, Përmet, Këlcyrë, Libohovë, Memaliaj and Dropull. The total population of these seven municipalities was 68,804 people according to the Census 2011. Of the seven municipalities, Gjirokaštër municipality has the largest population, followed by Memaliaj and Përmet.

Within the seven intersected municipalities there are five cities: Gjirokaštër, Tepelenë, Përmet, Këlcyrë, Memaliaj, and Libohovë. There are 33 settlements within the seismic corridors and a 200 meters buffer zone around its boundary²⁰⁹. These are mapped in Figure 4-36 and listed in Table 4-15.

The end points of a few seismic lines (where only geophones will be placed) extend into the municipalities of Delvinë and Kolonja, which are within the Counties of Vlorë and Korçë, respectively. However, there are no communities in proximity to these parts of the lines.

²⁰⁷ Territorial Reform in Albania <https://www.reformaterritoriale.al/en/>

²⁰⁸ The number of municipal representatives in the County Council is set in proportion to population number, as follows: i) Municipalities with a population of up to 20,000, 2 representatives; ii) Municipalities with a population of 20,001 to 50,000, 4 representatives; iii) Municipalities with population 50,001 to 100,000 inhabitants, 5 representatives; iv) Municipalities with a population of over 100,000, 5 plus an additional representative for every 1 to 50,000 inhabitants over 100,000 inhabitants.

²⁰⁹ This zone of a further 200m has been applied in the identification of settlements as it represents an approximate area within which direct, noticeable noise and visual impacts could occur.

Figure 4-36: Location of settlements, roads and waste management facilities within Block 4

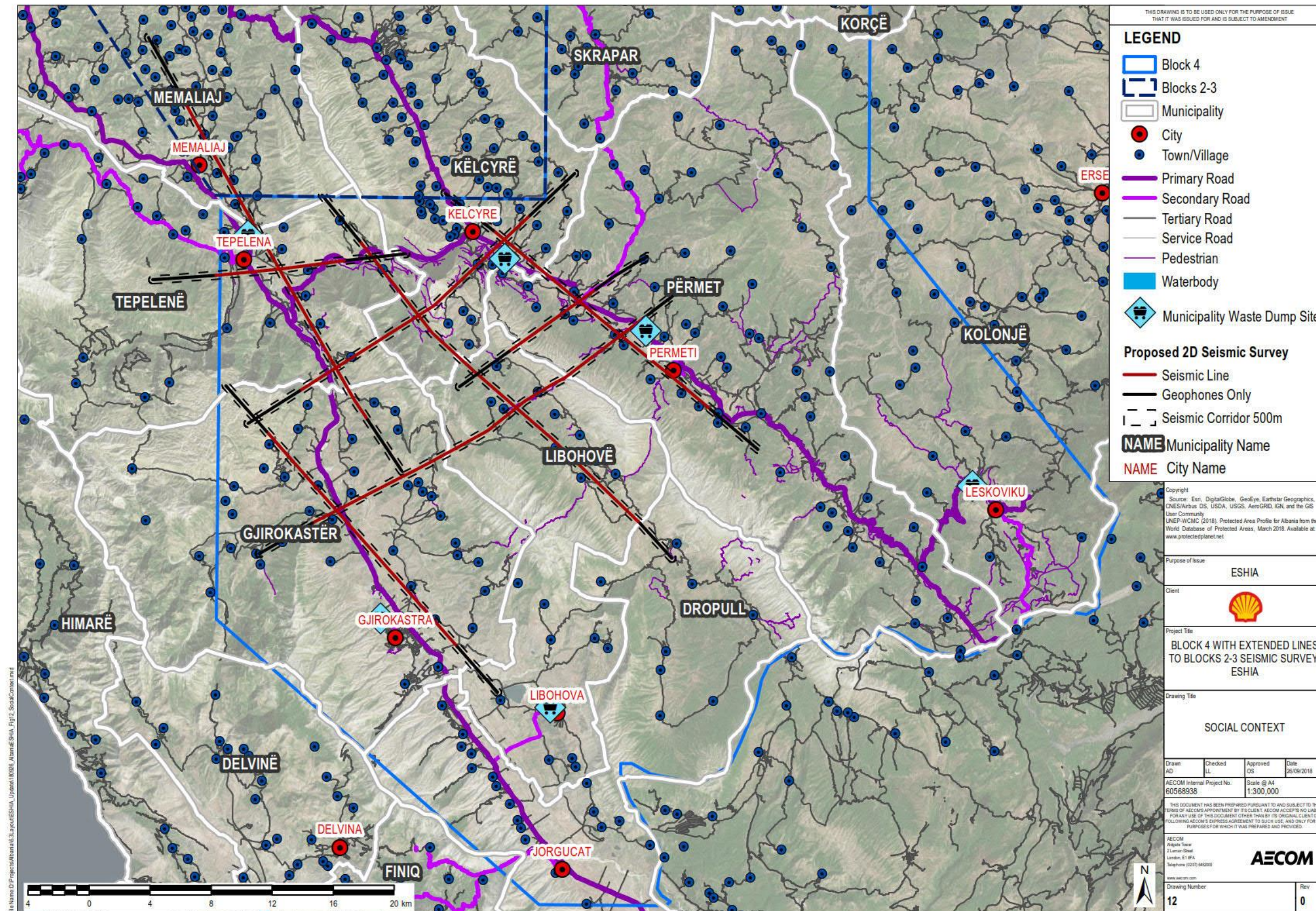


Table 4-15: Summary of settlements within the 500m seismic corridors and 200m buffer zone

Municipality	Sub-Municipality	Settlement Name	Type
Përmet	Qender Piskove	Buali	Village
		Badelonja	Village
	Petran	Badelonja (Lagja e Re)	Village
		Leshnica	Village
		Leusa	Village
		Lipe e re	Village
	Qender Piskove	Buali	Village
		Buali (golemas)	Village
		Piskova	Village
	Përmet	Permeti	City
Këlcyrë	Qender Piskove	Mokrice-zleusha	Village
		Rapcka (Vila)	Village
Këlcyrë	Kelcyra	Brezhani (Rreza)	Village
	Dishnica	Bedqyras	Village
Tepelenë	Qender Tepelene	Hormova	Village
		Mezhgorani	Village
		Peshtani	Village
		Dragodi	Village
Gjirokastrë	Cepo	Cepuna	Village
		Humelica	Village
		Kardhiqi	Village
		Plesati	Village
	Antigone	Arshi lengo	Village
	Lunxheri	Topullaraj	Village
Libohovë	Zagorie	Hoshteva	Village
		Topova	Village
		Doshnica	Village
Memaliaj	Memaliaj Fshat	Cerrila	Village
		Damesi	Village
		Damesi (bofeng)	Village
		Damesi (kallem)	Village
	Luftinja	Luftinja e Siperme (Canaj)	Village
		Zhapokika	Village
		Zhapokika e Siperme (Ballaxhija)	Village

4.11.8 Gjirokastrë County

Gjirokastrë County is located in the southeast of Albania, and borders with the counties of Fier, Korçë, and Vlorë, and the country of Greece to the south. Two of the most important valleys of southern Albania, the valley of Upper Vjosa and the valley of the Drinos River, pass through the county. The majority of Gjirokastrë County's population is located in these valleys, as are the main economic activities.

The County has a resident population of 62,952 inhabitants²¹⁰, being the smallest county by population in Albania, though the fourth largest county by area at 2,884km². Estimates of the 1 January 2018 population show that only three counties of Albania experienced population growth, compared to the previous year while nine of them (including Gjirokastrë) experienced a decrease. The largest decreases in population size occurred in Gjirokastrë (decreased by 4.5% from 2017 to 2018), Dibër (3.7% decrease) and Berat (3.4% decrease).

In 2011, Gjirokastrë's population was 17% aged 0 to 14, 15% aged 15 to 24, 52% aged 25 to 64, and 16% over 65²¹¹. The population was slightly male with 50.6% and 49.4% are female. The population of the County is currently divided almost equally between urban (51.8%) and rural areas (48.2%), although the recent trend to urbanization in this county has been particularly pronounced. The majority of the population that moved to urban centres was generally between the ages of 18 to 35. The consequence of this trend is that many villages in the area have been left with an aging population, composed mostly of residents over the age of 50.²¹²

Përmet is the largest municipality in the County, having a total surface area of 601.95 km², followed by Gjirokastrë with 469.25 km², and Dropull with 466.67 km². A detailed list of all intersected municipalities, population, surface and density in project area is provided in Table 4-16.

Table 4-16: Total Population in the project area

No	Municipality	Total Population Census 2011	Total Population Civil Registry ²¹³	Surface in km ²	Density Civil Registry (citizens/km ²)
1	Gjirokastrë	25,301	52,054	469.25	110.93
2	Memaliaj	10,657	21,467	372.07	78.90
3	Permet	10,614	20,301	601.95	33.72
4	Tepelene	8,949	16,371	431.24	37.96
5	Kelcyre	6,113	12,468	304.65	40.92
6	Libohovë	3,667	7,158	248.24	28.83
7	Dropull	3,503	23,131	466.67	49.56
Total		68,804	152,950	2,894.07	

Source: INSTAT Census Data Population (2011) and Civil Registry Population Data

The primary economic sectors in Gjirokastrë are agriculture, animal husbandry²¹⁴, trade and tourism. Agriculture and animal husbandry are discussed below. Trade with Greece is an important economic activity due to its proximity and the language skills in the Greek minority population. There are several big wholesalers in the district that serve the rest of Albania with a large variety of goods imported from Greece. The Greek Consulate in Gjirokastrë town where Albanians can apply for visas attracts many visitors and is an important economic attraction for the town's restaurants, shops, hotels and family guesthouses.

According to the data provided by the Institute of Statistics regarding regional GDP, Tirana region is clearly the engine of the Albanian economy, generating over 40% of the added value nationwide in 2015. Other significant regions are Fier (12%); Durrës (10%) and Elbasan (7%), while Gjirokastrë is the last ranked county with 2%. GDP per capita at national level for the year 2015 was EUR 3,541 (Table 4-17). Within the project area, after Tirana, Fier, and Durrës, Gjirokastrë has the highest rate of GDP per capita with 3,551 EUR in 2015.

Table 4-17: Gross Domestic Product by statistical regions (NUTS²¹⁵)

Regions	Gross Domestic Product Euro	Structure of GDP	GDP per capita

²¹⁰INSTAT, 2018. Population by prefecture: <http://www.instat.gov.al/en/themes/demography-and-social-indicators/population/#tab2>

²¹¹ INSTAT, 2011. Population and Housing Census – Gjirokastrë 2011.

²¹² INSTAT, 2011. Population and Housing Census – Gjirokastrë 2011.

²¹³ Civil Registry is the registered population, while Census provides the living population at the moment of the Census. The difference relates to the migrant population who are either temporarily or long term absent from their location of registry. Both estimates are provided due to the high rates of migration in the country.

²¹⁴Animal husbandry is the raising of animals for meat, milk, eggs, or other products.

²¹⁵Nomenclature of Territorial Measuring Units for Statistics

(millions)

	2014	2015	2014	2015	2014	2015
Tiranë	3,797	4,076	38%	40%	4,652	4,886
Fier	1,349	1,207	14%	12%	4,320	3,919
Durrës	923	992	9%	10%	3,344	3,568
Elbasan	738	726	7%	7%	2,502	2,498
Korçë	573	583	6%	6%	2,569	2,648
Vlorë	586	580	6%	6%	3,111	3,079
Shkodër	526	554	5%	5%	2,430	2,599
Berat	376	389	4%	4%	2,665	2,811
Dibër	315	338	3%	3%	2,345	2,579
Lezhë	333	339	3%	3%	2,490	2,572
Kukës	194	187	2%	2%	2,301	2,269
Gjirokastrë	259	247	3%	2%	3,619	3,551
Total	9,969	10,218	100%	100%	3,447	3,541

Source: INSTAT²¹⁶

The flagship of Gjirokastrë's industrial sector is the Glina mineral water factory, which has positioned itself to be the 'national' mineral water of Albania. The factory is situated near a mineral water spring in Libohova Qender commune on the eastern side of the valley, near the Greek border. Other beverage producers include Fresh Company, which produces a number of different soft drinks, and Boukas Company, which produces alcoholic beverages.

There are several textile factories in Gjirokastrë, mostly with between 50-100 workers but two with over 100 workers. Hundreds of housewives are engaged in embroidery of 'Greek handicrafts' for the tourist market in Greece. Other economic activity includes shoe manufacturing, the export of furniture, and marble and natural stone processing for construction. There are also several small factories producing for the domestic market, including paint, paint boxes, fences, plastic bags and several types of construction components.

Gjirokastrë County has an important tourism sector due to its geographical position and cultural, historical and archaeological heritage. The development of tourism is the main priority for the region and requires the development of infrastructure and improved urbanization. Gjirokastrë town, being on the UNESCO World Heritage List, is a centre for regional tourism and has experienced a considerable increase in activity during the recent years.

4.11.9 Gjirokastrë municipality

The municipality of Gjirokastrë consists of the city of Gjirokastrë, which since 2005 has been on the UNESCO World Heritage List, as well as the surrounding hilly rural areas. Gjirokastrë city is an Ottoman-style trading town, among the last surviving in the Balkans. The city has over 800 historic buildings, many of which are endangered by degradation.

The main sources of the urban economy in Gjirokastrë are tourism and manufacturing of clothing and footwear, which generally serves the Greek market and has been hit hard in recent years due to the economic crisis in Greece. Gjirokastrë is also a city with considerable trade activity, especially with regard to imports from Greece. The rural area close to the city is known for its small livestock and high quality of livestock products.

Gjirokastrë is the most affected area in Albania by the mass migration of the population over the last two decades, and this has led to the rapid aging of the population profile. According to the Census 2011²¹⁷, Gjirokastrë Region had the highest average age in Albania at nearly 40 years old.

²¹⁶INSTAT Regional Accounts in Albania 2015 <http://www.instat.gov.al/en/themes/economy-and-finance/regional-accounts-in-albania/>

Tourism in the city of Gjirokastrë has considerably increased during recent years. However, there is a need to improve the hotel capacity and promotion and administration of tourism as well as extending the tourist season beyond the spring and autumn months. The city has about 50-60,000 foreign visitors a year and has a network of hotels that accommodate these visitors. The municipality has a tourist information office, but few promotional products.

During the last years, with funding from the Municipality and with the support of the Regional Development Fund, Gjirokastrë is undergoing some important interventions in improving infrastructure. This includes: the reconstruction of the Viro Park, a project for the entrance to the north side (including bicycle lanes and for pedestrians), and paving the cobbled streets in the historic centre.

The transport of students in the municipality is a key issue that requires solution as the depopulation of many areas has resulted in the closure of schools in villages and an increase in distances travelled by children to access schools.

Issues with drinking water supply are expected to be solved after the completion of a project to reconstruct the old grid and build a new water depot.

4.11.10 Memaliaj municipality

The town was well-known for its coal mine until the closure of the mine in 1994. Many residents have migrated or emigrated, while those who still live in Memaliaj typically work in small-scale services or local trading businesses. The area lies mainly along the Vjosa River. Besides agriculture and livestock the principal other sources of income are from viticulture, medicinal plants collection, river tourism, historical and cultural tourism.

Unemployment in the Municipality of Memaliaj is around 21% (according to Census 2011). The unemployment rate for the municipality is lower than the average unemployment rate in the country by about 30%. On the other hand, the actual data collected by the Memaliaj Municipality speak about unemployment rates of around 40-45% in total.

Because of the mixed nature of the local economy, residents are employed in various sectors such as agriculture, industry and services. The employment structure in these sectors is as follows: in agriculture 50% of active labor force is employed, in industry about 12%, and in services 38%. These indicators point to a traditional economic structure dominated by farming and livestock farming, but urban features are emerging systematically with the increase in the number of employees in services.

Memaliaj Municipality's economy is characterized by the presence of informality and the prevalence of small and family businesses. A total of about 300 businesses are counted, of which approximately 200 operate in the territory of the Memaliaj administrative unit. Most of the business activities (about 52%) are concentrated in the agriculture and livestock sector. Existing agricultural and livestock activities aim at not only meeting family needs but also engaging products in the local market. The barrier to the increase in production is the fact that the farmer is limited to the use of parcels no larger than 1-2 ha for this purpose. The appropriate climate allows the growth of tens of thousands of roots of olives and vines. In livestock farms grow about 40,000 small head (34,000 sheep, 6,000 goats) and 3,000 cattle, whose products are traded outside the territory of the municipality.

In addition to the service sector, it is trying to gradually develop industrial activity, which consists mainly in the initial processing of medicinal plants.

Social benefits and similar benefits account for 13.9% of household income for the Memaliaj local population, where remittances represent 7.4% of income. The main source of family income is employment and self-employment, which together represent something less than half of the total: 44.3% and the different types of pensions, also in high proportion: almost 41.6% (the latter shows the composition of elderly population of the area).

Data on the number of households treated with economic aid are an indirect indicator of the poverty level in the Municipality of Memaliaj. This assistance is available to a total of 590 families, of which about 200 in the city of

²¹⁷Statistical data on Census 2011 <http://www.instat.gov.al/al/temat/censuset/censusi-i-popullsisi%C3%AB-dhe-banesave/#tab2>

Memaliaj. In relation to the total number of households, it results that about 10% of households benefit from this assistance.²¹⁸

The key challenges and priorities for this municipality are reported to include²¹⁹:

- Presence of small mountain villages that need to be supported by services and investment, and which are often blocked during the winter due to road slippage and they need investment.
- Need for economic assistance and schemes for poorer households who have few resources.
- The need to promote small dairy units, and support the protection of livestock from some dangerous infectious diseases,
- The need to invest in the setting up of irrigation systems and supporting small greenhouse production of early vegetables as a way to boost the economy of the area's families.

4.11.11 Tepelenë municipality

Many of Tepelena's mountainous areas have been depopulated due to population movement mainly to the coastal zone (Ksamil, Saranda). This has led to a decrease in the number of pupils in some schools and abandonment of villages by young people. The city of Tepelenë has relatively high levels of poverty and high levels of unemployment. Small-scale commerce services and collection of medicinal plants provide some income to households in the city, while income from remittances has undergone a significant reduction in recent years.

One of the most important projects is the revitalization of Ali Pasha's castle in the centre of the city of Tepelena, which is aimed at boosting tourism. This castle, as well as other assets such as Bënça Canyon, Beçisht Bridge or Cold Water can serve to promote cultural and natural tourism.

New investments are needed to improve educational facilities, including improvement of the student transportation system (especially for those schools that have fewer students due to emigration), and improving the playgrounds in the city schools.

Investments are also needed in infrastructure, education and health care. The main challenge is to create jobs in the city and especially to promote the medicinal plant sector. New opportunities for employing residents are needed, particularly from the opening of new businesses, development of small handicraft operations, and promotion of the medicinal plant sector in rural areas, the promotion of agribusiness and milk processing dairies, wine production or traditional products are seen as a key opportunity to increase the commercial capacities of residents.

Ali Pasha's Castle is a resource that could be further used to attract groups of tourists but needs to be restored and separated from the apartments around it. Coordination with the cities of Gjirokastër or Ioannina in Greece in the design of tourist itineraries could bring an increase of foreign visitors to the city and additional income for the municipality.²²⁰

4.11.12 Përmet municipality

The municipality of Përmet is surrounded by rare natural areas, as well as historical, ancient churches and monasteries that are at risk of being degraded by a lack of restoration. The municipality includes the Hotova National Park with its rare Mediterranean spruce, the curative baths in Bënjë, the canyons of Bënja and Lengarica, the House of the Frasheri brothers, the Churches of Leusas, Kosina, Bual, and Bjenja, and several bridges of the XVIII century such as that of Kati or Bënja. These resources make the municipality of Përmet an attractive destination for Albanian and foreign tourists.

People from Përmet are typically occupied with small commercial activities. Although the tourism sector is one of the main sectors of economic development, it still has little development, with a low hotel capacity in the city and fewer host facilities for tourists in the surrounding villages. The tourism sector is also required to support the growth of products and handicrafts. Përmet's mountainous areas, despite having large wilderness area that can

²¹⁸UNDP Local Development Operational Plan for Memaliaj Municipality 2016
<http://www.al.undp.org/content/dam/albania/docs/STAR/Bashkia%20Memaliaj.pdf>

²¹⁹Reporter Albania The Profile of Memaliaj Municipality <http://pushtetivendor.reporter.al/profil-i-bashkise-memaliaj/>

²²⁰Reporter Albania The Profile of Tepelene Municipality <http://pushtetivendor.reporter.al/profil-i-bashkise-telepelene/>

be used for hiking and mountaineering, have little promotion. There are few guides and the road infrastructure is poor. One of the rare assets of the area, Benja Thermal Baths, is located approximately 14 km from the town of Përmet.

The town of Përmet took shape following the urban planning arrangements in 1964 and then was further developed by the residents who came down from the surrounding villages. The city has architecture typical of the socialist period, with few new buildings. Përmet has many green and flowering areas, which continues to preserve the tradition of evening walks.

Përmet Municipality has a development strategy drafted which will require strong financial support to be realized. The income for this municipality is limited and often the municipality fails to pay the energy supply services of its institutions.

New opportunities for women's employment are needed, as unemployment is higher for women compared to men, especially in small manufacturing businesses and with opportunities to develop agribusiness, viticulture and wine production.

Health services need to be improved, while Përmet Hospital needs a more professional staff and good management of services. Likewise, the education sector needs to be restructured in order to support student transport and improve school environments.²²¹

4.11.13 Këlcyra municipality

Këlcyra is a town lying between the Trebeshina and Nemërcka mountains, which are crossed by the clear waters of Vjosa. The area has stunning landscapes and historic sites, though unwanted urban developments, the poor integration of construction before the 1990s with those of the transition, and the lack of an urban plan for expansion have brought challenges for the town of Këlcyra.

Local incomes are low, coming from small commercial and service activities, as well as agriculture and livestock. Këlcyra is always distinguished for the high quality of fruit and grapes and is known as the centre for raki and wine cultivation. However, issues in the Albanian liquor market and speculation have made the famous Këlcyra Merlot wine almost disappear in the Albanian wine market, and wineries contribute little to the economy of the area. Income from remittances has supported many families in the area, but recent decreases in this income have exacerbated the economic situation of residents.

The population of Këlcyra is mainly composed of long-time residents and from those arriving from surrounding villages. Many residents have migrated to Tirana, while a large part of the population has emigrated, mainly to neighbouring Greece.

The main challenges for Këlcyra are related to the reconstruction of roads, construction of bridges and aqueducts, coping with floods that may come from Vjosa, and damages caused by erosion. The needs of the education sector, especially for improving school environments, reconstruction of buildings and heating them during the winter, is also a priority.

Tourist programs should be developed and should be promoted the protection of natural resources and especially of some Byzantine churches, which endanger degradation from the long absence of restoration.

4.11.14 Libohova municipality

Libohova Municipality has been a separate administrative unit since 1914. The area is rich in cultural and natural monuments that are nationally and internationally recognized. Over the last 20 years, Libohova's population has experienced low levels of demographic growth, although emigration has markedly decreased. Livestock production and agriculture are important in the municipality, and it holds a record in Albania for the variety of medicinal herbs. There are opportunities for further development through investment in agriculture, livestock production and tourism. However, investment in road development to increase connectivity between villages is required to support the development of tourism. The geographic position by the border creates opportunity for the development of cross-border projects for eco-tourism development²²².

²²¹Reporter Albania The Profile of Tepelene Municipality <http://pushtetivendor.reporter.al/profil-i-bashkise-tepelene/>

²²²Reporter Albania The Profile of Libohove Municipality <http://pushtetivendor.reporter.al/profil-i-bashkise-libohove/>

4.11.15 Dropull municipality

The Municipality of Dropull is populated by many residents of the ethnic Greek minority in Albania. The Dropull region has a rare ethno-cultural wealth, with the local dance and costumes continuing to be performed and used. Dropull community is recognized by locals as the centre of the area, as where all the important political, cultural and religious activities of the minority take place, though the official centre of the municipality is in Sofratike. In recent years the Greek minority areas have experienced an improvement in road infrastructure improving connectivity between their communities and the broader region.

Using government grants and financial aid from Greece, many villages have also solved drinking water problems. Despite these investments during the 25 years of transition the Dropull area suffers from emigration. In the villages of Dropull there are few young residents, many homes have been closed for years, and much of the land is not cultivated.

The reintegration of migrants returning from Greece who have been affected by the economic crisis is one of the key challenges of the area. Further funding for waterworks construction and reconstruction of roads is needed. Key challenges for the local area include provision of health centres, as this area is inhabited by old aged people who need medical assistance. The agricultural sector is in need of special programs of support as in many areas, land surfaces have not been cultivated for years and there are many problems such as during floods in winter and lack of irrigation in the summer.

4.11.16 Villages in the project area

The following information on the socio-economic characteristics of villages within the project area was provided by local residents during the field mission:

- All of the remote villages in the project area have experienced significant population decline over the past decades. The extent of population decline varies by village, with the following examples being typical: Peshtan (approximately 100 families down to 25 families), Leusa (approximately 100 families down to 20), Fratar (approximately 300 families down to less than 20), Hoshteva (approximately 80 families down to 30 families), and Nderan (approximately 90 families down to 25 families). Some villages now have fewer than 10 families. The residents remaining in the villages are typically older, with a high proportion of residents now over 60 years old. Due to their small population size, many villages do not have a school, health centre or any bar or restaurant. Some village residents expressed concern that with continued out-migration as the older generation of residents die the village will die with them. The population of some villages may be higher during the summer but generally there is not a significant seasonal change in population.
- Livestock is the key source of livelihood in villages outside of the valleys, with farmers keeping cows, sheep and goats. Within the valleys agricultural production is a key source of livelihood, with limited keeping of livestock. Livestock farmers also typically grow some crops for their own consumption or for small scale commerce. Older residents of mountain villages who cannot physically look after livestock may rely only on small scale agriculture (e.g. vegetables, fruits) in their fields for their own consumption.
- The collection of medicinal herbs also provides a source of income for some residents.
- Aside from farming, local residents outside of the main towns do not typically have significant technical or professional training or experience.
- Some examples of small scale tourism businesses were identified in the remote villages, including hiking guides and a limited number of guest houses used for tourist accommodation in some villages
- Some villages experience significant water supply issues, with limited availability and / or the requirement to pipe or carry in water from surrounding areas. Supply issues may be worse during the drier months of the summer.
- Mobile phone signal coverage is good even in mountainous regions and valleys. Mobile phone ownership is widespread, though some residents may not have enough pre-paid credit to make calls and so only use their phones to receive calls.
- In remote areas agricultural production is restricted due to limited water availability and poor road conditions making it difficult and time consuming to take produce to market. As a result agricultural production is often for household consumption only.

- There is a problem with some residents using unregistered cars without insurance, particularly in rural areas. This is a problem whenever there is an accident with one of these uninsured vehicles.
- In villages close to the larger towns some residents commute for employment in those towns, including in factories. Water bottling plants, including Living Water in Zagoria, also provide employment for some local residents.
- For the residents of remote villages who do not have access to a four wheel drive vehicle the cost to travel to the closest city can be more than \$50, which may be prohibitive even in a medical emergency.
- There is an Aromanian minority – also referred to as the Vlach Minority - in Perment and some villages, and Nderan is an all Aromanian minority. Aromanian is an ethnic group native to the Balkans, traditionally living in northern and central Greece, central and southern Albania, the Republic of Macedonia, Kosovo and south-western Bulgaria.
- There is a notable Greek minority in Libohova municipality. The Greek communities within the administrative unit of Pogoni (villages of Poliçan, Skore, Hllomo, Sopik, Mavrojer, Çatistë and Selckë) have a recognized minority status by the Albanian state. The main and official language is Greek, including for meetings and official documents, but they may also use Albanian when required. Greek pensions used to be a key source of income for the Greek minority but these have now stopped. There is also a presence of Aromanian Minority in some of the Pogoni area villages.

4.11.17 Housing in the Project area

Housing quality in the project area is variable, ranging from typically well built and maintained housing in larger towns and villages in the valleys, through to some poor conditions in more remote villages.

The most used building material is stone or brick for the walls and tiles for the roofs. In towns brick is typical and in remote villages stone is typically used for walls.

Housing was historically concentrated near the centres of the towns and villages, but has increasingly spread to the outskirts since the fall of communism. Remittances have been used to improve and build new houses, but also to restore existing houses. In villages where de-population has occurred due to urbanisation or emigration there are many abandoned houses that are in a poor state of repair. Most remote villages have many abandoned houses that are no longer habitable without significant repair, with roofs and some walls partially or fully collapsed.

Figure 4-37: House in Ndëran village, part of Zagorie Administrative Unit, in Libohova Municipality



Photo taken during field survey (5 July 2018)

Figure 4-38: House in Fratar village, part of Dishnice Administrative Unit, in Këlcyrë Municipality



Photo taken during field survey (3 July 2018)

4.11.18 Land use in the project area

Land Use in Gjirokastrë County

The total area of Gjirokastrë County is 288,446 ha out of which 45,110 ha is agricultural land, 98,844 ha is pasture, 86,061 ha is forest and 147 ha are meadows. Gjirokastrë has the largest land surface area dedicated to agriculture in the county, followed by Përmet, and then Tepelenë. The process of consolidating small, disjointed plots of land into larger, cohesive and more productive agricultural fields is occurring slowly in Gjirokastrë County. The average dimensions of these plots (1.26 ha per family in the county) mean that without consolidation there will be very little room for enlarging agricultural operations.²²³

Much of the agriculture is subsistence farming, providing food for farming households as well as generating some income, though not at the scale of larger commercial operations. Fifty-five percent of farmers have livestock, 40% only cultivate crops, and 5% work in other farming activities. There are about 7,800 cows from which milk and meat are sold and supplied locally, and there are about 145,000 sheep and 40,000 goats in the Gjirokastrë District. A substantial amount of sheep meat is exported to Greece and the milk is used for cheese production and sold in the domestic market. The other parts of the agricultural sector are rather underdeveloped due to lack of equipment and machinery and poor irrigation systems.

Livestock rearing is of great importance in the County. The income generated from livestock via sales of meat, whole milk, and milk by-products, remains significant for most farming households. Livestock breeding, such as cattle, sheep, and goats, is likely to be one of the primary means of economic development in the county in the future, especially since numbers of livestock have risen over the last few years. The recent transfer of large plots of agricultural land for pasture purposes has also accompanied this increase. As a result of low production capacity, livestock breeding is perceived as not being used to its full potential and the economic situation of many breeders has not been improving.

The County is rich with olives, grapes, oranges, cherries, apricots, apples, pears, plums, figs, and different varieties of nuts. The cultivation of olive trees has been increasing, especially in Përmet, throughout the

²²³ Ministry of Agriculture, Food and Consumer Protection, Albanian National Land Consolidation Strategy 2013
<http://extwprlegs1.fao.org/docs/pdf/alb149566.pdf>

municipality of Tepelenë, and to a lesser extent in some areas of the municipality of Gjirokastrë. Despite the decline in cultivation of grapes during the political transition years, cultivation of the fruit is now recovering quickly and becoming a staple product for farmers. Tobacco plantations are also traditional crops of the County.

Sustainable management of forests in the County is a challenge, with perceived lack of control over illegal activities such as indiscriminate logging, and overgrazing. Albania has large areas of forests and mountain lands and a rich variety of wildlife, including deer, wolves, bears, jackals, foxes, wild boar, lynx, and various birds. In the past, hunting was reserved for the Communist party elite, since the possession of shotguns and other firearms by the general populace was prohibited. More recently, the Albanian Parliament has adopted a total hunting ban enforced from 2016 to 2021²²⁴ prolonging the first ban from 2014 to 2016. Rabbit, partridge and thrush were commonly hunted in the past.

A wide range of different medicinal herbs are grown in the region. With about 500ha of cultivated area of medicinal and aromatic plants, Albania is one of important players in the production and exportation of these natural resources. The medical and aromatic plant sector generates about 18 million Euros of exports, which is the second largest sector in agricultural exports. Traditionally, Albania exports wild, raw medicinal plants that are treated and packaged abroad. Processed plants are then used in the food industry for herbal teas, in various food preparations, as extracts for essential oils, in the beverage industry, as health products, and in cosmetics and perfumes.

Land Ownership and Use within Seismic Corridor

Within the seismic corridors the predominant land uses indicated by the Corine land cover data set are (Figure 4-39):

- Scrub and/or herbaceous vegetation associations (33%). This includes natural grasslands and transitional woodland shrub.
- Forest (25%), principally broad-leaved forest.
- Heterogeneous agricultural areas (24%), which includes areas of small land parcels with diverse annual crops, pasture and/or permanent crops, and agricultural areas interspersed with significant natural areas.

These data indicate that the following types of land use can be anticipated to occur within the seismic corridors:

- Farming of a variety of agricultural crops
- Farming of livestock, including use of pasture lands.
- Farming of fruit trees and berry plantations.
- Growing and collection of herbs from pasture and other areas.
- Use of forests for recreational values and collection of wood.

It is noted that the Corine land cover data set is a coarse classification of land uses and that the actual land uses impacted by the seismic line will only be known once the location of the line has been set, within the already set seismic corridor. As such, there could be, for example, a higher proportion of the line impacting permanent crops than is shown in this table. The data shown in Table 4-18 is however, expected to be indicative of the project area.

The following information on land use and ownership was provided by local residents during the field mission:

- Much of the agricultural land in the valleys is planted with annual crops, including oat, wheat and vegetables. There are also areas of vineyards, fruit trees, olive trees and hazelnuts. In the mountainous villages crop production may be limited to the areas closest to the village and may be principally in the garden of each household for household consumption only. In the valleys agriculture is conducted on a commercial basis.
- Grazing takes place in hill and mountainous areas, and is done on a mix of privately owned and publically owned land. The publically owned pasture land is rented out to farmers for use by their livestock, with fees charged by the municipality that owns the land on a per head basis. Livestock may be moved higher into mountain pasture during the summer.

²²⁴Law no. 61 dated 02.06.2016 "On Hunting Moratorium", <https://www.parlament.al/wp-content/uploads/2016/06/ligj-nr.-61-dt.-2.6.2016.pdf>

- There is a low level of documentation of land ownership, and so many landowners do not have documented proof of their ownership. However, village heads are aware of which areas are owned by which family. The allocation of land following the political transition was complex, and some landowners may own multiple parcels of land. Some landowners may no longer be resident in the village where their land is located as they have migrated to cities or other countries.
- Medicinal herbs can be collected from public lands without requiring a permit or license. Collectors may come from outside the local area, and there are no records kept of who uses which areas for collection.
- Albania remains a significant source country for cannabis, which is distributed with the help of a complex network of organized-crime groups. While authorities increased their counter-drug operations in 2017, there were also reports of decreased cannabis cultivation within the country.²²⁵ Cannabis cultivation was reported as having decreased in the area, though there may still be some areas used for this illegal activity in Memaliaj and Tepelene. Precautions should be exercised as in these two areas can be increased risk, especially if there is any cannabis cultivated area, where for sure people with guns may protect it. The employees working in these areas should have a contingency plan for emergency situations as local police may have limited ability to protect and assist them immediately in the remote areas. Police presence may be also requested during the implementation of the project in these two specific areas.
- There is some beekeeping in the project area, and a small number of beehives were observed.
- Illegal hunting is reported to take place in some areas, including for rabbits, wild pigs, bears, and quails.
- Wildfires have occurred in some areas, and are an ongoing hazard.

Table 4-18: Different land uses within the 500m seismic corridors

Main Land use	Category of land use	Sub-Category of land use	Total Area*	% of total
Agricultural Areas	Arable land	Non-irrigated arable land	833	
		Permanently irrigated land	38	
	Arable land Total		870	8.1
	Heterogeneous agricultural areas	Complex cultivation patterns	1366	
		Land principally occupied by agriculture, with significant areas of natural vegetation	1208	
	Heterogeneous agricultural areas Total		2574	23.9
	Pastures	Pastures	467	
	Pastures Total		467	4.3
	Permanent crops	Fruit trees and berry plantations	66	
		Olive groves	40	
	Permanent crops Total		106	1.0
Forest and Semi-Natural Areas	Forests	Broad-leaved forest	2558	
		Coniferous forest	140	
		Mixed forest	26	
	Forests Total		2724	25.3
	Open spaces with little or no vegetation	Beaches, dunes, sands	69	
		Burnt areas	11	
		Sparsely vegetated areas	162	
	Open spaces with little or no vegetation Total		241	2.2
	Scrub and/or herbaceous vegetation associations	Moors and heathland	133	
		Natural grasslands	1243	

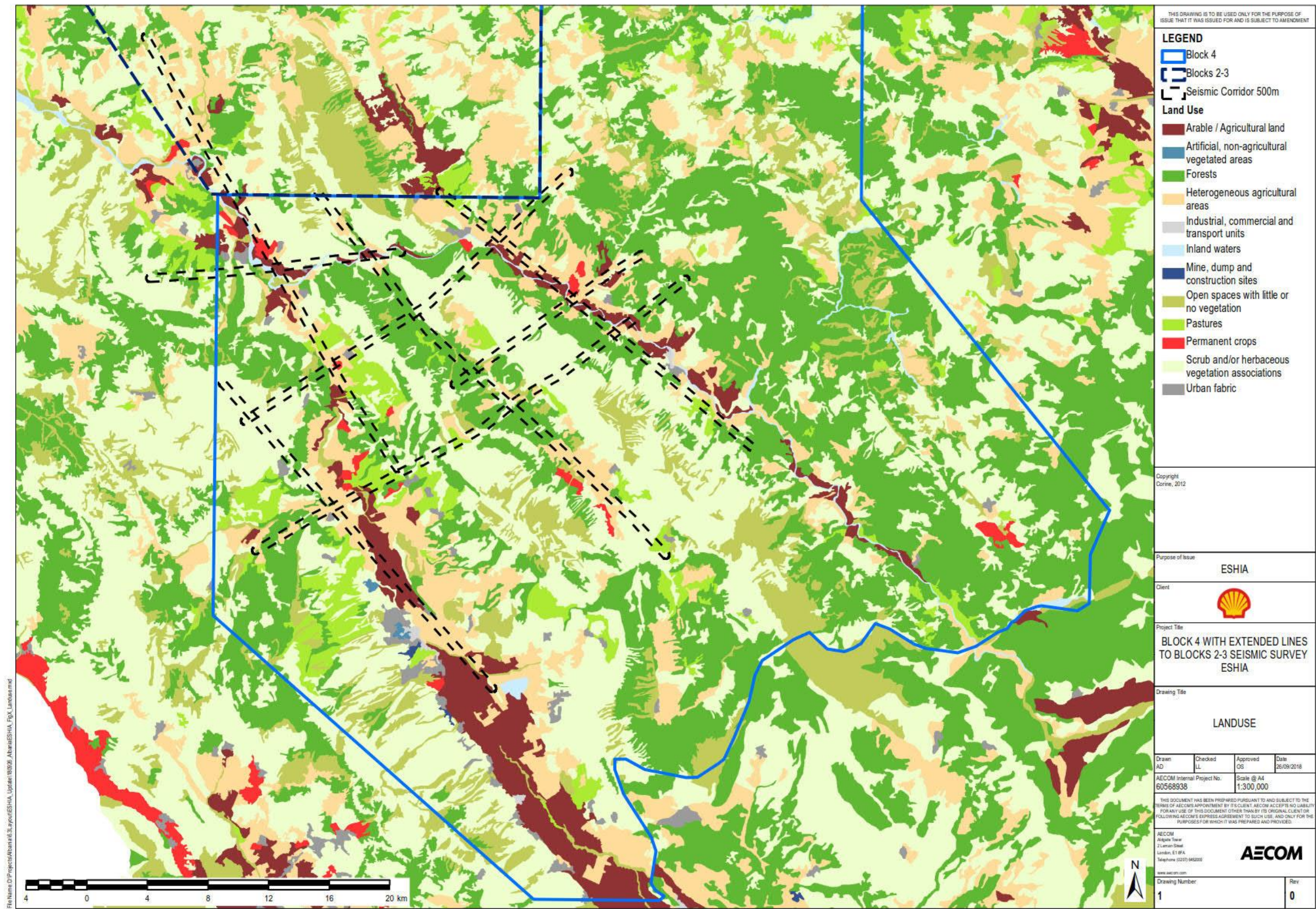
225United States Department of State Bureau of Diplomatic Security Albania 2018 Crime & Safety Report
<https://www.osac.gov/pages/ContentReportDetails.aspx?cid=23195>

Main Land use	Category of land use	Sub-Category of land use	Total Area*	% of total
		Sclerophyllous vegetation	895	
		Transitional woodland-shrub	1274	
		Scrub and/or herbaceous vegetation associations Total		3544
	Water Bodies	Inland waters	Water courses	154
Inland waters Total		154	1.4	
Urban Area	Urban fabric	Discontinuous urban fabric	69	
	Urban fabric Total		69	0.6
TOTAL LANDUSE WITHIN SEISMIC CORRIDOR			10750	

Land ownership documents do not exist for all land properties and owners in the project area. Families often own several parcels of land spread over a wide area. Uncertainty over land rights remains an obstacle in the project area and land access is a sensitive issue.



Figure 4-39: Land Use within Block 4 (European Commission, Corine Land Cover, 2012)



4.11.19 Tourism

Overview

The key tourist attractions within the project area are the Gjirokaštër city UNESCO world heritage site, the recreational opportunities provided in the mountains and rivers (including hiking, mountain biking, climbing and rafting), and the opportunity to visit cultural heritage sites including churches and archaeological sites. Gjirokaštër and Permet are key bases for tourism in the area, and each have a number of hotels.

While the region and Albania more generally are not tourism 'hot-spots' at an international level, there is marketing of the area for its outdoor opportunities, culture and local food, and tourism is economically important in the area. Aside from the main tourism towns of Gjirokaštër and Përmet there is some tourist activity in the rural areas, with tourists visiting remote cultural heritage sites and taking part in outdoor recreation. Some rural residents provide tourism services through hike guiding and provision of basic accommodation.

Main tourist attractions in Gjirokaštër city

Since 2005 the city of Gjirokaštër has been a UNESCO World Heritage site in recognition of the importance of its architecture and unique values. The origin of the city starts with the castle of Gjirokaštër, built in the 4th century AD. The city was named Argyrokastro in 1336. In 1417, it was conquered by the Ottoman army. The city reached its peak over 1800-1830, when monumental assembly houses were built. Gjirokaštër was an important administrative centre during 19th-century, it was populated by landowners who had the finances to build the grand fortified tower houses known as *kullë*. There are over 500 of these historic buildings in the city. The main characteristic of Gjirokaštër is the intensive use of stone in building the houses, which look like small fortresses, and the streets of cobblestone. Due to all these features, Gjirokaštër is also known as the "The Stone City".

Gjirokaštër had approximately 35,000 visitors in 2014²²⁶ and 43,000 in 2015²²⁷. As well as visitors from elsewhere in Albania, foreign visitors come principally from Eastern Europe, Germany, Greece and Italy. The main attractions in Gjirokaštër city are²²⁸:

- **Castle.** The most important structure of the city is the castle, which is the biggest castle in Albania. The castle is open all year round (April to September 09:00 to 19:00, October to March 09:00 to 17:00) with an admission price of 200 Lek. The castle has been the nucleus of Gjirokaštër, with most of its population originally living within its walls until the Old Bazaar Quarter (Pazar i Vjetër) developed outside its walls. The National Folk Festival has taken place in this castle during the years.
- **The Bazaar of Gjirokaštër.** By the 1580s the town had more than 400 dwellings, and in the 17th century Memi Pasha, the Ottoman governor, laid out a new commercial quarter with a mosque, on the present site, with all roads coming together at the 'neck' of the bazaar. This first planned town centre was almost completely destroyed by fire and rebuilt in the 1750s. Nowadays the area has many shops, artisan activities and bars and restaurants.
- **Museum of Weapons.** The Museum of Weapons opened in 1971 and is located within the castle. Weapons from the prehistoric times up to the World War II are exhibited.
- **Ethnographic Museum.** This museum located in the house where the former communist dictator Enver Hoxha was born.
- **Houses.** Some of the houses with historic significance can be visited, such as the house of Zekati family in Palorto, which has undergone restoration and is one of the most magnificent and characteristic buildings of Gjirokaštër. The Babameto House is an elegant 2 stores house situated in the very heart of the Bazaar, and after restoration is now open for the public, serving as a Centre for Culture and Heritage and hosting cultural and tourist events. One of the famous spots to visit at Sokaku i te Marreve (Mad People Street) is the reconstructed house of the famous Albanian writer Ismail Kadare.
- **Culinary specialties.** The town of Gjirokaštër is known for its culinary specialties; including *pasha qofte*, *shapkat*, and *oshaf*, which is a dessert with sheep's milk, sugar and dried figs.

²²⁶Kotollaku, M and Margariti, M (2015). *Cultural Tourism in Gjirokastra*. European Scientific Journal May 2015 edition vol.11, No.14

²²⁷Avdulaj, J and Muco, K (2016). Gjirokastra's promotion as a branding and marketing city. Business and Economic Research 2016, Vol. 6, No. 2.

²²⁸Albanian National Tourism Agency, 2018. Gjirokastra. Available at: <http://albania.al/destination/13/gjirokastra/>

Cultural heritage sites located close to Gjirokaštër can also be visited by tourists while staying in Gjirokaštër, including²²⁹:

- **Antigonea.** The archaeological park of Antigone is located near Saraqinishte village, approximately 14km east of Gjirokaštër. There are many attractions to be visited in the archaeological park Antigone such as: the mosaic, columns, promenade, an antique scale, the surrounding walls, etc.
- **Hadrianapolis.** The ancient theatre of Hadrianapolis is located near the village of Sofratika, approximately 14 km to the south-east of Gjirokaštër. The Hadrianapolis amphitheatre dates back to the 2nd century B.C; it has a capacity of 4,000 seats and has 27 steps. Cajupi's field lies in Lunxheria area, which is 1,310 meters above sea level; it is a flat area, which is used as climatic resort and surrounded by many sources of cold water.
- **Churches.** There are many old churches in the area that can be visited by tourists. This includes the church in the village of Labove e Kryqit, located near the small town of Libohova, where there is one of the oldest and the most beautiful Byzantine churches in Albania, dedicated to St. Mary.

Main tourist attractions in Përmeti area

Tourism is a key economic activity for the Permeti area. The preferred time for visiting Permet is April-May and September – October because of the weather and hiking conditions. During April to June there are many visitors from Germany and Israel, and during the summer there are many Albanians and Italians. The key tourist attractions in the Permeti area are²³⁰:

- **Natural environment.** The natural environment of mountains and valley is a key tourist attraction, providing outdoor recreation and thermal water attractions.
- **Cultural heritage sites.** These include many churches, Byzantine monasteries, archaeological ruins left over by the Turkish invasion (castles, bridges etc.), and the Bektashi monuments found in the villages of Frashër and Ali Postivan
- **Folk culture, local food and folk music.** These are known throughout Albania, and there are a number of events during the year that display the local folk culture and music. The highly valued local food produce includes grapes, cherry, apricot, figs, aromatic and medicinal plants, meat products (lamb, goat's meat), cheeses, honey and machete (a freshly-flavoured dessert).
- **Outdoor recreation.** The area includes good sites for mountain biking, climbing, hiking, off-road driving, and rafting. Many people come to Permet to raft on the Vjosa River.
- **Thermal waters.** Thermal springs and a canyon are located in the area around Benja, a village located about 8km from Përmet. The natural thermal waters can be accessed in natural pools, with temperatures ranging from 25°C to 28°C, and are used for treating rheumatism, dermatological diseases, acne, osteoporosis, gastritis, etc.

Accommodation

Gjirokaštër has an accommodation capacity of 800 beds in the historical centre²³¹. In the area of Permet and Kelcyra there are approximately 400 beds for accommodating tourists²³². These areas are the key areas for tourism accommodation though there will also be smaller levels of hotel accommodation in other parts of the project area.

Events

During the year there are a number of events that take place for local people and tourists. Some events are regular annual events that take place at approximately the same time each year, and some are one-off events. The main regular events that take place in the tourist areas of Gjirokaštër and Permet are²³³:

- Summer Day (March 2018 in Gjirokaštër and Përmet)

²²⁹ Albanian National Tourism Agency, 2018. Gjirokastra. Available at: <http://albania.al/destination/13/gjirokastra/>

²³⁰ Identified through discussion with Permet Touristic Information Center and from www.visitpermet.org.

²³¹ Kotollaku, M and Margariti, M (2015). Cultural Tourism in Gjirokastra. European Scientific Journal May 2015 edition vol.11, No.14.

²³² Personal communications: discussion with Permet Touristic Information Center, July 2018.

²³³ Bashkia Permet, Kalendar i aktiviteve, available at: http://www.bashkiapermet.gov.al/?page_id=630; Bashkia Gjirokaštër, Kalendar i aktiviteve kulturore vjetore, available at: <http://bashkiagjirokaštër.gov.al/events/kalendar-i-aktiviteve-kulturore-vjetore-bashkia-gjirokaštër/>

- Opening of the Tourism Season event (April in Permet, May in Gjirokaštër)
- Folk group concert (end May or early June in Permet)
- Gjirokaštër cultural activities during weekends in June, July, August²³⁴.
- ‘Saint Mary’ celebration and holiday party with concerts (August in Permet)
- Divani Lunxhot cultural festival (August 2018 in Gjirokaštër)
- Argjiro Fest (concerts, painting exhibitions, culinary exhibitions) (3 days, September in Gjirokaštër)

During these events there are higher numbers of people present in the area, with higher occupancy in hotels.

The National Folk Festival was last held in Gjirokaštër in 2015 and is a significant and large festival of folk culture, showcasing Albanian traditional music, dress and dance from Albania and the broader region. It has taken place on a five-yearly basis, though it is not yet known when the next festival will take place.

Touristic activities and attraction is present in the project area mainly in the town of Gjirokaštër due to its architectural and historical sites and less along the Vjosa river valley (and Permeti area) mainly for nature exploration and biking. The most frequent tourism period in Gjirokaštër town is during the spring, summer and autumn. The preferred time for visiting the Vjosa river valley and Permeti area is April-May and September – October because of the weather and hiking conditions. The project activities and tourism may have some interactions in terms of hotels availability, restaurants capacities and travel risks along especially the bikers along the Vjosa valley.

4.11.20 Drinking water supply

The drinking water supply in the project area is provided by two types of systems: municipal water systems providing water for the main towns, and local village systems providing water at the village level.

Due to recent territorial and water reforms²³⁵ water supply maps and descriptions of water supply systems are not consolidated and published. As part of the recent territorial reform²³⁶ water supply enterprises have been reorganized as Directories within each municipality. Tepelena and Memaliaj Municipalities have agreed to have only one joint water supply administrate²³⁷.

A specific performance report (PR) for the service of the water supply in Albania is published on yearly basis from Water Regulatory Authority (WRA) in Albania that assesses the performance and progress of the Water Supply Enterprises. According the latest performance report²³⁸ of WRA, due to limited water availability; all municipalities (Figure 4-40) provide limited hours of water supply, with Këlcyra, Kolonja and Delivina each providing an average of less than 10 hours of water supply per day.

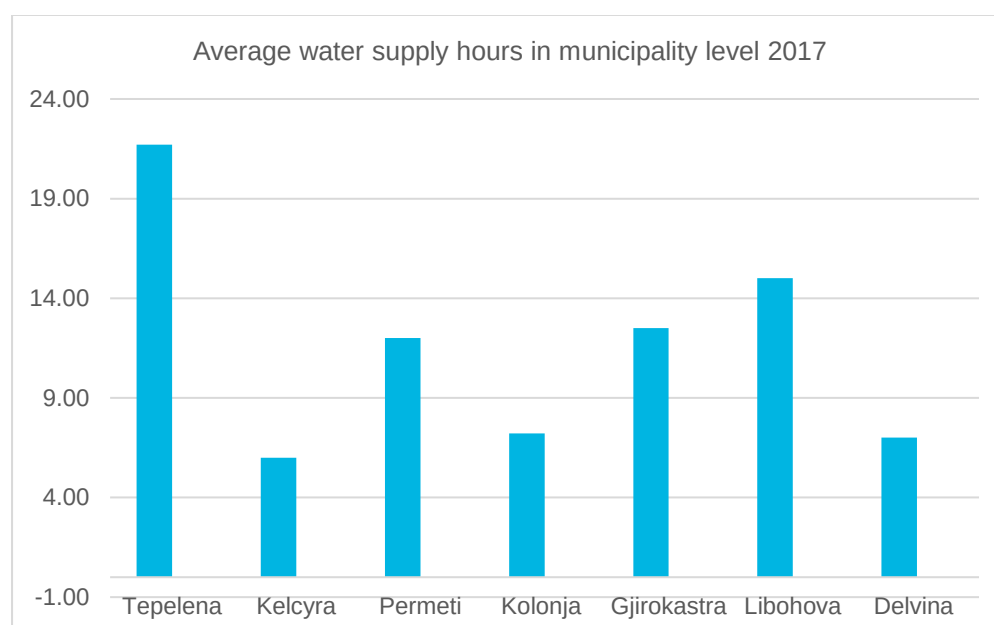
²³⁴A number of Gjirokastra's cultural and tourist events take place during each year at the Gjirokastra festival stage, which was erected in the city in the 1980s and has for some years been the home of the Albanian National Folk Festival, held every four years (last held in 2015).

²³⁵DCM no.63, dated 27.01.2016 "For the re-organization of operators towards the service of supply with drinking water, collection, distribution and treatment of polluted waters"

²³⁶<https://www.reformaterritoriale.al/>

²³⁷Memaliaj Mayor communication during the 3d mission of engagement

²³⁸http://www.erru.al/doc/Raporti_Performances_2017.pdf

Figure 4-40: Water Regulatory Authority - Performance Report 2017²³⁹

According to the performance report 2017, at the country level the average for municipal water supply is 12 hours per day. Approximately 65% of the water produced does not provide financial revenues as payments for supply are not collected). In terms of cost coverage in country level, this figure indicates the average level of 85% meaning that dominant part of the municipalities have financial shortage to invest in the water systems.

Based on feedback received during engagement and social research at the village level,²⁴⁰ the majority of water supplied to villages is from natural springs along the hills and mountains and a few drilled ground wells. Villages have independent water supply systems (i.e. not connected to other villages or municipalities), which usually consists of a central community water store that stores water from a nearby spring and delivers it to different parts of the village via pipes. Above-ground flexible plastic piping is commonly seen in villages though there may also be buried piping. In some villages there are community water taps that are supplied by springs and from where community members can take water.

Water quality testing is performed from Institute of Public Health but data are not made public and managed only from authorities. The testing of water is more focused on towns and systems with high community agglomerations.

Albanian legislation calls for the establishment of sanitary protection zones on a case by case basis by the water authorities. There are no official records of these areas. Although the local authorities were not able to provide maps of water system infrastructure they were able to indicate on maps the locations of some water system infrastructure in the project area. The locations are only indicative and the extent of the sanitary protection area is not known. The sites are presumed to groundwater wells or constructed water deposit close to a well and the locations can be considered to be "drinking water sensitive areas". A water supply survey was not undertaken therefore there may be other water supply sources, such as private wells or springs, within the project area that have not been identified. Springs that have been identified are shown in Figure 4-16.

The information on water supply sources provided by local authorities is illustrated on Figure 4-41. It should be noted that due to the lack of centralised mapping of water systems, Figure 4-41 does not indicate all water supply infrastructure within the project area. There are 20 water supply sources in the vicinity of 7 of the proposed seismic corridors and protection zones. At the village level it can be expected that there could be multiple springs, storage tanks, taps and piping systems for each village, and these are not indicated in Figure 4-41.

The water supply sources based on point locations are summarized in Table 4-19:

²³⁹ http://www.erru.al/doc/Raporti_Performances_2017.pdf

²⁴⁰ Municipality Water Enterprises, Administrators of municipalities and village heads/chairman

Table 4-19: Water Supply Sources within the 500m seismic corridors and 200 meters protection zone

Map Label	Water supply source	Seismic Corridor (500m)	Protection Zone (200m)
1	Badelonja	Yes	Yes
2	Leshnica	Yes	No
3	Mokrice-Zleusha	Yes	Yes
4	Piskova	Yes	Yes
5	Rapcka	Yes	Yes
6	Rapcka (Vila)	Yes	Yes
7	Bedqyras 1	Yes	Yes
8	Bedqyras 2	Yes	Yes
9	Bedqyras 3	Yes	Yes
10	Humelica	Yes	Yes
11	Cepuna	Yes	No
12	Plesati 1	Yes	Yes
13	Plesati 2	Yes	Yes
14	Bulua	Yes	No
15	Kakazi	Yes	No
16	Hormova	Yes	Yes
17	Leki	Yes	No
18	Dragodi 1	Yes	Yes
19	Dragodi 2	Yes	No
20	Memaliaj	Yes	No

Water samples were not collect from the water supply sources identified in Table 4-19. However, as noted in **Section 4.8, Water Resources**, the Quaternary aquifer of Vjosa is monitored at 6 locations: Buduk, Budrishtë, Vanistër, Kafaraj, Novoselë and Pish – Poro, with the first three located within the Block 4. The recorded data (physical and chemical parameters) indicates generally good water quality.

Photographs of a community water store, a drinking water pipeline and a community water tap are shown in Figure 4-42, Figure 4-43 and Figure 4-44, respectively.

Figure 4-42: Example of a community water store



Figure 4-43: Example of drinking water piping



Figure 4-44: Community water tap in project area (Skore village)



The main problems related²⁴¹ to drinking water in the project area are:

²⁴¹ As per feedback provided during stakeholder engagement and social research conducted during the field missions

- There is a lack of investment and maintenance in water distribution systems
- Towns are much better serviced and supplied with drinking water, while rural areas and villages have partial water piping to residents;
- There is significant water supply shortage in dry seasons. This is reflected in short hours of water supply for towns, especially in Këlcyra Municipality
- There is no comprehensive and regular testing of water quality in all settlements in project area.
- The water supply system incurs financial losses as there is not a full collection of water consumption tariffs.
- There is no available data and mapping of the water sources and systems.

4.11.21 Waste management

National context

The National Integrated Waste Management Strategy and Action Plan (2010 – 2025) is the main planning document in the field of municipal, non-municipal and hazardous waste management. The strategy was developed in 2011²⁴² and currently is under revision and update for new period 2018 -2033.

Waste management remains a challenge for Albania, as noted in the Albania 2018 Report of European Commission²⁴³:

“The legal framework for waste management is partially aligned. The national strategy on waste management (covering 2010-2025) is being revised but implementation remains at an early stage. Work done on waste landfills has brought waste treatment facilities closer to the EU standards. Further efforts are needed to close the over 300 non-compliant landfills, increase the separate collection of different waste streams and reduce bio-waste. Economic instruments to promote recycling and prevent waste generation remain limited. The construction of an incinerator in Elbasan which started to operate last year and plans for further investment in incinerators pose concerns in terms of compliance with EU principles since disposal and incinerations are the least preferred waste management options.”

Municipalities are responsible for the management of urban solid waste, as defined by the approved Law 10463, dated 22.09.2012 "On Integrated Waste Management" and other legislation. Ministries are in charge of adopting legislation, strategies and plans in national level and providing technical and financial support to the municipalities to build waste infrastructure and align with waste management.

Waste management practices in the project area

Collection of the waste in all municipalities is conducted from several local sub-contractors selected and contracted from each municipality. These companies are generally small and perform the clean-up of the waste bins and transportation of the waste to the assigned disposal site. While several recycling companies are operational in Albania (focused on recycling of metals, plastic and package paper²⁴⁴), there is not yet in place any functional waste segregation and recycling system for the municipalities in the project area. There is a separate private service for treatment of medical waste. A few private licensed companies provide such service, including one in Gjirokastër town²⁴⁵.

The Ministry of Tourism and Environment (MTE) with support from various agencies has undertaken a recent assessment for the mitigation of risk from existing waste disposal sites in all regions of Albania. The assessment report²⁴⁶ was finalized in June 2018 and provides an overview of the current situation of waste management in all municipalities. The results of the MTE assessment indicate that in Gjirokastër County there are eight waste disposal sites, with one for each municipality except Permeti which has two disposal sites (Figure 4-45).

²⁴²DCM no.175, dated 19.01.2011 "On approval of National Waste Management Strategy and National Plan for Waste Management"

²⁴³²⁴³ European Commission (April 2018), Albania 2018 Report, pg.86 <https://ec.europa.eu/neighbourhood-enlargement/sites/near/files/20180417-albania-report.pdf>

²⁴⁴http://www.ara.org.al/?page_id=12

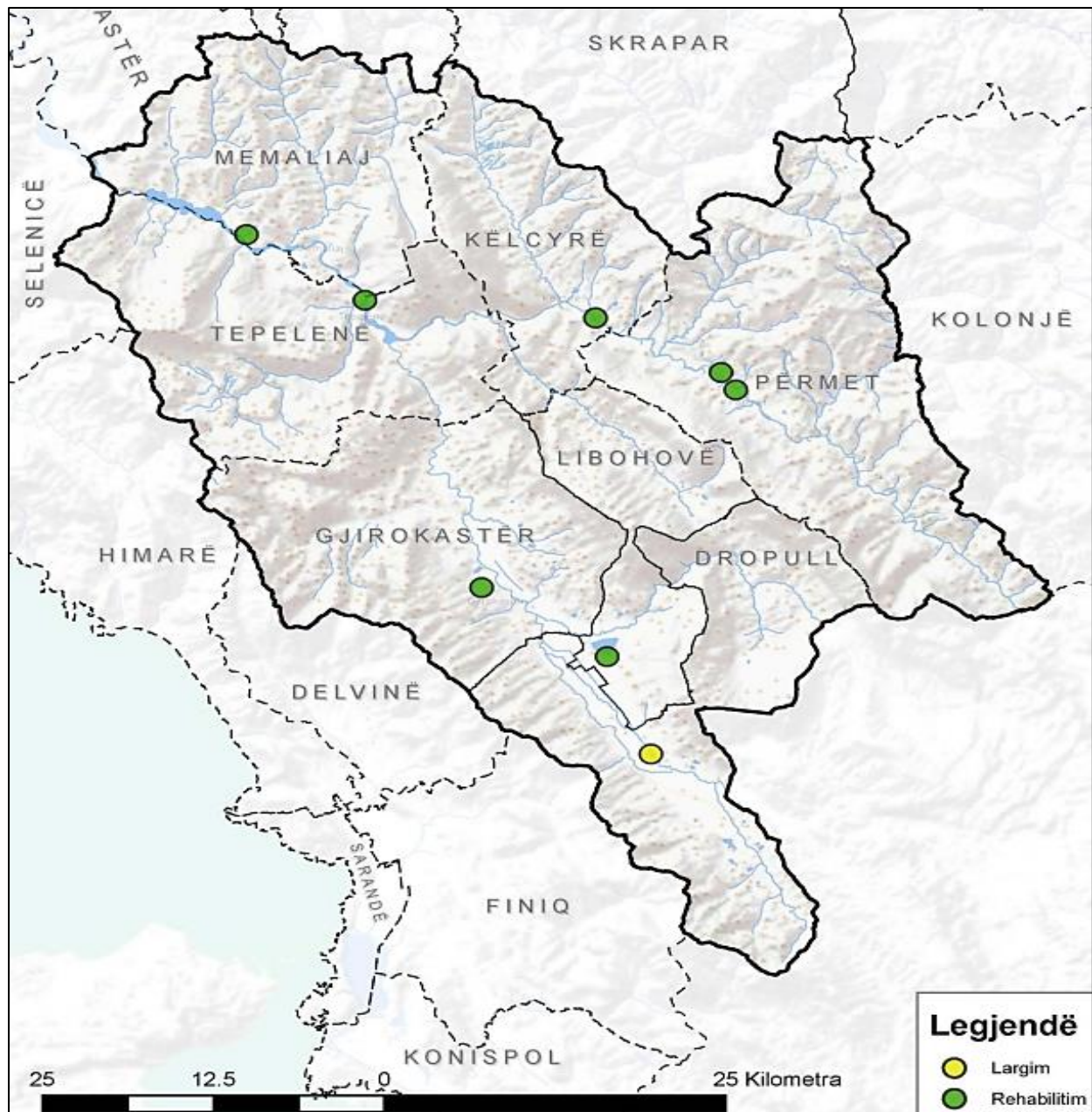
²⁴⁵ <http://ecoriciklim.al/>

²⁴⁶MTE (June 2018), Risk mitigation in landfills, Final report, <https://www.km.dldp.al/wp-multimedia/swm/Reports%20SWM/Shqip/-Zbutja%20e%20Riskut%20ne%20Vend%20depozitime%20Raporti%20Final.pdf>

All disposal sites do not meet the basic sanitary environmental standards and are open pits into the soil or dumping of waste on the soil surface. Out of eight disposal sites five are located close to water courses (rivers), discharges pollution into close by the rivers and water courses. In Kolonja municipality there are two disposal sites, neither of which meets any national environmental protection standards.

Delvina Municipality is serviced from the Bajkaj landfill, located within Delvina Municipality), managed from specific enterprise (Bajkaj Land sh.a) under the authority of the Regional Council of Vlora. The landfill was financed by the World Bank and was constructed to cover the entire Vlora region for 20-25 years. It is operational since in 2014 and meets the environmental protection standards. It is licensed to accept municipal solid waste only, i.e. no hazardous waste. Use of Bajkal landfill by private operators from outside Vlora region is subject to authorisation with the Bajkal Management Authority. There are no wastewater treatment facilities within the municipalities of the project area and sewage is discharged in river flows along each settlement; the closest waste treatment facility is located in Saranda town.

Photographs of the waste disposal site in Përmeti and the Bajkaj landfill are shown in Figure 4-46 and Figure 4-47, respectively.

Figure 4-45: The locations of the existing waste disposal sites at Gjirokaštër region²⁴⁷

Note: Yellow dot proposed to be closed, green dots proposed for rehabilitation efforts

²⁴⁷<http://uts-01.com/WebGis/venddepozitime/>

Figure 4-46: Waste disposal site in Permeti (Photo of 2 July 2018 during 2nd mission)



Figure 4-47: Bajkaj landfill²⁴⁸



Within the project area, waste and sewage disposal remains one of the main sources of soil pollution. Solid waste management is not at adequate level and waste is being dumped in open pits and left to be degraded releasing contaminants into the environment. The project area lacks of waste disposal infrastructure and the closest landfill with adequate disposal standards is Bajkaj located in Delvina Municipality. No wastewater treatment plant (WTP) is available in the project area. The closest WTP to the project area is in Saranda Town, approximately 60km from Gjikastër Town.

²⁴⁸ <https://www.facebook.com/Bajkaj-Land-1426934794265608/>

4.11.22 Education in the project area

Access to primary education in the rural parts of the project area is challenging as not all villages have an elementary school. For those villages without an elementary school, the nearest school is some kilometres away in a neighbouring village or city. In general, there is one school in the village that is the centre of the administrative unit. However, even these schools are under pressure of closure because the number of children in villages is continuing to decrease with the migration of people from the rural villages. Some schools have less than three attending children with only one teacher teaching all the subjects for all grades.

Enrolment rates in primary schools have fallen since the mid-1990s for both girls and boys. The enrolment rate for girls in urban and rural areas is lower compared to boys, especially with regard to the upper level of primary education in rural areas. This is a result of the belief in many rural villages that completion of the lower level primary education is sufficient for girls.

The quality of schooling in the project area, mostly in the rural areas, has suffered over the past decade for several reasons. The majority of elementary schools in the villages have to organize combined classes because of a limited number of pupils. These combined classes of different age groups limit the effectiveness of the teaching process. In urban centres, the immigration from rural areas has had the opposite effect on classroom sizes with student-teacher ratios increasing, once again impacting on the quality of teaching.

A large number of schools in the project area are also in a poor physical state of repair. Over the past ten years, investment has gone into improving school infrastructure in the region, with funds coming from the state budget and foreign donors. These investments have largely targeted the upgrading of existing school buildings or the construction of new ones, diverting funds away from other aspects of the education system such as quality assurance and school administration and management. Teacher training, especially those in rural areas, is regarded as insufficient, inefficient and lacking proper assessment standards.

Access to secondary education has improved, with enrolment and attendance rates growing. However, problems also exist in secondary education. Most secondary schools are located in towns and the majority of students come from urban areas. The growth in secondary education has also been accompanied by an increase in student-teacher ratios.

In the project area, there is one public university, University Egerem Çabej Gjirokaštër, and branches of the private universities such as the Albanian University. According to the Ministry of Education and Science, the total number of students registered in the public University Egerem Çabej Gjirokaštër²⁴⁹ during the academic year 2014-2015 was 1,616 full-time students (out of which 56.9% were female), and 840 part-time students.

4.11.23 Health Services in the project area

The healthcare system in the project area comprises primary healthcare, hospitals and pharmaceutical services. Primary healthcare services represent the most important part of this system. They are often the first point of contact for people in need of health services. There is a requirement for each administrative unit to have at least one health centre, which provides basic medical attention. Each health centre should have a general practitioner supported by nurses and/or midwives. Typically they have a nurse providing basic services with a doctor visiting on a periodic basis, e.g. once a week. Each village should also have at least one ambulance; however, it was noted during the field mission that except for the villages that the centre of the administrative units, there were typically no health facilities or ambulances.

According to the social research conducted during the field surveys, the villagers complained that the health centres offer a very basic care service which is mostly related to information and referral to a more specialized visit in the city, and are not appropriately supplied with medication or equipped to provide any specialized health services or medical tests. In villages in the mountain areas which lack paved road access, the costs for reaching a hospital in the case of emergency can reach 50-60\$, which is prohibitive for some residents.

Advanced care hospitals and pharmacies are available in the cities of Gjirokaštër, Tepelene, Përmet, Kelcyre, and Libovohve. Three hospitals serve a population of 166,788. There is one hospital in each of the following cities: Gjirokaštër, Tepelene, and Përmet. The combined number of beds in the three hospitals in the county totals approximately 370; this is the least number of beds per capita in all Albania.

²⁴⁹University Egerem Çabej Gjirokaštër <http://www.uogj.edu.al/>

Gjirokastrë County has one of the lowest numbers of general practitioner doctors in the country. The ability of the region to attract and retain doctors is challenging. Doctors are migrating to areas where they can access larger client bases, better infrastructure, and higher salaries. There are 58 physicians, 214 nurses and 42 health centres in Gjirokastrë County.

4.11.24 Key health outcomes

The public hospital service in Albania is provided by regional hospitals with basic services and specialized hospitals, which are mainly concentrated in Tirana and other district centres in the country. In 2017, there were 55 public and non-public hospitals in the country, of which 42 being state hospitals and 13 private hospitals. Coverage of the public and non-public hospital service is 2 hospitals per 100,000 inhabitants and the number of public and non-public hospital beds is 8,885 (3 beds per 1000 inhabitants). In 2017, there are 413 outpatient health centres, 2,022 ambulances, as well as 46 specialized polyclinics.

In 2017, the total number of visits to the primary service was 7,942,742, averaging 3 contacts per person per year. The number of visits to the children's consultant during 2017 was 929,330, while the visits to the women's consultant were reported to be 272,172. The number of patients, operated on in 2017, has increased by 10.0 % compared to the previous year. The primary care service is 2.7 times per patient, in other words each resident in Albania in 2017 contacted the primary health care centres on average three times.²⁵⁰ The number of first obstetric visits was reported as 32,787, which corresponds to the number of births reported in 2017.

The hospital service is an important part of the tertiary service is represented by the University Hospital Center (QSUT) which has the highest number of admissions and operations per year for the whole country. In 2017, 34.4% of the total hospital admissions were realized at QSUT, while the operations carried out in this centre accounted for 46.7 % of the total operations in the country. The average hospital stay of a hospital patient was 5.4 days in 2017 and 5.3 days in 2016 with a bed rotation of 32.8 times a year. The use a hospital bed for health care during 2017 was 176.8 days, approximately 48.4 % of the calendar days in a year.

The specialized mental health hospital service is concentrated in the Vlora and Elbasan districts with special hospitals. In Shkodra and Tirana, the mental health service is included within the hospital service. An important role in this service is community mental health centres and supported homes.

In 2017, the number of deaths registered in Albania was 22,232, an increase of 3.9% in comparison to the previous year. By gender, the number of deaths reported for males was 11,610 (2.9% more than in 2016) and for women 10,622 (5.1 % more than in 2016). The crude mortality rate for 2017 was 77.4 deaths per 10 thousand inhabitants, compared to 74.4 in 2016. With respect to the cause of deaths, the largest share of deaths from "Natural causes" was 90.1%, followed by "Accidents" comprising 2.1%.²⁵¹ Mortality statistics are classified by group (Table 4-20).

Disease Group "Diseases of the bloodstream" is the dominant cause of death in all prefectures. This cause marks the highest value in the Berat prefecture with 61.7 % of the total number of deaths and Kukës with 61.6% of the total number of deaths. The "Tumor" group causes over 13.0% of total deaths in each prefecture, marking the highest value in Shkodra prefecture with 18.2% of deaths. Disease Group "Symptom, Signs and Unspecified illness" is the third leading cause of deaths for all prefectures with the highest value in Elbasan district with 24.3 % and Gjirokastrë with 21.4%.

The diseases group "Diseases of the bloodstream" is the main cause of death, both in women and men, respectively 210 and 205 per 100,000 inhabitants. "Tumors" are the second leading cause of deaths for both genders, with a male dominance of about 30 percentage points. The mortality rate for this group for males is 78.3% for males and 48.5 for females per 100 thousand inhabitants.

In 2017, deaths from the group "Diseases of the bloodstream" accounted for 53.7% of total deaths. This disease group continues to be the leading cause of death, with a mortality rate of 41.5 per 10,000 inhabitants, showing a 2.5% increase compared to the previous year. Within this group, the highest percentage of deaths is from "Vascular Brain Diseases" (32.6 %) and "Chronic Heart Disease" (26.3%).

Deaths from the "Tumor" disease group accounts 16.4% of total deaths, ranking as the second major group of fatal diseases. The mortality rate in 2017 for this disease group is 12.7 per 10,000 inhabitants, an increase of

²⁵⁰ INSTAT Public Health Indicators 2017 <http://instat.gov.al/media/4556/public-health-indicators-2017.pdf>

²⁵¹ INSTAT Causes of deaths 2017 <http://instat.gov.al/media/4068/causes-of-deaths-2017.pdf>

2.0% compared to 2016. In the "Tumor" group the highest percentage of occurrences was noted for the subgroup "Tumor of the respiratory system" (33.5%).

Deaths from disease group "Symptoms, Signs and Illness Unspecified" are ranked as the third major group with respect to the number of deaths caused. The mortality rate for this group disease is 16.0%, marking an increase of 11.2 % compared to 2016. In this group, 75.5% of the deaths are at age 80 and above, and the specific cause of death is "Death from old age".

Recent reports estimate life expectancy at birth to be 74 years for males and 79 years for females.²⁵² In 2017, the infant mortality rate is 8.03 per 1000 live births, compared with 8.7 in 2016. The main causes of infant mortality (under 1 year old) are "Diseases occurring in the nursing period"(39.1%) and "Costs of Birth, Birth and Postpartum Complications"(24.8%) of the deaths of this age group.

In the age group 1-14, among the 4 major disease groups, the highest mortality rate was noted for the group "Diseases of the bloodstream" (48.0%) for this age group. In the age group 15-39, the highest mortality rate is noted for diseases classified as "Traumatic Damage and Poisoning", with over 45 % of the number of deaths for this age group. In the age group 40-49, the highest cause of death was noted for the disease group "Tumor" (38.6%). Between the ages of 50 to 80 and over, most of the deaths were caused by disease group "Diseases of the bloodstream".

Table 4-20: Summarized mortality rates during 2017, based on the cause of death

Total deaths		22,232
1	Males	11,610
2	Women	10,622
Death causes		
1	Natural causes	90.1%
2	Accidents	2.1%
3	Other	7.8%
Groups of disease and deaths		
1	Diseases of the bloodstream	53.7%
Mortality from DB		41.5 per 10,000 inhabitants
2	Vascular Brain Diseases"	32.6 %
3	Chronic Heart Disease	26.3%
4	Tumor	16.4%
Mortality from Tumors		12.7 per 10,000 inhabitants
5	Symptoms, Signs and Illness Unspecified	16.0%

Health services are limited in the project area and include; insufficient medical staff to serve the population needs, poor conditions of the hospitals, lack of medicines etc. The main hospital is located in Gjirokaster town, Permeti and Memaliaj have smaller hospitals. Food safety is generally acceptable but it is recommended to obtain these services from restaurants located within towns. Along the rural areas and in upland pastures there is a risk to face shepherd dogs, it is recommended to investigate and communicate to the owners (shepherds) when possible or sit down and wait rather than fight or run. Snake poisoning is among the critical risks related with the area and project operations. Two poisons vipers occur in the project area such as *Vipera ammodytes* (European Nose Horn Viper) and *Vipera ursiniigraecus* (Orsini's Viper). Some basic services can be obtained in these local hospitals but to the project staff it is recommended to rely on private hospitals located in Tirana.

²⁵²World Health Organization Albania 2016 <http://www.who.int/countries/alb/en/>

4.11.25 Roads

National context

A rapid expansion in private car ownership, which was prohibited throughout the fifty years of communist rule, has put pressure on the road network. There tends to be a preference for vehicles with a high engine power, which results in high fuel consumption and a higher level of air pollution caused per vehicle. There has been a rapid increase in wastes associated with private vehicles, such as scrap, batteries, and used car oil, as well as a significant increase in the number of road accidents.

Albania has a total of 18,000 km of roadways. Since the end of the conflict in Kosovo, NATO rebuilt roads to Kosovo and has offered funding for other road construction projects. The government has prioritized a number of road corridors for construction and/or improvement to enhance the national road network. These include the Pan-European Corridor VIII, the Durrës–Kukës–Morinë road linked to Corridor VII; and the North–Central road (Hani Hotit–Shkodër–Gjirokastër–Kakavijë). This is an ongoing program with the corridors being constructed in sections. New roads from Fier to Vlore, Gjirokaster to Kakavije and Kukes to Morine have been constructed. The construction of a new road from Tirana to Elbasan started in 2011.

Public transport in Albania is dominated by the minibuses, which pick up passengers at bus stations in the main cities and in unmarked stops in other parts.

Roads in the project area

The project area has a range of road types, including:

- Primary regional roads connecting the main towns, e.g. Gjirokaster to Tepelene.
- Network of secondary and tertiary and service roads connecting town and village communities, including some roads in mountainous regions. An example of these roads is provided in Figure 4-48.
- Unpaved access roads for accessing those villages away from the main roads in the valleys, and to agricultural fields. These roads are typically in poor condition with deep ruts and steep inclines, passable only by four wheel drive vehicles. They are single lane, with limited opportunities for passing. Travel along these roads is slow; for example, the 11km of road to Fratar takes over one hour. Examples of these roads are provided in Figure 4-49 and Figure 4-50.

Road travel in the project area can be difficult in winter and after heavy rains, particularly along unpaved roads. Snow and rain can make some routes to remote villages unpassable. A small number of villages met with during the field surveys reported that roads to the villages can be unpassable at times during winter. Poor road conditions and accessibility challenges were mentioned by a number of community members during the field surveys as being a reason why younger people have left the rural villages. Community members perceived that if roads could be improved (particularly through paving) it would help to attract some migrants who have left the village to return. A few areas have had recent road paving (e.g. to Polican from Libohova), but for the vast majority of villages there are no current plans to improve road access.

Regional roads can also be hazardous in winter, with some areas being subject to flooding and landslides, and freezing during cold weather. For example, stakeholders met during the field survey referred to the Permet – Carshvove road being subject to landslides and flooding of the Vjosa River presents a risk to the road at Carshove.

Overall, road infrastructure and safety is generally poor in the project area. The main national level road from Memaliaj – Gjirokastër – Jorgucat, constructed within the last 10 years, is in good condition with four lines. The other national road from Memaliaj town to Permet is an old asphalted road with two lines and in poor conditions. The road system in the project area is considered rural and is unpaved (gravel) and access is difficult especially in wet season (i.e. landslides, floods). The key safety issues with respect to the main roads connecting the towns is the existence of many exits and access points onto these roads for the local community contributing to the presence of livestock along the roads and the lack of personal safety standards. In Permet area, touristic bikers can be encountered along the road and usually hidden from vegetation and road curves.

Figure 4-48: Example of unpaved access road to village (Leusa village, Petran Administrative Unit, Perment Municipality)



Figure 4-49: Example of unpaved, steep access road to village (Fratar village, Kelcyre Municipality)



Figure 4-50: Example of road through village (Kardhiq village, Gjirokaštër Municipality)



Air transportation

Albania has one civilian international airport, Tirana International Airport (Mother Teresa Rinas Airport, TIA) located northwest of Tirana. The airport is being upgraded under a concession agreement. Its access roads have been substantially improved to meet international standards. There are 19 foreign airlines that operate out of Albania.

Flights in and out of TIA per year have quadrupled between 2001 and 2016 from 5,307 to 22,352, while passenger numbers have more than quadrupled over the same period from 460,000 per annum to 2,195,100 (Table 4-21).

Table 4-21: Air transport activity

Items	1993	2001	2011	2012	2013	2016
Airlines companies	10	11	15	14	19	14
Flights	2,661	5,307	22,932	20,408	19,799	22,352
Passengers	130,123	460,020	1,817,084	1,665,331	1,757,342	2,195,100
Goods (tons)	377	1,389	2,290	1,875	1,778	2,200

Source: INSTAT Air transport activity (1993-2016)²⁵³

4.12 Archaeology and Cultural Heritage

4.12.1 Tangible Cultural Heritage

The project area is rich in Cultural Heritage with known assets dating from the prehistoric through to the medieval period. Despite this the project area is little surveyed and so has the potential for unknown assets to be present that could be of high cultural value.

Prehistoric tumuli (burial mounds) are well known in the area which include Çepuna (Gjirokastër) which was excavated in the late nineteen sixties and excavations in Pepel and Shtëpëzë (Gjirokastër). Other sites located within the project area include Lekël of Tepelena as well as in the small city of Limari and in the Drinos valley. In the region, sites have been identified in: Paleokastra, Kardhiqi, Jerma, Labova, Muzina, Melani, Pepli, Selo, Ktismata.

The two prehistoric settlement sites of the Illyrian period, Antigonea and Sofratika (later Hadrianopolis), are both located within the project area with both relatively close to the survey lines, in particular Hadrianopolis. Both sites can be considered to be of international importance although they are not designated as world heritage sites.

4.12.2 Intangible Cultural Heritage/ Living Cultural Heritage

Intangible cultural heritage includes the practices, representations, expressions, as well as the knowledge and skills (including instruments, objects, artefacts, cultural spaces), that communities, groups and, in some cases, individuals recognised as part of their cultural heritage. It is sometimes called living cultural heritage and includes oral traditions and expressions, including language; performing arts; social practices, rituals and festive events; knowledge and practices concerning nature and the universe; and traditional craftsmanship (UNESCO, 2003).

Several cultural events take place in the project area. Most of them relate to the conservation and promotion of the local tradition among the most important is the festivals of iso-polyphonia. Albanian folk iso-polyphony was inscribed in 2008 on the Representative List of the Intangible Cultural Heritage of Humanity (originally proclaimed in 2005). UNESCO states that "...the tradition is adversely affected by poverty, the absence of legal protection and the lack of financial support for practitioners, threatening the transmission of the vast repertoire of songs and techniques. The exodus of young people from rural areas to the bigger cities and abroad in search of jobs compounds this danger."²⁵⁴

²⁵³INSTAT Air transport activity <http://www.instat.gov.al/en/themes/industry-trade-and-services/transport-and-accidents/>

²⁵⁴(<https://ich.unesco.org/en/RL/albanian-folk-iso-polyphony-00155>, accessed 31/05/18)

Traditional Albanian polyphonic music can be divided into two major stylistic groups as performed by the Ghegs of northern Albania and the Tosks and Labs living in the southern part of the country. The term 'iso' is related to the 'ison' of Byzantine church music and refers to the drone accompanying polyphonic singing. The Albanian folk festival in Gjirokastër and other folk festivals in which Albanian iso-polyphony is performed can be considered to be of national or international importance depending on their scale. This festival is held every 5 years with participation of folk groups from all over the country. The 2015 Gjirokastër festival (from 10 to 16 of May 2015) drew approximately 1,800 artists to perform²⁵⁵.

Other cultural events are organised by different authorities such as Municipalities and the Ministry of Tourism and Cultural Heritage. Specific program dates for 2019 are not yet available, however, according to the Traditional Fests Calendar of 2018²⁵⁶ published by the Ministry of Tourism and Environment (MTE), events are planned during from May to September. In the 2018 Program of MTE, Gjirokastër town dominated the number of activities (14 events) followed by Permeti (6 events), followed by other towns with one or two events; no events were held in Kelcyra municipality.

Other intangible cultural heritage activities in the project area are assessed as being of local significance; however, no particular elements are designated or registered, nor are there any associations with particular innovations, technical or scientific developments, movements or specific individuals of regional or national significance (ICOMOS 2011)²⁵⁷.

4.12.3 Critical Cultural Heritage

Critical cultural heritage is defined as 'one or both of the following types of cultural heritage: (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'. Examples of legally protected areas 'include world heritage sites and nationally protected areas' (IFC, 2012)²⁵⁸.

Internationally recognized or legally protected Cultural Heritage Areas

The closest World Heritage Site to the project area is the Historic Centre of Gjirokastër, which was inscribed in 2005 (see Figure 4-51). The city is cited as rare example of an architectural character of the Ottoman period and features a series of outstanding two-story houses which were constructed in the 17th century. The town also retains a bazaar, an 18th-century mosque and two churches of the same period; all located within the project area.

The nearest Tentative List World Heritage Site to the project area is the ancient city of Apollonia, situated in about 13 miles from the city of Fier and is outside of the project area.

Nationally recognized or legally protected Cultural Heritage Areas

There are nationally protected sites within the project area (i.e. historical monuments and objects of archaeological, paleontological, ethnographic and traditional interests) designated under Albanian legislation. All matters relating to protecting cultural heritage in Albania are governed by Law 27/2018²⁵⁹ "On cultural heritage and museums" appealing the law no. 9048/2003 (from 07/04/2003) "With Respect to Cultural Heritage". The definitions of cultural heritage and cultural monuments as described in Article 5 of the Law on cultural heritage are as follows.

"Cultural heritage" it is the cultural assets, material and non-material of one individual, group or society inherited from the past to the present time and that will be transmitted to the future generations in order to express their identity, knowledge, tradition, beliefs and landscape cultural assets".

"Cultural monument (CM)" it is a protected object or the construction with historical and cultural values.

²⁵⁵ <https://www.balkanweb.com/festivali-folklorik-kombetar-dhe-zeri-i-trashegimise-kulturore/>

²⁵⁶ Events calendar 2018, Ministry of Environment and Tourism

²⁵⁷ ICOMOS 2011 Guidance on Heritage Impact Assessments for Cultural World Heritage properties. Appendix 3A, Example Guide for Assessing Value of Heritage Assets. January 2011. International Council on Monuments and Sites, Paris <http://openarchive.icomos.org/266/>

²⁵⁸ IFC 2012 Guidance Note 8: Cultural Heritage. International Finance Corporation, Washington DC http://www.ifc.org/wps/wcm/connect/39e39000498007fda1fff3336b93d75f/Updated_GN8-2012.pdf?MOD=AJPERES and IFC 2012 Performance Standard 8: Cultural Heritage. International Finance Corporation, Washington DC http://www.ifc.org/wps/wcm/connect/dd8d3d0049a791a6b855faa8c6a8312a/PS8_English_2012.pdf?MOD=AJPERES

²⁵⁹ Adopted in 17.05.2018

The CM's are divided in two categories:

- Cultural monument of Category I – it the construction with distinguishable values and heritage importance and that it is protected with its complete (full) architectural composition. The composition of its volumes, architectural technique of inner or outer views and its layout cannot be changed.
- Cultural monument of Category II - it the construction with distinguishable values especially for the outer view, the outer view volumes and architectural technique is protected.

Material cultural assets (tangible) comprises the mobile and non-mobile assets of artistic, archaeological, architectural, urban, ethnographic, archival, bibliographic and other defined as assets of the civilisation values/history.

Non material cultural assets" (intangible) comprises the non-material cultural values such as practises, expressions, knowledge, tools, objects, artefacts and cultural spaces that are established and accepted as part of cultural heritage from communities, groups or individuals. These assets are created from environment and historical circumstances and transmitted from generations as part of their identity and continuance of the cultural heritage.

The law provides for a buffer zone defined as an area beyond the historical centre, object, architectural complex or cultural monument. The role of the buffer zone is to protect the cultural assets and ensure the space to be used and observed from the public

Cultural Heritage Baseline

Table 4-22 summarizes cultural heritage monuments within the 500 meter seismic corridors and the 200 meter buffer zone around these corridors prescribed for the protection of monuments.. All cultural monuments identified within 500m seismic corridors and 200 meters buffer zones are Category I monuments except for one which is Category II. The description of each monument is based on the official data published at ASIG²⁶⁰ (State Authority for Geospatial Information) Albania. The locations of the monuments are shown in Figure 4-51. Of these seven were inaccessible during field survey work. An overview of each monument is provided in Table 4-23.

Table 4-22: Cultural Monuments within the 500m seismic corridors and 200 meters buffer zone

Map Label	Cultural Monument Name	Type
1	The Castle of Limari	Archaeological
2	The Castle Bridge	Architectural
3	The Church of Saint Friday or Saint Paraskevi	Architectural
4	The House of Permeti Congress	Architectural
5	The House of Ylli Imami and Lilo Vangjeli	Architectural
6	Drinking water fountain with Aqueduct/Pacomiti Bridge (Këlcyrë)	Architectural
7	The Church of Saint Elijah	Architectural
8	Characteristic house model in Buhali Village	Architectural
9	The ruins of old Kardhiqi Village	Architectural
10	The Building of Cepo Monastery	Architectural
11	Hoshteva Stone Bridge	Architectural
12	The Church of Saint Mehilli Monastery	Architectural
13	The Church of Saint Apostles in Hoshteva	Architectural
14	Remains of Saint Mehilli Church in Lekel	Architectural
15	The Church of Prophet Ilia, Lekel	Architectural

²⁶⁰ <https://geoportal.asig.gov.al/map/?auto=true>

Overall, the project area is a rich in cultural heritage region. Cultural heritage of the project area is comprised designated protected sites and intangible heritage. The stability of the designated monuments is not known. In addition to the designated sites, there are local burial places (communal cemeteries) and places of worship throughout the project area. The boundaries of the cemeteries are often not demarcated. There are some places of worship which have been designated, however, the undesignated sites are still valued and, as with the designated sites, the stability of the structures is unknown.

Figure 4-51: Cultural Monuments and World Heritage Sites

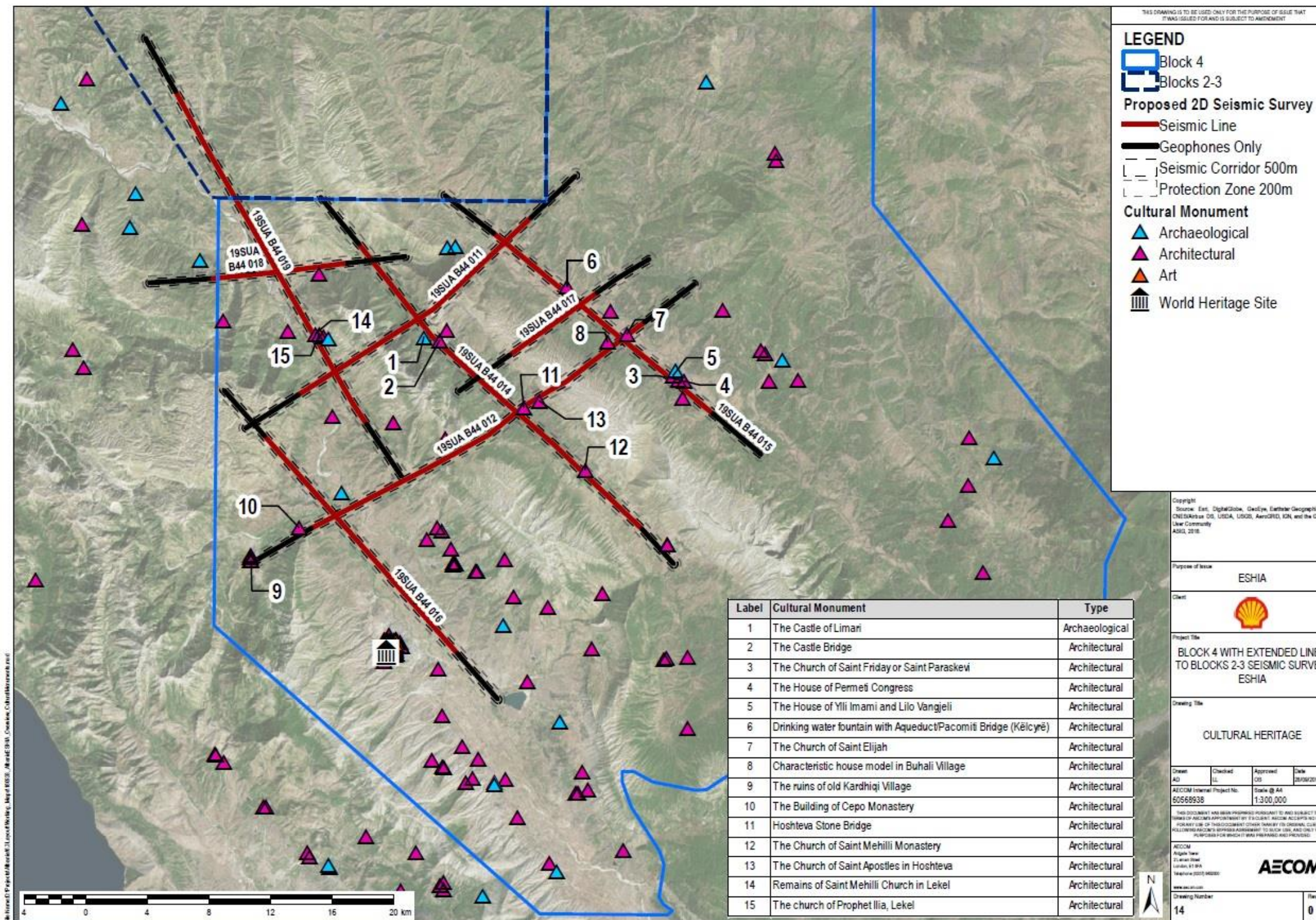


Table 4-23: Overview of cultural monuments within the 500m seismic corridor and 200 m buffer zone**Map Ref. Cultural Monument****1 The Castle of Limari**

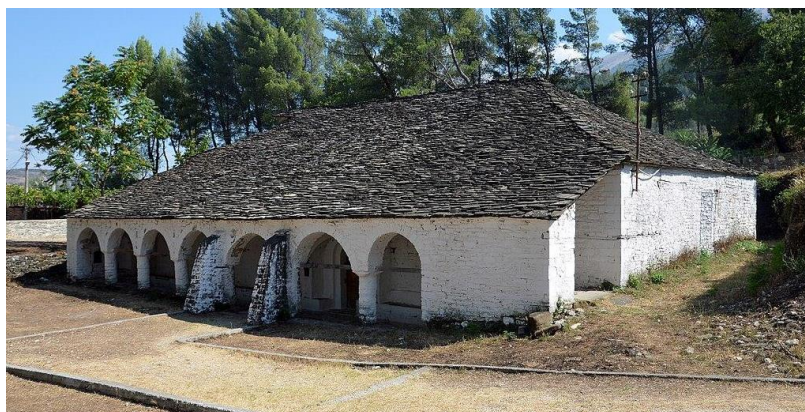
The Castle of Limari is a fortress dating from 3rd century BC. It is an archaeological site of Category I, proclaimed in 1963. It is located in Limari village circa 19km from the main road (Lekel- Kelcyre), in the Municipality of Kelcyra; the road to access the site is in a poor condition. The fortification is located on rocky hill, extending towards the north, on its west side the hill is steep and falls at around 40-50°, while on the east the hill side is sharp at circa 80°. Even given the steep terrain the fortification has double parallel stone walls 50m apart from each other. The outer wall has several towers with a height of 8.5m and width of 5.5 m each. The entrance to the outer wall is hidden in a natural curve of the terrain and the entrance to the inner wall comes at the same position immediate after accessing the outer wall entrance. The fortification covers a total area of 1.5ha.

2 The Castle Bridge

Dating from the second half of the 18th century, the bridge is a protected monument of Category I proclaimed in 1973 and consists of a stone bridge above the Zagoria River in Limari village, Kelcyra Municipality. The bridge provided access to the Limari Castle. The bridge is located in Limari village circa 19km from the main road (Lekel- Kelcyre); the road to access the site is in poor a condition. The bridge is a stone arched bridge with an arch diameter of circa 22m. The arch shoulders are based on the river banks circa 7.5m above the river bed. The right shoulder contains an opening.

*The Castle Bridge²⁶¹***3 TTThe Church of Saint Friday or Saint Premte**

The Church is a religious architectural monument dating from 1776 (orthodox) and was proclaimed in 1973 as Category I. The Church is located in Permeti town. The walls of the church are constructed with stone and fortified with lime mortar. The roof of the church is covered from natural clay tiles.

*Photo taken during field survey (2 July 2018)***4 The House of Permeti Congress**

²⁶¹Photo source: <https://mapio.net/pic/p-40604349/>

Map Ref. Cultural Monument

The House of Permeti Congress, located in Permeti town, is an architectural monument of Category I with historic political importance for Albania. The building was constructed during 1938-1940 and served as military building. In this building from 24th–28th May 1944, a Congress of the Communist Party of Albania was held and a temporary government was established. The house was declared a monument in 1963 and has been used as a museum of the Congress (as also actually). Constructed with river stones it has a rectangular shape of 29.3 x 8.9m, consisting of two rooms and roof covered with tiles.



Photo taken during field survey (2 July 2018)

5 The House of Ylli Imamit and Lilo Vangjelit

This building is characteristic of a building typology known as “Divitlije” type. It is a two-floor building proclaimed as architectural monument of Category I in 1979 located in Permeti town. The building dates from the end of 19th century, constructed with clay bricks and rendered with lime mortar. After proclamation as monument the house was used as ethnographical museum but this museum is not functioning anymore (closed) (ASIG data).

6 Drinking water fountain with Aqueduct/Pacomiti Bridge (Këlcyrë)

The drinking water fountain and aqueduct date from second half of 19th century and are located near Piskova village along the main national road Kelcyre – Permet. This system was proclaimed as protected architectural monument of Category I in 1979. The tap is supplied through a bridge type canal from Pocamiti stream. The system is constructed clay bricks, however the tape/fountain structure is constructed with white stones (marble) in 1967.

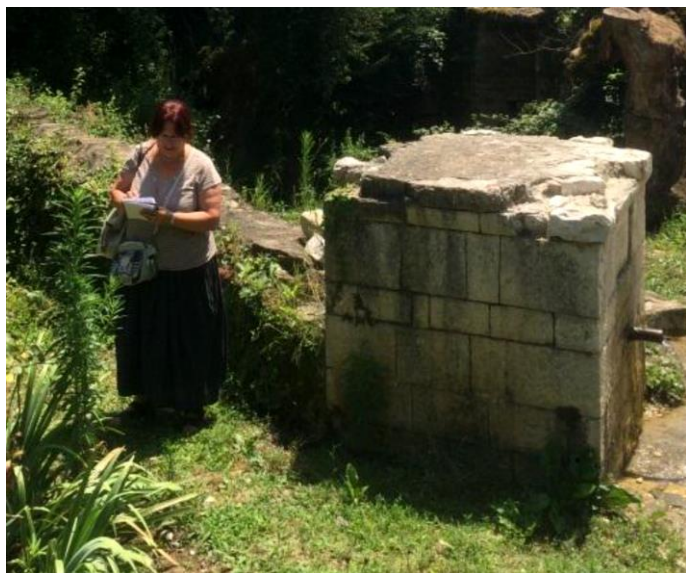


Photo taken during field survey (2 July 2018)

7 The Church of Saint Dellia

This Byzantine Orthodox Church dates between 11-12th century and was reconstructed in 17th century. The church is located on small hill close to Vjosa River and Buhali Village, Permet. The Church is an architectural and religious (orthodox) monument proclaimed as Category I monument in 1973. The Church is decorated with frescos and is easily accessible from the Permet – Buhali road

Map Ref. Cultural Monument

Photo taken during field survey (2 July 2018)

8 Characteristic house model in Buhali Village

The building is an architectural monument of Category I, proclaimed in 1979. It represents a characteristic architectural style of house of the 20th century constructed with a combination of stone and wood. The house is located in Buhali village, Permeti Municipality.



Photo taken during field survey (2 July 2018)

9 a. The ruins of old Kardhiqi Village

The ruins of old Kardhiqi village consist of old houses and fortress dating from the end of 18th century. Among the ruins are the bases on two towers that formed part of the fortress. The houses of the village are most likely contemporary with the fortress. The site was proclaimed as architectural monument of Category I, in 1979. The ruins are covered with soil and vegetation. The site is within the current new Kardhiqi village, part of Gjirokastër Municipality.

Map Ref. Cultural Monument**9 b. Kardhiqi Castle**

This monument is overlapped in the maps, but it is a separate monument close to Kardhiqi village. The castle is located on a hill close to Kardhiqi village and dates from the 17th century. It was proclaimed an architectural Category I monument in 1963. The Castle has ruins of walls and towers in polygonal form. Constructed with limestone blocks the castle with a perimeter is 280m, it has 23 rooms and 2 wells.



Photo taken during field survey (4 July 2018)

10 The Building of Cepo Monastery

The building is a religious architectural monument proclaimed as a Category I monument in 1973. The building has two floors, dates to before 1900 and is located in Mashkullora Village, Gjirokastër municipality. The monastery has two floors and has used black and white stone. The ground floor at the front is made of stone arches. The facade on the second floor has windows on three sides. The building now functions as a church.



Photo taken during field survey (4 July 2018)

Map Ref. Cultural Monument**11 Hoshteva Stone Bridge**

The stone bridge on the Zagoria River is an architectural monument dating from before 1900 and was proclaimed as Category I monument in 1983. The arch bridge is located close to Hoshteva village in Libohova Municipality and is part of the historical route connecting Permeti with Gjirokastër. The bridge is constructed with local black stone of the zone. The bridge spans 28m with an average width of 2.8m. The arch diameter is 15m. There is no vehicular access to this monument.



Bridge before destruction (Lida Miraj, picture in 2011)

12 The Church of Saint Mehilli Monastery

The Church is an architectural religious monument dating from 1702 (orthodox) and was proclaimed in 1977 as Category I. The walls of the church are constructed with lime stone strengthened with lime mortar and are without any particular decoration. The roof structure is of wood. The church has multiple phases of construction. An inscription on one wall reads 1777, which corresponds with the date of construction of the narthex (the porch or antechamber at the western entrance to some early Christian churches).

13 The Church of Saint Apostles in Hoshteva

The Church is post Byzantine dating from the 18th century, located on a small hill close to Hoshteva Village, Libohova Municipality. The Church is a religious architectural monument proclaimed as Category I monument in 1977. The church is constructed with black stones and roofed with natural stone tiles. The church has a large courtyard.



Photo taken during field survey (5 July 2018)

Map Ref. Cultural Monument**14 Remains of Saint Michael Church in Lekel**

This church was proclaimed in 2010 as protected religious Category II monument. The church dates from 18th century and is reported as ruined.



Photo taken during field survey (4 July 2018)

15 The Church of Prophet Ilia, Lekel

Located in Lekli village, Tepelene, the Church is an architectural monument dating to the 19th century and was proclaimed as a Category I monument in 2010. The church is constructed of stone and concrete, with a roof of clay tiles. The iconostas in the upper side has 20 icons of various saints and the lower side has 17 icons. The church has undergone some restoration works in 2001. In general the church is in good condition.



Photo taken during field survey (4 July 2018)

Summary of Cemeteries

The locations of cemeteries were identified during the social survey. The location of each cemetery is shown on Figure 4-52.

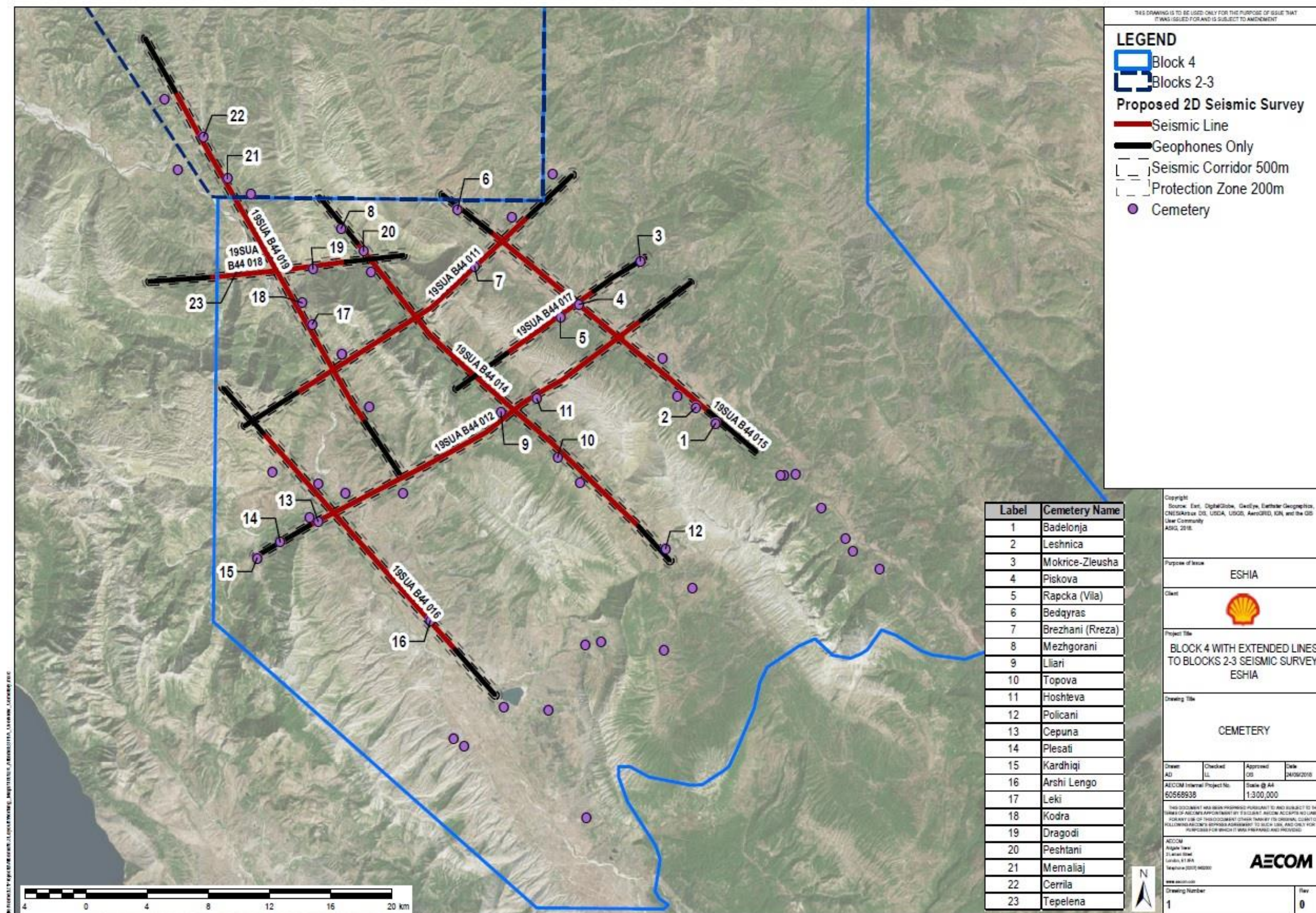
There are 23 cemeteries that lie within 8 of the proposed seismic corridors or protection zone. The footprints of the cemeteries are not known and only point locations are available. The locations of the cemeteries were identified in meetings with the local authority, specifically, Head of Sub/Municipalities and head of villages. The sites were located during the meetings with google earth system and confirmed on the ground where possible. It should be noted that some cemeteries may be fenced and have well-defined area whereas other cemeteries are not fenced nor have recognizable boundaries. The seismic crew will have to carefully observe the extension of the cemetery and plan accordingly. There is no Albanian regulatory requirement for a protection zone; however a

precautionary protection zone of 200m has been adopted. The cemeteries based on point locations are summarized in Table 4-24.

Table 4-24: Cemeteries within the 500m seismic corridor and 200 meters protection zone

Map Label	Cemetery Name	Seismic Corridor	Seismic Corridor (500m)	Protection Zone (200m)
1	Badelonja	19SUA_B44_015	Yes	No
2	Leshnica	19SUA_B44_015	Yes	No
3	Mokrice-Zleusha	19SUA_B44_017	Yes	Yes
4	Piskova	19SUA_B44_015	Yes	Yes
		19SUA_B44_017	Yes	No
5	Rapcka (Vila)	19SUA_B44_017	Yes	Yes
6	Bedqyras	19SUA_B44_015	Yes	Yes
7	Brezhani (Reza)	19SUA_B44_011	Yes	Yes
8	Mezhgorani	19SUA_B44_014	Yes	Yes
9	Lliari	19SUA_B44_012	Yes	No
10	Topova	19SUA_B44_014	Yes	No
11	Hoshteva	19SUA_B44_012	Yes	Yes
12	Policani	19SUA_B44_014	Yes	No
13	Cepuna	19SUA_B44_012	Yes	Yes
14	Plesati	19SUA_B44_012	Yes	Yes
15	Kardhiqi	19SUA_B44_012	Yes	Yes
16	Arshi Lengo	19SUA_B44_016	Yes	Yes
17	Leki	19SUA_B44_019	Yes	No
18	Kodra	19SUA_B44_019	Yes	No
19	Dragodi	19SUA_B44_018	Yes	Yes
20	Peshtani	19SUA_B44_014	Yes	Yes
21	Memaliaj	19SUA_B44_019	Yes	Yes
22	Cerrila	19SUA_B44_019	Yes	Yes
23	Tepelena	19SUA_B44_018	Yes	No

Figure 4-52: Cemeteries in Block 4



5. Analysis of potential negative impacts to the environment

The structure of this chapter is based on Albanian legislation DCM 686/29.07.2015. The legislation requires that the key project impacts associated with the relevant environmental resources and social receptors are identified followed by the impact assessment methodology and the justification of the impact assessment for each resource and receptor. Receptors comprise human beings, either individually or collectively, and the socio-economic systems on which they depend, such as communities and local or regional economies. Resources are defined as biophysical features, which include soil geology, groundwater and surface water, biodiversity, ambient light and noise landscape, cultural heritage, archaeological sites, and community facilities.

The project activities or aspects associated with the undertaking of the 2D seismic survey have potential to adversely affect the existing biophysical and social environment. The potential negative impacts to the environment addressed include:

- Negative impacts to the physical environment (soil, geology, groundwater, surface water) in **Section 5.1.1**;
- Negative impacts to the biodiversity and habitats in **Section 5.1.2**;
- Discharges into the environment (including air emissions, noise, lights) and waste generation (different streams of solid waste and liquids) in **Section 5.1.3**;
- Cumulative negative impacts to the environmental quality of the area and natural resources such as forest, waters etc. in **Section 5.1.4**;
- Potential social and health impacts in **Section 5.1.5**; and
- Potential environmental accidents and unplanned events in **Section 5.1.6**.

The potential impacts are then assessed such that mitigation measures can be proposed to avoid or reduce the impacts to an acceptable level. The impact analysis is based on the adoption of a consistent methodology, the identification of receptors and a scoring system to assess the impacts as described in the following sections:

- the applied methodology for the environmental impact assessment in **Section 5.2.1**;
- receptor identification including area of influence and duration of the identified negative impacts **Section 5.2.2**;

- the scoring system to assess the impacts in **Section 5.2.3**; and
- impact assessment for each receptor or resource in **Section 5.2.4**.

A summary of the impact assessment is provided in **Section 5.3**

The mitigation measures proposed to avoid or reduce negative impacts are discussed in **Chapter 8, Mitigation Measures**.

5.1 Potential negative impacts

The project activities or aspects considered are based on the description of the project as described in **Chapter 2, Project Description**.

For the purpose of the impact assessment, the project is divided into to four phases:

- Mobilization;
- Support facilities (e.g. base, fly camps, helipad and explosives magazine) ;
- Seismic Survey; and
- Demobilization and restoration.

The mobilization phase is comprised of the seismic survey pre-acquisition activities of permitting, site reconnaissance of the area and acquisition of environmental approvals and other permits. Permitting as associated with the seismic survey is used to describe the process of arranging permissions and agreements to access land and arrange the terms and conditions for compensation. Prior to the initiation of the seismic survey, the base, fly camps, helipad and the explosive storage facilities are established.

The seismic survey activities include:

- geodetic survey of lines to mark out survey positions in consideration of offsets and protection areas;
- clearance of survey lines for access and mobility;
- shot hole drilling;
- laying out of ground equipment (e.g. placement of geophones along receiver lines); and
- data acquisition.

During demobilisation and restoration phase, the base, fly camps, helipad and explosive storage magazine are closed, removed and the sites restored to pre-project conditions. Features along survey lines and roads are inspected and restored, grievances addressed and compensation with land owners finalized.

Project aspects that could adversely impact the environmental during each phase of the project were identified from AECOM's previous experience on similar projects.

5.1.1 Physical environment

5.1.1.1 Soils

The principle project activities that have the potential to affect soils is the movement of heavy vehicles, the clearance of vegetative cover or soils, the storage and use of fuels, maintenance of equipment and waste generation. Details of the soils conditions and land use within the survey area are provided in **Chapter 4, Baseline (Section 4.7 and Section 4.11, respectively)**.

Impacts identified with respect to soils are:

- Soil erosion
- Soil compaction
- Degradation of soil quality

An indirect impact of soil compaction is increased runoff resulting in erosion and reduction in water infiltration. Erosion of soil/sand by wind and rain may have indirect impacts on water resources leading to a decline in water quality and smothering of aquatic habitats.

Soil erosion may be exacerbated by the clearance of topsoil / vegetation when preparing ground surfaces for construction, stockpiling of loose material and vehicle and equipment movement over unpaved surfaces. During heavy rain events, excessive storm water flows across disturbed areas can cause erosion.

Soil compaction can result from the movement of heavy machinery or stockpiling (i.e. laydown) of equipment or excavated soils.

Soil quality impacts can result from accidental spills or leaks of waste, fuels, chemicals, or oils from Project vehicles, equipment, and storage tanks throughout the life of the Project. The impacts of soil contamination are expected to be localised, however if not appropriately and immediately cleaned-up then contaminants could be carried or leached to surface and groundwater sources respectively. Impacts to soil quality from the release of contaminated materials to ground may also impact the health of construction and maintenance workers or local residents / wildlife utilising land which has been contaminated.

Mobilisation and Support Facilities

The main impacts on soil conditions during the mobilisation phase are related to damage to existing unpaved roads, vehicles used during site reconnaissance and ad-hoc off-track driving to access fly camps.

Damage to existing roads and tracks by the mobilisation of heavy plant and increased usage could result in rutting of the surface leading to the potential for local gullyng and soil erosion. The movement of vehicles can also result compaction of soils especially by heavy vehicles transporting the vibroseis machines and logistical infrastructure (e.g. cabins and equipment) to site.

In addition, there is potential for localised contamination of the soil as a result of leakages or spillages of fuel from site vehicles, including any resulting from road accidents.

The principal activities in the camp set up and operation phase with potential to impact on soils include removal of vegetation and soils for camp construction; bulk storage of explosives, fuels and chemicals; vehicle refueling and maintenance; and waste generation. The establishment of the base (if existing facilities are not utilized) and fly camps may require the removal of vegetation and surface levelling resulting in the exposure of soils to erosion.

Soil compaction can result from the repeated movement of vehicles on the same tracts, the placement of facilities and structures and trampling by foot traffic at the fly camps. Laydown areas for equipment can also result in soil compaction if left for an extended time. Soil compaction can result in increased storm water runoff during heavy rains causing local gullyng and soil erosion.

Leakages and spills of fuel and oils used for vehicles and electricity generators as well as the maintenance of vehicles and machinery contaminant soils.

A secure storage facility will be constructed for explosives. It is not considered that the storage of the explosives poses a risk to soils.

Seismic Survey

The principal activities during the seismic survey with potential to impact on soils include, seismic line vegetation clearance, the movement of heavy vehicles, shot hole drilling and the use of machinery and equipment and storage and use of explosives.

The clearance of the seismic survey lines will result locally in the loss of vegetation cover and the potential exposure of the surface soils, leading to erosion and loss of the surface soil layer. Any stripped soil and vegetation will be retained in the area for subsequent restoration of the land.

Seismic corridors of up to 5 meters wide will be used for vehicle and road access to survey lines. Heavy plant and vehicle movement could lead to soil compaction, deterioration of the surface vegetation and erosion rendering land less usable for agriculture and grazing. In the absence of controls, seismic line vegetation clearance and the movement of heavy vehicles, during the seismic survey would present a potential risk to soils.

Leaks and accidental spillage of fuels or lubricants has the potential to result in localized soil contamination, particularly during refueling activities in the field. Once the survey lines and drilling locations have been established, the potential impact on soil conditions is related to management of drilling fluids and the cuttings

generated by the installation of the shot-holes. There is no evidence that the underlying ground is contaminated and therefore the drilling cuttings will be suitable for re-use without any prior treatment. Drilling fluid to be used for drilling will consist of water and bentonite (natural clay mineral) and do not represent harm to the environment, including soils.

Soils could also be contaminated due to the burial of explosive charges. It is expected that Pentolite, which is specially designed for surveys similar in nature to the seismic survey will be used. Pentolite is a stable and degradable product. If that is the case, it is considered that the use of the explosives does not pose a long term risk to soil quality.

Demobilisation and Restoration

The demobilisation of the Base, explosive magazine and fly camps will leave exposed soils that have the potential to erode. Tracks from the use of heavy equipment for the removal of the temporary logistical infrastructure (e.g. cabins, can cause ruts in soils and on unpaved tracks that during inclement weather can erode.

The extended placement of camp facilities will compact soils. The movement of vehicles can also result in compaction of soils especially by heavy vehicles transporting the vibroseis machines and logistical infrastructure (e.g. cabins and equipment) from the site after the survey has been completed.

The movement of vehicles can also result in compaction of soils especially by heavy vehicles transporting the vibroseis machines and logistical infrastructure (e.g. cabins and equipment) from the site after the survey has been completed.

During the demobilisation and restoration, sites will be restored to pre-survey conditions. Impacts to soil quality can result from uncontrolled waste materials and soils contaminated from leakages and spills from vehicles and equipment.

In the absence of control measures, project activities could have an impact on soil condition. The impact assessment for soils is provided in **Section 5.2.4.1** and mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Section 8.1**

5.1.1.2 Geology

The principle project activities that have the potential to impact geology are the setup of fly camps and seismic acquisition data acquisition activities. Details of the geological conditions within the survey area are provided in **Chapter 4, Baseline (Section 4.6)**. The locations of these designated areas are shown on maps provided in **Annex 4**.

Impacts identified with respect to geology are:

- damage to geological monuments and features and
- karst collapse.

Mobilisation and Support Facilities

Protected surface geological features include the Lisat e Manastirit at Nivan and Pylli i Gurte at Nderan, are present within the 500m seismic corridor. During the mobilization phase of the seismic survey, project activities will be non-intrusive and no impact to protected natural monuments is anticipated. However, there may be unique geological features, although not designated, may be encountered and worthy of protection. Fly camps will be required and site selection will be based on sites not requiring levelling. However, if on a potential site all other operational criteria are met but leveled ground is unavailable, possibility of limited ground levelling is considered.

Seismic Survey

The principal activities during the seismic survey with potential to impact on geology include the shot hole drilling and the use of vibroseis machines. Both surface and subsurface geological monuments and undesignated but unique geological features could be damaged by the data acquisition activities.

Surface geological features including the Lisat e Manastirit at Nivan and Pylli i Gurte at Nderan may be fragile and could be damaged by the data acquisition using explosives or vibroseis methods. Subsurface features caves

such as Mezghorani Cave can be damaged by the drilling of the shot holes into the cave ceilings potentially result in the collapse of the cave; particularly in areas where the cave ceilings are not deeper than 12-15 meters (shallow). Furthermore, the shot hole borings open a pathway for surface water to infiltrate the cave system causing damage to the cave tunnel geology. There may be additional undocumented cave systems within the survey area that is primarily comprised of limestone and karst. The use of explosives and vibroseis machines, again in areas where cave ceilings are shallow, can result in the collapse of the cave ceiling.

Demobilisation and Restoration

No impacts during the demobilisation and restoration phase have been identified.

In the absence of control measures, project activities could have an adverse impact. The impact assessment for geology is provide in **Section 5.2.4.2** and mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Section 8.2**.

5.1.1.3 Groundwater

The potential effects of the project activities on groundwater can be separated into aspects relating to groundwater quality and groundwater resources. The major elements of work that could affect groundwater quality are the storage of fuels and chemicals, refueling and maintenance of plant; drilling of shot holes and liquid and solid waste disposal. Details of the groundwater within the Project area are provided in **Chapter 4 Baseline (Section 4.8.2)**.

Specific impacts identified with respect to groundwater are:

- Degradation of groundwater quality
- Groundwater resources (See *Section 5.1.5*)

Groundwater quality can be degraded as a result of the spills of fuel or chemicals or residual explosive products migrating to the underlying aquifer. If soak always or septic systems are utilized, biological contamination can migrate to the aquifer.

Mobilisation and Support Facilities

During mobilization, spillages and leaks of polluting substances from vehicles and equipment and subsequent infiltration into the underlying ground could result in contamination of the groundwater. The potential quantities of fuel that could be released would be approximately 150 liters for a standard pick-up truck should the fuel tank rupture or up to 1,000 liters of fuel from a tanker truck.

With respect to base and fly camp set up and operation, the major elements of work that could affect groundwater quality include the storage of fuels and chemicals, refueling and maintenance of plant; and liquid and solid waste disposal. Spillages and leaks of polluting substances and subsequent infiltration into the underlying ground could result in contamination of the groundwater. Untreated sanitary sewage, arising from project activities, which if discharged on to the ground has the potential to contaminate groundwater. If soak-aways or septic systems are utilized, biological contamination can migrate to the aquifer.

Seismic Survey

During the seismic survey, there is a risk of spills or leaks of fuel, engine oil and lubricants with subsequent infiltration into the underlying ground which may result in contamination of the groundwater. Drilling fluids that may be used for drilling will consist of water and bentonite (natural clay mineral) and do not represent harm to the environment including groundwater.

The residues from detonating explosives during seismic surveys can also be a potential source of groundwater contamination as a result of leaching, particularly in shot holes, located closer to the water table. However, the explosive that is expected to be used for the survey is Pentolite, which is a non-toxic degradable explosive. Unfired shots, including the plastic casing and explosives will degrade. The rate of degradation by aerobic and anaerobic bacteria is dependent upon soil properties.

Demobilisation and Restoration phase

Following completion of the survey, the equipment, temporary structures and materials associated with the seismic survey lines, the base and fly camp will be demobilised and the areas restored to as close to their pre-survey condition as practicable. All wastes are planned to be removed to licensed waste facilities or stored until appropriate disposal options can be arranged and implemented.

In the absence of control measures, project activities could have an adverse impact on water quality.

The impact assessment for groundwater is provide in **Section 5.2.4.3** and mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Section 8.3**.

5.1.1.4 Surface water

The main potential impacts on surface water from the project are related to the exposure of the ground strata to physical disturbance or contamination as a result of camp set up; establishment of the site access roads and tracks; seismic line clearance; fuel use and waste generation. Details of surface water hydrogeology within the survey area are provided in **Chapter 4 Baseline (Section 4.8)**.

Specific impacts identified with respect to surface are:

- Degradation of water quality and
- Alterations in stream bank geomorphology and integrity resulting from river crossings

Potential impacts to surface water include degradation of water quality and sedimentation of streams and rivers. Water quality can be degraded by the accidental release of fuels during storage, transportation and during refuelling operations of vehicles and equipment, uncontained drilling fluids and cuttings, leaks from drill rigs and vehicles including vibration trucks. The clearance of vegetation for the installation of the fly camps and the seismic track may exposed bare soils that may be prone to erosion resulting in sediment laden runoff into the nearby streams and rivers.

Mobilisation, Support Facilities set up and Operations

During mobilization, fluids can leak from vehicles can migrate to surface waters. During support facility operations, in particular fly camp operations, solid waste or untreated sanitary waste accidentally discharged into surface water has the potential to contaminate it leading to elevated nutrient levels and microbial contamination. Other sources of contamination include potential run-off of hydrocarbon spills from the base (if not located in an industrial area) or fly camps during vehicle refueling and maintenance, or leakage from fuel storage. Additionally, hazardous waste (including contaminated wash water from vehicles and equipment) would result in contamination of soils and be entrained in surface water ruff off. Such run-offs have potential to cause localised impacts to the surrounding surface water bodies.

Seismic Survey

Potential impacts to surface water include the degradation of water quality and the changes in stream bank morphology.

Water quality can be degraded by the accidental release of fuels during storage, transportation and during refuelling operations of vehicles and equipment, leaks from drill rigs and vehicles. Surface water contamination due to hydrocarbon spills and leaks could potentially occur during seismic activities, which could cause visible pollution and deterioration in water quality if the incident occurs close to a water course.

Drilling fluids that may be used for drilling will consist of water and bentonite (natural clay mineral) and do not represent harm to the environment, including water. Bentonite is a fine powdered material and may temporarily increase turbidity if flushed into the water course.

It is understood that the seismic survey requires the need for river crossings and many of the smaller tributaries. Temporary bridges and stream crossings can alter the stream bank morphology. While no seismic equipment installation is envisaged within river beds, vehicle crossing is likely to take place. Potential erosion from the river bed by such crossings might contribute to siltation of rivers. Vehicle traffic can also destabilize stream and river banks.

Demobilisation and Restoration

Following completion of the survey, the equipment, temporary structures and materials associated with the seismic survey lines, the base and fly camp will be demobilised and the areas restored to as close to their pre-survey condition as possible. There is potential to have sediment rich runoff migrating offsite during the replacement of stripped soils at fly camp locations. Potential impacts to surface water quality can result from uncontrolled waste materials and soils contaminated from leakages and spills from vehicles and equipment that have been left in place being becoming entrained in runoff thus migrating off site resulting in localized surface water quality degradation. Temporary bridges left in place could have a detrimental impact on stream bank morphology.

During the demobilisation and restoration, sites will be restored to pre-survey conditions; therefore, no residual impacts are anticipated.

In the absence of control measures, project activities could have an adverse impact. The impact assessment for surface water is provide in **Section 5.2.4.4** and mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Section 8.4**.

5.1.2 Biodiversity and Habitats

There are potential impacts on biodiversity in the project area throughout the seismic survey and associated activities including:

- mobilisation phase, including transport of people and equipment
- camp set up and operation phase, including the effects of the production of wastes and indirect pressure of workers' presence;
- seismic survey phase, including line clearance, and seismic data acquisition; and
- Demobilisation and restoration (included in mobilisation phase as impacts are of similar nature).

Due to the presence of important biodiversity including species of protected areas, sensitive habitats and species of conservation concern (flora and fauna); there is the potential for negative impacts on these receptors due to Project activities. Details of biodiversity are provided in **Chapter 4, Section 4.10**.

Potential impacts to biodiversity include:

- loss / disturbance of natural habitat through vegetation clearance or damage;
- loss / disturbance of plant species of conservation concern; and
- contamination of terrestrial or aquatic habitats

For the purpose of the impact assessment, the discussion has been subdivided into:

- protected areas (**Section 5.1.2.1**);
- habitats (**Section 5.1.2.2**); and
- species (**Section 5.1.2.3**).

5.1.2.1 Protected areas

The designated and protected areas of ecological significance within the Study Area include:

- Kardhiqi Strict Nature Reserve;
- Bredhi i Hotovës-Dangelli National Park,
- Gërmenj-Shelegurë Managed Nature Reserve,
- Zheji Nature Monument;
- Piskal-Shqeri Managed Nature Resources Area;
- Uji i Ftohtë-Tepelenë Nature Monument;
- Lengarica Canyon Nature Monument;
- Zagori Natural Park and Butrint Key Biodiversity Area (KBA).

Butrint KBA is recognised as internationally protected located in the Project Area; however, no national designation has been assigned. Overall, fourteen protected areas are intersected by the 500m seismic corridor and 200m buffer zone which include:

- Bredhi i Hotoves-Dangelli National Park (Category II under IUCN), comprising a large and diverse area supporting a range of game species and mature woodlands (proposed Special Area for Conservation);
- Zagoria Natural Park (Category IV under IUCN), representing a natural habitat with biological diversity and species of conservation interest: and

- 11 Nature Monument areas (Category III under IUCN), including Zheji (an important area for ecotourism).

In addition, the Gjirrokastër IBA is located in the southern segment of the Project area. All of these protected areas have ecological importance because they are designated at a national and/or international level. Locations of protected and designated areas are provided in **Annex 4**.

Mobilisation, Support facilities set up and Operations and Demobilisation and Restoration

During mobilisation there should be no (or minimal) activities or movements within protected areas and therefore any impacts will be insignificant. However, if there are last minute and/or unforeseen changes to this phase requiring entry and/or work within a protected area then all restrictions and protections will be adhered to.

Following survey works, restoration of seismic lines may be required. As some of the seismic lines do pass through Protected Areas there is a risk that they will affect the integrity of these areas because qualifying features (i.e. those features for which the protected area has been designated (e.g. habitat or species)) could be affected by the works.

Consequently, there is a risk that air pollution, dust and exhaust fumes from ground transportation may affect a range habitats and particularly plants within close proximity to roads and access tracks. Dust is likely to be primarily an issue in dryer areas and close to the camps where vehicle movement is more frequent.

Transport associated with the proposed activities has potential to cause water or soil pollution and potentially impact receptors such as flora and fauna. This is of particular importance for water bodies including wetlands and the species living there (i.e. fish and amphibians) and is most applicable in areas surrounding fly camps.

Incidental transport of seeds and other propagating materials can cause the colonisation by invasive species into new areas. This has the potential to impact on protected areas within the Project Area.

Noise from the moving vehicles has potential to disturb species including birds during the breeding season. This is important in relation to the Gjirrokastër IBA which has as qualifying features breeding and on-passage populations of Egyptian vulture and lesser kestrel.

Direct fauna mortality is possible due to collisions with moving vehicles, particularly small mammals and herptiles. The potential for such collisions will be highest in areas which support the greatest diversity of fauna or areas with predicted high traffic movements. Despite the sensitivity of fauna in the project area, vehicular collisions are unlikely to have a long term impact upon the overall populations of these species.

The fly camps will not be located in Protected Areas unless special dispensation is granted by NAPA, over-riding the stated permissible activities within these areas.

Seismic Survey

Seismic line preparation may result in the localized loss or disturbance of habitats within Protected Areas, due to the vegetation clearance of approximately 5m wide seismic lines to facilitate the movement of seismic equipment.

The Protected Areas where seismic activity will be undertaken include Zagori Nature Park and the Zheji Nature Monument. In addition, within the Zagori Nature Park the central management areas are considered to be the most sensitive because these have been designated on the basis of their ecological importance.

Clearance of trees to allow passage of seismic lines results in direct individual tree loss, particularly as the seismic survey activities that bisect wooded areas.

Noise disturbance generated by seismic charges is expected to be minimised by the depth that the lines will be buried. However, there is a potential risk of causing collapse or structural changes at Natural Monuments, particularly the karst cave systems and consequently the species they contain.

Similar to the mobilisation phase, the movement of seismic vehicles may lead to incidental transport of seeds and other propagating materials that could potentially introduce invasive species into new areas. In addition, as a result of the seismic survey activities there is the potential for non-routine events to have a serious impact upon the habitats within the survey area. These include fires, uncontrolled explosions and pollution incidents.

5.1.2.2 Habitats

The seismic acquisition lines will intersect with habitats which are listed in Annex I of the EU Habitats Directive (see **Chapter 4, Baseline**). Annex I Habitats are those defined in the Directive as “natural habitat types of community interest whose conservation requires the designation of Special Areas of Conservation” (SAC). Consequently, although these habitats do not currently have the precise status conferred by the Habitats Directive within Albanian

law, these are very important habitats and any disturbance to or loss of these, which compromises their ecological status, should be avoided.

The seismic acquisition lines will intersect with Annex I of the EU Habitats Directive listed below as follows:

- 91M0 Pannonian-Balkan turkey oak–sessile oak forests
- 91L0 Illyrian oak-hornbeam forests (*Erythronio-Carpinion*)
- 9340 *Quercus ilex* and *Quercus rotundifolia* forests
- 9250 *Quercus trojana* woods: old oak forest with *Q. trojana*
- 5330 Thermo-Mediterranean and pre-desert scrub (*Phlomis fruticosa*)
- 9540 Mediterranean pine forests with endemic Mesogean pines
- 9180 * Tilio-Acerion forests of slopes, screes and ravines
- 6520 Mountain hay meadows
- 92C0 *Platanus orientalis* and *Liquidambar orientalis* woods (*Platanion orientalis*)
- 92A0 *Salix alba* and *Populus alba* galleries
- 3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

In addition, of these Annex I Habitats, 9180 * Tilio-Acerion forests of slopes, screes and ravines is defined in the Directive as an Annex I “priority habitat”. This category of habitat is considered to be particularly vulnerable.

Mobilisation, Support facilities set up and Operations, Demobilisation and Restoration

Air pollution, dust and exhaust fumes from ground transportation may affect habitats close to roads and access tracks, where they may be smothered. The risk of dust generation is likely to be primarily an issue in dryer areas and close to the camps where vehicle movement is more frequent.

Transport of people, equipment and materials may cause water and soil pollution from oil or fuel leaks and potential receptors include habitats in areas surrounding camps. Spills and leaks may be produced during refueling, material loading and offloading, malfunctioning machinery as well as during road accidents.

Incidental transport of seeds and other propagating materials can expedite the colonisation by invasive species into new areas. This has the potential to impact on all plant types across the project area.

Removal of vegetation to facilitate fly camp construction may result in habitat loss or degradation.

Seismic survey phase

Seismic line preparation may result in the localised loss or disturbance of habitats due to vegetation clearance (up to 5m wide for vibrosies on line L16 and 2.5m wide for shot-hole drilling) for the seismic line corridors to facilitate the movement of seismic equipment.

Based on the available vegetation mapping it is likely that seismic lines will have to pass through areas of Annex I habitat. However, it is unlikely that such activities will significantly affect the habitat through which they are located and if there are impacts these will be localised, temporary and can be restored.

As well as localised loss of habitat areas, the above habitat types may also experience degradation which is represented by reduction in habitat quality resulting from the seismic survey activities, not associated with the actual clearance of habitat. This may include for example the impacts of offline trampling and fragmentation.

There is also potential for fires as a result of human activities where vegetation is dry from survey activities or some carelessness such as personnel smoking on site. In addition, as with the mobilization phase, the movements of seismic vehicles may lead to incidental transport of seeds and other propagating materials which can expedite the colonisation by invasive species into new areas.

5.1.2.3 Species

There are flora and fauna species of conservation concern within the survey area that have the potential to be adversely impacted during Project activities.

Chapter 4 Baseline lists the species that are likely to be present in the Project Area and defines their conservation status based on their IUCN and RLA designation. This section lists the plant and animal species of conservation concern in Albania and/or species that were actually recorded in the Project Area during surveys. In addition, some listed species, that may not have been recorded during surveys are included because although not found during surveys undertaken for the ESHIA, are considered to be potentially present in the Project area.

There are 405 plant species listed on the RLA in total. Based on the geographic location, altitude, climate and likely habitat types, the RLA plant species listed in Table 5-1 are considered likely to be present within the Project area. The full list also includes species identified as being rare and present in the study area, but are not included on the current version of the RLA. Based on their listing in their RLA and/or their IUCN conservation status, all of these plant species are considered to be of moderate sensitivity for the purposes of this assessment.

Table 5-1 Flora species

RLA Ref.	Specific Name	RLA Conservation Status	Sensitivity
357	<i>Dictamnus albus</i>	VU	Medium
240	<i>Hypericum Perforatum</i>	EN	Medium
250	<i>Juglans regia</i>	EN	Medium
41	<i>Juniperus oxycedrus</i>	VU	Medium
258	<i>Origanum vulgare</i>	EN	Medium
263	<i>Salvia officinalis</i>	VU	Medium
169	<i>Sambucus nigra</i>	VU	Medium
264	<i>Satureja montana</i>	VU	Medium
171	<i>Viburnum tinus</i>	VU	Medium
310	<i>Acantholimon ulicinum</i>	N/A	Medium
42	<i>Juniperus foetidissima</i>	EN	Medium
265	<i>Sideritis raeseri</i>	EN	Medium

In total, 575 species of fauna are listed in the RLA, which covers all Albanian species of conservation concern including terrestrial and marine animals as well as birds and fish.

Of the terrestrial animals present in Albania (in addition to numerous bat species), the main threatened mammal species listed in the RLA likely to be present in the Project area are listed in Table 5-2.

Table 5-2 Mammal species

RLA Ref.	Specific Name	Name in English	RLA Conservation Status	Sensitivity
563	<i>Lynx lynx</i>	Eurasian lynx	CR	High
554	<i>Ursus arctos</i>	Brown bear	VU	Medium
569	<i>Cervus elaphus</i>	Red deer	EX	no longer found in Albania
564	<i>Felis silvestris</i>	Wildcat	EN	Medium
558	<i>Meles meles</i>	Badger	EN	Medium
559	<i>Mustela erminea</i>	Stoat	EN	Medium
560	<i>Mustela putorius</i>	European polecat	EN	Medium
556	<i>Canis aureus</i>	Golden jackal	VU	Medium
570	<i>Capreolus capreolus</i>	European roe deer	VU	Medium
557	<i>Lutra lutra</i>	Otter	VU	Medium
562	<i>Martes martes</i>	Pine marten	VU	Medium

Species encountered during field surveys 2018

532	<i>Nannospalax leucodon</i>	mole-rat	IUCN DD	Low

RLA Ref.	Specific Name	Name in English	RLA Conservation Status	Sensitivity
575	<i>Martes foina</i>	beech marten	IUCN LC	Low
558	<i>Meles meles</i>	badger	EN	Medium
562	<i>Sus scrofa</i>	wild boar	IUCN LRnt	Low
554	<i>Ursus arctos</i>	brown bear	VU	Medium
557	<i>Lutra lutra</i>	otter	VU	Medium
537	<i>Muscardinus avellanarius</i>	hazelnut dormouse	DD in the RLA)	Low

In addition, there are numerous herptiles (amphibians and reptiles) as well as fish and birds included in the RLA. Threatened terrestrial herptiles included on the RLA likely to be present in the Project area are listed in Table 5-3.

Table 5-3 Herptiles species

RLA Ref.	Specific Name	Name in English	Conservation Status	Sensitivity
367	<i>Pelophylax kurtmuelleri</i>	Balkan water frog	VU	Medium
369	<i>Rana epeirotica</i>	Epirus water frog	VU	Medium
371	<i>Rana lessonae</i>	Pool frog	VU	No longer found in Albania
396	<i>Coluber gemonensis</i>	Balkan whip snake	CR	High
399	<i>Elaphe longissima</i> (<i>Zamenis longissimus</i>)	Aesculapian snake	EN	Medium
400	<i>Elaphe quatuorlineata</i>	Four-lined snake	CR	High
401	<i>Elaphe situla</i>	European rat snake	CR	High
406	<i>Typhlops vermicularis</i>	European blind snake or European worm snake	CR	High

In addition, there are numerous birds such as woodpeckers, (*Dendrocopos syriacus*, D. major not listed in the RLA but are IUCN LC), Egyptian vulture (*Neophron percnopterus*, VU), golden eagle (*Aquila chrysaetos*, EN), short-toed eagle (*Circaetus gallicus*, VU), buzzard (*Buteo buteo*, VU), white stork (*Ciconia ciconia*, CR), grey heron (*Ardea cinerea*, VU), little egret (*Egretta garzetta*, VU), bee-eater (*Merops apiaster*, EN) and lesser kestrel (*Falco naumanni*, VU), may also be present in large numbers in certain areas.

The following sections summarises the negative impacts on these receptors.

Mobilisation, Demobilisation and Restoration

Air pollution, dust and exhaust fumes from ground transportation may affect a range of species particularly plants within close proximity to roads and access tracks, where they may be smothered. The risk of dust generation is likely to be primarily an issue in dryer areas and close to the camps where vehicle movement is more frequent.

Transport of people, equipment and materials has potential for water and soil pollution from oil or fuel leaks and potential receptors include all plants and fauna. This is of particular importance for water bodies including wetlands and the species living there (i.e. fish and amphibians) and is most applicable in areas surrounding camps.

Noise and vibration from the moving vehicles may disturb animal populations. The highest potential risk will be experienced in high traffic areas including areas around camps and seismic lines.

Direct fauna mortality is possible due to collisions with moving vehicles. However, despite the sensitivity of fauna in the project area, vehicular collisions are unlikely to have a long term impact on the overall populations of these species.

Removal of vegetation to facilitate camp construction may result in loss of plant species.

Noise and lighting from the camp and presence of workers in the region may disturb fauna in the vicinity of the camps, including bats.

There is potential for fauna direct mortality as a result of accidental entrapment in excavations. Reptiles are probably the most at risk from this as they are generally smaller than other taxa.

Leaks and spills, wastewater and solid waste can have impacts on species and pollution effects can impact multiple sensitive flora and fauna identified in the baseline. This is of particular importance near rivers.

Seismic Survey

Seismic line preparation may result in the loss or disturbance of species, including i plant species, during vegetation clearance. Animal species are more likely to avoid areas where seismic survey activity is in progress, although smaller species such as herptiles and also nesting birds may not be able to leave the area easily. Species are likely to be encountered in designated areas and in natural habitats, such as Annex I habitats (see **Section 5.1.2.2**).

Particularly sensitive species include Lynx, which is Critically Endangered (CR) but is unlikely to be found in the Project Area. Other CR species include various herptiles but these are likely to move away as a result of vibrations during setting up and preparatory works. Bird species may be at risk if works are undertaken during the breeding season and nests of particularly sensitive species are disturbed.

There are specific risks associated with seismic activity that may affect the karst caves in the region. In addition to their geological interest, these may contain bat populations as well as cave dwelling species. All bat species are protected in Albania and therefore the presence of caves that may be affected (and which may be Natural Monuments) and the bats and other species using them may be at risk during this phase if the caves are not sufficiently mapped so that they can be avoided.

Seismic noise and vibration generated by seismic charges is expected to be minimised by the depth they are buried. Nevertheless, the presence of workers and machinery might disturb local fauna. Also potential direct mortality may occur resulting from collision with vehicles.

In the absence of control measures, project activities could have an adverse impact. The impact assessment for biodiversity and habitats is provide in **Section 5.2.4.5** and mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Section 8.5**.

5.1.3 Discharges to the environment

Potential negative impacts resulting from Project discharges and emissions to the environment have been identified based on the description of project activities in **Chapter 2, Project Description**.

Potential negative impacts have addressed include:

- air emissions (**Section 5.1.3.1**);
- noise emissions (**Section 5.1.3.2**);
- light emissions (**Section 5.1.2.3**); and
- waste generation (Section **5.1.3.4**).

5.1.3.1 Air emissions

The main project activities that have the potential to impact air quality are associated with vehicle movement, vegetation clearance and site levelling and use of generators. A risk based approach is adopted to assess potential environmental impacts of the development on the local air quality. Details of the air quality within the survey area are provided in **Chapter 4, Baseline (Section 4.4)**.

In the absence of control measures, project activities have the potential for adverse impacts. The impact assessment air quality is provided in **Section 5.2.4.6** and mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Section 8.6**.

Impacts identified with respect to air quality are:

- Degradation due to atmospheric emissions (greenhouse gases and particulate matter);

- Climate change resulting from air emissions; and
- Uncontrolled explosions and fire activities resulting in deteriorated air quality.

The primary source of atmospheric emissions will be from vehicle exhausts and operation of diesel generators at the temporary fly camps. Fugitive emissions such as dust and particulate matter will occur during transport operations and from exposed soils surfaces including unpaved roads. Dust emissions could also be expected during vegetation clearing.

Mobilisation and Support Facilities

The main sources of air emissions during this phase will be associated with vehicle movements (transport and equipment). Vehicle emissions will be fairly limited in quantity and duration and therefore not considered to contribute considerably to baseline levels of NO_x, SO_x or CO_x.

The mobilisation will also be accompanied by release of dust and particles, particularly while crossing any unpaved road sections or tracks. This is of particular importance in the summer and will have potentially higher impacts to communities located close to the roads.

The base and helicopter pad facilities will be required to provide logistical support during the seismic campaign, and are likely to be located close to the town of Gjirokastër (in an industrial area); however other possible locations may be considered. The fly camps will also be temporarily established closer to the seismic lines to accommodate the working crew for a short duration (days-weeks). Emissions and particulates during the base and fly camp set up and operation will be generated by vehicle movements (both land transport and helicopters); construction equipment and machinery (drill rig, front end loaders, bulldozers); and the use of generators. Little earthwork is expected given that base is to be located in an existing industrial area, however fly camps will be located throughout the survey area which may need to be cleared and levelled.

Increased dust generated by helicopters during routine and non-routine (emergency evacuations) landing could potentially decrease the air quality in its immediate surroundings for a limited period of time. Increased fine particulate matter concentrations that can affect human health and increased dust deposition which can be a nuisance.

Similar to the mobilisation phase, exhaust emissions from vehicles and machinery will be fairly limited in time. For static sources (e.g. two diesel generators in fly camps), potential impacts caused by diesel combustion engine emissions vary in intensity according to the distance of potential receptors from the source.

The emission of greenhouse gases (e.g. CO₂) from vehicles, generators and other machinery may also be considered to have an impact on climate change. There is also the potential for deterioration in air quality to result from uncontrolled explosions and fire activities, associated with the storage of explosives.

Seismic Survey

The potential sources of emissions during the seismic survey will be associated with establishing the seismic grid (vegetation clearance, earthworks), drilling of approximately 3,000 shot-holes and up-holes and vehicle movements. These activities are expected to have greater effect on local communities located close to the seismic corridors and in villages through which the crew will transit on a daily basis to and from the accommodations and base. There could be some localised impacts associated with dust deposition on nearby agricultural land. No impacts on air quality are expected from the detonation of charges; however there is the potential for uncontrolled explosions and fire activities to result in deteriorated air quality.

Demobilisation and Restoration

The potential changes in air quality during demobilisation and restoration phase would be similar to those associated with the mobilisation phase including increased traffic and need of heavy machinery to restore the camp sites and rehabilitate the vegetation.

In the absence of control measures, project activities could have an adverse impact. The impact assessment air quality is provided in **Section 5.2.4.6** and mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Section 8.6**.

5.1.3.2 Noise and Vibration

The main project activities that have the potential to impact the ambient noise environment are from vehicle movements, use of generators, camp operations and seismic data acquisition.

Impacts identified with respect to noise emissions are:

- Nuisance to communities from noise and vibration and

- Disturbance of religious ceremonies.

Noise and vibration have the potential to disturbance to surrounding fauna and is discussed in the section on Biodiversity (**Section 5.1.2**). The potential impacts from vibration to geological and cultural heritage monument are discussed in **Section 5.1.1.2** and **Section 5.1.5**, respectively. Damage to landowner property such as building and domestic wells are discussed in **Section 5.1.4**.

For the purpose of the impact assessment, mobilization, camp set up and operations and the demobilisation phases are combined as the impacts are similar in nature.

Mobilisation, Support Facilities, Demobilisation and Restoration

The main sources of noise and vibration will be associated with increased road traffic during the mobilisation phase, construction activities in the camp set up and operation of generators.

Mobilisation vehicles will cross various localities, particularly Gjirokastër, where residential and commercial areas, hospitals and schools can be found. Vehicle movements cause localized elevated noise and vibration levels, especially for the movement of heavy vehicles transporting machinery and equipment to site. Within residential areas and in some cases remote areas there may be religious services taking place which would be disturbed by the additional vehicle traffic.

Operational and construction activities within the base and fly camps will result in an increase in ambient noise levels attributable to vehicle engines, diesel generators, pumps, compressors, etc. In quiet rural settlements; such activities and the continual use of camp generators have the potential to cause considerable nuisance, when close to homes or other noise sensitive receptors.

Worker accommodations located within villages, have the potential to disturb local residents by the noise generated by the crew and moment of vehicles.

The potential noise impacts of the demobilisation and restoration would be similar to those associated with the mobilisation phase.

Seismic Survey

Vehicle movements will generate noise and vibrations along seismic lines and within communities through which the crew will transit going to and from the base and accommodations. The opening of seismic lines will involve heavy machinery and vegetation clearance however it is unlikely that these noise sources will all be together in one place, but rather spread out over a distance. Furthermore, the noise sources will be moving so at any particular point along the route the impacts would be localised and for a short duration.

Noise and vibration from the various activities along the seismic lines, notably shot-hole drilling and data acquisition (detonation of explosives and vibroseis) will result in increased level of nuisance to local communities, depending on the distance from source and other factors such as topography.

An explosion in a shot-hole will produce a pressure wave in the ground. The noise attributable to the detonation of the shots is described as a muffled 'thump' (as opposed to an explosive 'bang'). With the use of vibroseis machines a vibrating source is placed on the ground.

In addition to above, the noise generated by helicopters during routine and non-routine operations could potentially create a disturbance to communities. The level of noise generated will vary due to factors such as helicopter model and flight path (which in turn depends on the weather). It is assumed that landing would be the greatest source of noise. Landings associated with routine operations will take place at the Base.

The effect of vibration on buildings and other structures is discussed in **Section 5.14** and cultural heritage in **Section 5.15**.

5.1.3.3 Light

Light emissions are primarily caused by the light from the operation of Base and fly camps and security of the explosive storage magazine. Most of the seismic survey area is rural where there are little or no sources of ambient light, existing ambient light sources are primarily around villages and larger towns. The locations of villages in proximity to the seismic survey are shown in **Figure 4-33**.

Impacts identified with respect to light emissions are:

- Disturbance to human receptors (local residents, businesses etc.);
- Disturbance to ecology (see **Section 5.1.2**); and
- Impacts on visual amenity (see **Section 5.1.6**).

Mobilisation, Support Facilities, Seismic Surveys and Demobilisation and Restoration

No vehicular transport will be permitted at night (with the exception of emergency vehicles) hence no impacts are anticipated to result from vehicle movements associated with any phase of project. Camp set up and seismic surveying is also anticipated to be undertaken during daylight hours, and therefore no impacts are anticipated during these phases.

Light will appear as a new and uncharacteristic feature in the rural environment resulting from fly camp operations, security lighting the explosive storage magazine, with the potential to disturb human receptors (residential) and fauna in the vicinity, as well as potentially impacting visual amenity (glare/sky glow).

Light emissions will also result from base operation. Although the base is to be located in an existing industrial areas, there remains potential for disturbance to human (business and residential) receptors) and loss of visual amenity (glare/sky glow).

5.1.3.4 Waste

A risk based approach is adopted to assess potential environmental impacts of the development resulting from waste generation, storage and handling. Details of waste management within the survey area are provided in **Chapter 4 Baseline (Section 4.11)**.

Impacts identified with respect to waste are:

- Littering – environmental degradation
- Environmental contamination as a result of hazardous waste
- Environmental contamination as a result of non-hazardous, operational and domestic waste
- Availability/capacity of licensed waste disposal options

Mobilisation

It is not anticipated to generate waste from the mobilisation activities, and therefore no impacts are expected from this phase of works.

Support Facilities and Seismic Survey

During camp set up, operation and the seismic survey phases there is potential for uncontrolled waste to result in nuisance litter in the vicinity of the Base, fly camps and along the survey corridors, this can lead to environmental degradation, poses a risk to fauna through ingestion or if caught up in, and can also be an eyesore with implications for visual amenity (see **Section 5.1.6**)

Poor or the lack of appropriate waste management, particularly at fly camps can result in secondary impacts to soils, groundwater and surface water through contamination.

Wastes will be disposed of in licensed facilities; this may put a strain on existing facilities, if available. Without approved facilities, wastes, in particular hazardous waste will need to be appropriately stored and managed to avoid risks of environmental contamination.

Demobilisation and Restoration

During this phase the Base, explosive magazine and fly camps will be closed. Fly camps will be closed and restored throughout the seismic survey data acquisition phase as they will be relocated in the vicinity of the seismic corridors as necessary. If waste is poorly managed during this process, there is the potential for the release of litter and/or environmental contamination.

5.1.4 Social and Health Impacts

A risk based approach is adopted to assess potential environmental impacts of the development on social communities and health and safety. Details of social and health conditions within the survey area are provided in **Chapter 4, Baseline (Section 4.11)**. The potential impacts to social receptors are summarized in this section and the impacts are assessed in **Section 5.2.4.10**. Mitigation measures to avoid or reduce the impacts are provided in **Chapter 8, Section 8.10**.

Social and health impacts principally relate to the following five key sensitivities that exist within the project area:

- Disturbance, damage or disruption agricultural communities and agricultural
- Water availability
- Damage to road infrastructure
- Limited availability of medical facilities and nurses or doctors in rural areas.
- Conflicts with tourism

Mobilisation and Support Facilities

Establishing the camp

Subject to the location of the camps there will be a requirement to acquire permission for use of land and then clearance of crops or pasture from that land, and exclusion of any grazing livestock. Local residents could have a high reliance on that land for subsistence food or income purposes. The area impacted may be limited to one or a small number of landowners, and the approaches for siting will mean that any land with sensitive uses will be avoided.

Accommodation of project workers

The workers that are not from local communities will be housed in existing hotels and guesthouses, and potentially in the base or fly camp. For work in remote areas fly camps will be established, as a temporary accommodation for workers. The presence of non-local workers in local communities can create disturbance to existing residents, particularly if the camp was located in or close to a rural village or in existing accommodations within the villages. If the camp is located within or close to any of the major towns then the size of the workforce is small enough to not create a noticeable impact. However, if accommodations are established close to or within a village then the population of the crew could be substantially larger than that of the village, and the noise and traffic associated with the crew movements would be substantial compared to baseline conditions.

Project workers who are accommodated in hotels and guest houses will create revenues for those business owners. However, they could displace tourists due to the reduced availability or increased cost of hotel rooms, particularly during peak tourist season and for the major events that take place in Gjirokastrë and Permet. That displacement of tourists would impact the number of visits made to other tourism businesses, such as attractions and tours.

Use of water for operation of camps

The camps will require water for domestic sanitation and for various other project uses, e.g. washing and maintaining machinery. Water supply within the municipalities is limited at some time of year, and in the villages it is an important resource for irrigation and domestic use. Due to the limited availability of water there is the risk that project water use at the camps could contribute to water shortages and reduced supply to other users.

Traffic operating to and from accommodations during mobilisation and operation

The movement of project vehicles to and from the accommodations will increase traffic on the road and could contribute to an increased risk of road accidents for other vehicles, pedestrians and livestock. This impact will be limited as the Base is to be located close to major towns as roads are wider and better maintained in those areas. In rural areas project traffic going along small roads through villages and in areas of livestock could create an elevated risk of accidents involving pedestrians and livestock. This impact description also applies to the impact of traffic during the seismic survey phase.

Introduction or spread of communicable diseases within local communities

The operation of the camps and the presence of non-local workers working in local communities may create a potential risk of spread of communicable disease and creation of unsanitary conditions. It is not yet known where project workers will come from, and so the profile of disease risk cannot be established. Domestic waste and

sewage will be created at the camps, and will be managed to avoid the creation of unsanitary conditions for local residents.

Provision of security at camp

Project security staff may be used to protect assets and personnel at the camp. Their role will be to provide a deterrent (e.g. to theft) and to respond to any security incidents. Security will be unarmed, or equipped proportionate to security threat. Any inappropriate behaviour or excessive use of force by project security staff would impact community safety and wellbeing. For accommodations located within or close to a rural village the local residents could be particularly vulnerable to any inappropriate behaviour or excessive use of force. This impact description also applies to work sites during the seismic survey phase.

Seismic Survey

Clearance of crops or pasture from seismic lines and access routes

In rural areas households typically grow vegetables and fruits for household consumption close to the residences, locating the seismic line to avoid the residences may also create adequate avoidance of these areas used for vegetables and fruits. However, there may be some areas where these types of crops grown for household consumption are further away from the residence and could be impacted.

Pasture for livestock grazing is fairly extensive around many villages, and areas directly impacted by clearance for the survey may be a negligible proportion of total land available. However, some livestock keepers may own or have rights on smaller parcels and impacts on could be noticeable.

Disturbance to livestock from seismic survey activity, including helicopter movements

Cows, sheep and goats are kept across the Project area, particularly in the upland areas. Project vehicles and work crews will frequently interact with livestock, either on access roads or in pasture lands. This interaction could create minor disturbance to the livestock. Helicopter movements and detonations may create more disturbance, and potentially loss of livestock if they bolt away from the sound source. Disturbance to livestock creates a nuisance for their keeper and potential a financial impact if any are lost.

Disruption to landowners due to access restrictions during seismic acquisition activity

During the seismic survey the positioning of vehicles and equipment and the imposition of exclusion zones around active shot holes could block off access to roads or fields. This would happen if vehicles and equipment have been positioned without consideration of access points for local people, including farmers. At any one location this impact would be brief, and would be remedied by the contractor moving vehicles or equipment, and at the end of the imposition of exclusion zones around the active shot holes.

Decreased tourist appeal of the area due to noise and disturbance created by the project and visual impact

There could be an impact on the tourist appeal of the area as a result of noise and disturbance from helicopters and increased traffic, as well as due to the visual impact to the local scenery from clearance of seismic lines.

Use of water for seismic survey activities

The seismic survey will require water for drilling. Water supply within the municipalities is limited at some time of year, and in the villages it is an important resource for irrigation and domestic use. Due to the limited availability of water there is the risk that project water use for the seismic survey could contribute to water shortages and reduced supply to other users.

Poor handling, transportation, storage and use of explosives

Poor handling, transportation, storage and use of explosives could result in accidents (e.g. fires, explosions) and injury of workers and members of the public. Transportation of hazardous materials gives rise to a risk from spills or accidents which can affect not just the environment, but residents and road users.

5.1.5 Cultural Heritage and Archaeology

Project activities that have the potential to impact cultural heritage and archaeology are mainly from site clearance and levelling activities, the movement and use of vehicles and machinery and seismic data acquisition. The location of settlements within 500m of the seismic corridors and cultural monuments are shown in **Figure 4-33** and **Figure 4-48**, respectively. Cultural monuments are protected under Albanian legislation and are considered to be designated sites. IFC PS 8 also classifies cemeteries and structures that embody religious

values such as churches as cultural heritage even if they are not legally protected²⁶². Details of the protected cultural heritage and cemeteries within the survey area are provided in **Chapter 4, Baseline (Section 4.12)**.

Impacts to cultural heritage that may arise from project activities are:

- Physical damage to cultural heritage sites and archaeological remains (tangible cultural heritage)
- Noise and visual intrusion on the setting of cultural heritage sites (tangible cultural heritage)
- Noise and visual intrusion on cultural or religious ceremonies or festivals (intangible cultural heritage)

Mobilisation Support facilities, and Demobilisation

During mobilization, all activities are non-intrusive and comprise vehicles moving through the Project area and pose no direct risk to cultural monuments. However, the movement of vehicles and equipment can introduce noise and visual intrusion on the setting of known cultural heritage sites. This noise and visual intrusion could also impact cultural or religious ceremonies or festivals.

Site clearance for fly camps has the potential to impact on known cultural heritage sites and on as yet unknown archaeological sites. Earth moving for ground levelling is likely to have impact and could as a worst case result in the removal of as yet unknown archaeological sites.

Seismic survey phase

The drilling of shot holes has the potential to cause limited impacts to as yet unknown archaeological sites, as shot holes are a small localised excavation. The shooting of seismic charges and the use of vibroseis machines has the potential to cause vibration damage to cultural heritage sites. The laying of geophones within sacred sites such as cemeteries can be disrespectful of the religious value of the sites.

Demobilisation and Restoration

As described with earlier project phases vehicle movements during the demobilisation and restoration phase can introduce noise and visual intrusion on the setting of known cultural heritage sites and impact cultural or religious ceremonies or festivals.

5.1.6 Landscape and Visual Amenity

Landscape and visual amenity impacts are those changes to the existing environment that may alter the character of an area experienced by residents and tourists. Impacts to this resource are considered to be secondary or indirect impacts as a result of project activities.

Specific direct impacts include:

- Deterioration of roads and unpaved tracks;
- Vegetation clearance;
- The presence of fly camps, machinery and equipment;
- Littering; and
- Light emissions (see **Section 5.1.3.3**)

Mobilisation and Support Facilities

During the mobilization phase vehicle movements can deteriorate roads and unpaved tracks. The deterioration of roads and land scarring from tracks alter the visual landscape to residents and tourist. Similarly, the presence of fly camps, machinery and equipment will disturb the tranquil rural environment. Litter can be windblown and affect the visual amenity of the area.

Seismic survey phase

Vegetation clearing for clear lines of sight will leave noticeable pathways, particularly in forested areas. As with the mobilization phase, the presence of machinery and equipment will disturb the tranquil rural environment and litter will be affect the visual amenity.

Demobilisation and restoration phase

As in the mobilization phase, the potential impacts result from the visual appearance of roads and the presence of machinery and equipment. The removal of camps will leave bare spots until the vegetation regrows.

²⁶² IFC 2012 International Finance Corporation Performance Standard 8 Cultural Heritage

5.1.7 Unplanned events

Unplanned events are incidents that are not expected to occur during project activities, such as accidents. The Project follows safety and design criteria that aim to reduce the probability and consequences of unplanned/non routine events that could lead to adverse environmental, socio-economic or health and safety impacts.

This section provides an assessment of the potential impacts from non-routine events that could potentially occur. Potential non-routine events associated with the project include:

- Rupture or damage of fuel and oil storage;
- Vehicle collisions and accidents; and
- Uncontrolled explosions and fire

Rupture of storage tanks, theft, road traffic accidents involving tankers or chemical transporters and acts of vandalism could result in contamination of habitats in the project area, although the surface waters and wetland habitats are the most sensitive to pollution impacts. Despite the short duration of the seismic survey activities, any spillage such as oil or diesel could remain in the sediment in ponds and water courses over an extended period of time. Other fuels such as A1 fuel for helicopters would have a similar impact but to a lesser extent.

Releases of fuels can result from vehicle collisions; with impacts dependent upon the quantities of material released which would be more than that resulting from incidental spills and leakages from vehicles and equipment.

Uncontrolled explosions could also heavily impact upon the habitats of the project area. Explosions could cause direct mortality to fauna in the surrounding area, and in turn lead to uncontrolled fires. All non-routine events can potentially cause long term impacts upon the habitats, flora and fauna of the area, through direct habitat loss, habitat disturbance and direct mortality of plants and animals. However, these events are unlikely to occur and they can be controlled.

Fires and explosions (non-routine events) may have significant impact on the surrounding environment as well as potential injuries if intensity of the accidental event is of large proportions and uncontrolled. This impact is of particular importance during explosives handling and storage.

Mitigation for non-routine events will include the development of Emergency Response Plans and training of staff in:

- Take appropriate steps to contain and minimise damage in the event of a non-routine event in compliance with the Emergency Response Plan;
- Prevention of accidents by adhering to good industry practices;
- Training in immediate response to bush fire, spillages, among others.

5.1.8 Cumulative environmental impacts

Cumulative impacts²⁶³ result from the incremental effects of the proposed Project when added to other past, present and reasonably foreseeable future actions, regardless of who undertakes them. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over time.

The known activities within the Project Area of Influence include:

- Agricultural farming, mainly seasonal crops and fruit plantations. This activity is present in the valley of largest river Vjosa and its tributaries.
- Husbandry and milk processing facilities, which are particularly common in the Gjirokastra and Dropulli areas.
- Several main water bottling facilities are located within Block 4, and include Trebeshina, Tepelena, Glina sparkling and spring water.
- Several stone quarries producing decorative stones are located along the Vjosa valley from Kelcyra to Permeti.

²⁶³ Cumulative impacts are limited to those impacts generally recognised as important on the basis of scientific concerns and/or concerns from Affected Communities. Examples of cumulative impacts include: incremental contribution of gaseous emissions to an airshed; reduction of water flows in a watershed due to multiple withdrawals; increases in sediment loads to a watershed; interference with migratory routes or wildlife movement; or more traffic congestion and accidents due to increases in vehicular traffic on community roadways (IFC, 2012).

- Development of small hydropower plants has increased in the recent decade backed up by national policies on renewable energy. The majority of developments take place along the Benca River (tributary of Vjosa River and along several tributaries of Vjosa River from Kelcyra to Carshova). Some of these are known to be in planning and construction phases.

Cumulative impacts are associated with:

- increased air emissions;
- increased demand for water
- increased levels of waste to be managed;
- increased stress on tourist locations (e.g. parks, cultural monuments); and
- increased demand for temporary accommodation.

There are no cumulative impacts associated with agricultural farming, animal husbandry and milk processing facilities as the impacts from these operations are different from those anticipated by the project.

The water supply facilities will experience an increased demand for water. The water supply network in the Project area is stressed (see **Section 4.11.20**). Some villages experience significant water supply issues with limited availability and /or the requirements to pipe or carry in water from surrounding areas. Supply issues may be worse during the drier summer months.

Stone quarries are known to generate dust. Dust generated project activities will be localized and no cumulative impact can be expected.

The construction of hydro power plant will generate waste that will require disposal. Waste disposal infrastructure is limited in the region and in Albania. The additional waste streams requiring disposal may put an additional strain on the existing non-hazards waste disposal facilities. All disposal sites do not meet the basic sanitary environmental standards and are open pits into the soil or dumping of waste on the soil surface (See **Section 4.11.21**). There are no hazardous disposal facilities in Albania; as such the wastes will be stored until final disposal options become available there is no cumulative impact.

The focus of most of the municipalities is to increase tourism which will draw more people to the area. Although no specific involvement of these activities could be identified; there are plans to develop tourism, agro-tourism and eco-tourism further, especially in the Gjirokastër and Permet areas. The increase in activity from tourist and the Project activities in national and natural parks will add additional stress to these sensitive environments.

Furthermore, the accommodation for the project work force will be either in camps, hotels or in guesthouses in local villages. The increased need for local accommodation resulting from efforts to promote tourism in the area may exceed the available hotel capacity making them unavailable to tourists.

5.2 Impact analysis and assessment

5.2.1 Methodology

This section summarizes the overall approach to be taken to identify and characterize the environmental, social and socioeconomic impacts associated with the Project in the ESHIA Report.

An initial step in assessing potential changes to the baseline conditions resulting from the Project will be to identify environmental aspects. Environmental aspects are defined in ISO 14001 as:

- *“An element of an organization’s activities, products or services which can interact with the environment.”²⁶⁴*

As part of this process, potential receptors within the study area that might be affected by any project activities will be identified. An environmental receptor can be defined as:

- *“An entity that receives a contaminant or pollutant and which can be subject to an environmental impact. It can be a body of water, air, parcel of land, community, ecosystem or individual organism, human being or property”.¹*

²⁶⁴ ISO 14001 Environmental Management Systems

Once the aspects and receptors are identified, the interactions occurring between the individual aspects and receptors that might lead to potential impacts of the proposed activities will be considered and evaluated.

For the purpose of this ESHIA an environmental or social impact is defined as:

- *"Any change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation's activities or services."*¹

5.2.1.1 Impact identification

To identify the potential project impacts, all proposed activities have been considered in terms of their potential to:

- Interact with the existing environment including its physical, biological and social elements;
- Breach relevant Albanian legislation, relevant international legislation, standards and guidelines, and corporate environmental policy and management systems.

Impacts were identified and assessed according to the different project phases (mobilisation, Base and fly camps set up and operation, seismic survey, and demobilisation and restoration). The approach has been formulated to assess potential impacts resulting from planned or routine project activities. The method therefore assumes that the project activity that may cause the impacts will occur. The impact assessment also considered events that are not planned but may occur during the project lifecycle. Such 'non-routine events' are generally incidents or accidents that have the potential to result in a greater impact than routine events.

Potential non-routine events associated with the project include:

- Fuel and oil spills from vehicles and camp workshops;
- Uncontrolled explosions and fire; and
- Vehicle collisions and accidents.

The evaluation of impacts arising from non-routine events uses the same methodology as for routine project activities. The likelihood of a non-routine event occurring is not assessed. Rather, the method considers the degree to which receptors and resources may be affected assuming that the non-routine event happens, and serves to identify the receptors most at risk should such an event occur.

5.2.1.2 Impact assessment criteria

In order to assess the overall level of an impact it is necessary to establish:

- The sensitivity or importance of the receiving environment or receptor;
- The type (direct or indirect) and magnitude of the effect occurring; and
- The change to the existing baseline conditions as a result of the project.

5.2.1.3 Sensitivity of receptors and resources

Receptors may be people, ecological, biological and physical components of the environment, or cultural sites. Receptor sensitivity considers how a particular receptor may be more or less susceptible to a given impact. More sensitive receptors may experience a greater degree of change, or have less ability to deal with the change, compared with less sensitive receptors that may be more resilient or adaptable.

Potential environmental effects have been assessed in relation to baseline conditions, i.e. the conditions that would prevail should the proposed project does not go ahead. Baseline conditions are those that existed at the time of the assessment. Impact identification was considered in terms of receptors and resources sensitive to changes in baseline conditions where:

- Receptors comprise human beings, either individually or collectively, and the socio-economic systems on which they depend, such as communities and local or regional economies; and
- Resources, defined as biophysical features, which include flora, fauna, water, landscape, built heritage, archaeological sites, transport networks and community facilities among others.

Receptor sensitivity is based on multiple characteristics, namely:

- Vulnerability: the degree to which a receptor is vulnerable to change (i.e. higher or lower sensitivity);
- Value: the degree to which a receptor is valued or protected, with higher value receptors (based on ecological, cultural, social, economic, or other grounds) having a higher sensitivity; and
- Resilience: the degree to which a receptor is able to recover from an impact.

The sensitivity of a resource may be rated as **negligible**, **low**, **moderate** or **high**. Table 5-4 provides definitions of the sensitivity criteria used for resources in this Report. The sensitivity of a receptor may be rated as **negligible**, **low**, **medium**, **high** or **very high**. Table 5-5 provides the sensitivity criteria for human receptors.

Table 5-4 Definition of sensitivity criteria for resources

Sensitivity rating	Criteria
<i>High</i>	The receptor or resource has little or no capacity to absorb change without fundamentally altering its present character, is of very high environmental or social value, or is of international importance
<i>Moderate</i>	The receptor or resource has low capacity to absorb change without fundamentally altering its present character, is of high environmental or social value, or is of national importance
<i>Low</i>	The receptor or resource has moderate capacity to absorb change without significantly altering its present character, has some environmental social value, or is of national importance
<i>Negligible</i>	The receptor or resource is tolerant of change without detriment to its character, is of low environmental or social value, or is of local importance

The sensitivity of social receptors is defined in Table 5-5.

Table 5-5 Sensitivity definitions for receptors

Sensitivity	Definition
<i>Very High</i>	Large numbers of individuals or whole communities have minimal resources to adapt to external change and this creates significant vulnerability with respect to basic food security and shelter, with the potential for substantially deteriorated living conditions and / or health status in the long-term.
<i>High</i>	Individuals and the broader community have limited resources to adapt to external change. Adaptation will be limited and slow to occur, with the potential for deteriorated living conditions and / or health status in the medium term.
<i>Medium</i>	Individuals and the broader community have resources and systems in place to partially adapt to change, but impacts on the livelihood, wellbeing or health of community members will be noticeable in the short-term.
<i>Low</i>	Individuals and the broader community have resources and systems in place to absorb change with only a minor change from baseline conditions.
<i>Negligible</i>	Individuals and the broader community have plentiful resources and systems in place to readily absorb change without there being risk of noticeable impacts on the livelihood, well-being or health of community members.

5.2.1.4 Types of effects

Potential effects are classified using the following terminology in this Report as described in Table 5-6.

Table 5-6 Terminology of Potential Effects

Types of Effects	Criteria

Types of Effects	Criteria
Beneficial (positive)	Effects that, in the opinion of the ESHIA team, have a beneficial influence on receptors or resources
<i>Adverse (negative)</i>	Effects that, in the opinion of the ESHIA team, have an adverse influence on receptors or resources
<i>Permanent</i>	Effects that result from an irreversible change to the baseline environment or which persist for the foreseeable future
<i>Temporary</i>	Effects that persist for a limited period only, such as those which would cease once a particular activity has finished or which may disappear due to natural recovery of the environment
<i>Direct or Primary</i>	Effects that arise from the impact of activities that form an integral part of the project
<i>Indirect or Secondary</i>	Effects that arise from the impact of activities that do not form part of the proposed project, but which are a consequence of a primary effect
<i>Cumulative</i>	Cumulative is the projects residual impacts plus impacts from other projects.

5.2.1.5 Impact magnitude

The magnitude of a given impact is a measure of the degree of change from the baseline conditions, and is determined through the consideration of the following factors:

- Extent: the spatial extent (e.g. footprint, local which comprises the project footprint and additional 1 km from site activities, regional comprises the project footprint and extends to 30km of project activities and national);
- Duration: how long the impact will last (e.g. permanent or temporary);
- Frequency: how often the impact will occur (e.g. a one-off event, periodic, or continuous); and
- Reversibility: the length of time and effort required for baseline conditions to return (e.g. reversible in the short-term or long-term, or irreversible).

The magnitude of an impact may be rated as **negligible**, **low**, **moderate**, or **high**.

Table 5-7 provides definitions of the magnitude of impact criteria used in this Report.

Table 5-7 Definition of magnitude of impact

Magnitude of Impact	Criteria
<i>High</i>	Total loss or major alteration to key elements or features of the baseline conditions as a result of project activities such that the character or composition of the baseline condition would be fundamentally changed.
<i>Moderate</i>	Loss or alteration to one or more key elements or features of the baseline conditions as a result of the project such that the character or composition of the baseline condition would be materially changed.
<i>Low</i>	Minor shift away from baseline conditions as a result of the project. Changes arising from the alteration would be detectable but not material; the underlying character and composition of the baseline condition would be similar to the baseline situation
<i>Negligible</i>	Very little change from baseline conditions as a result of the project. Change is barely distinguishable, approximating to a "no change" situation.

5.2.2 Receptor identification

Receptors are environmental resources, people and cultural heritage assets that may be affected, adversely or beneficially, by the Project. Potential receptors were identified through both desk- and field-based studies, taking into consideration likely Project impacts. As describe in **Chapter 4, Baseline**, there are designated and protected areas within the survey area which include protected natural and cultural monuments, nature and natural reserves and water supply zones.

In addition **Chapter 4, Baseline** lists the species that are likely to be present in the Project Area and defines their conservation status based on their IUCN and RLA designation. Listed flora and fauna species, that may not have been recorded during surveys are included because although not found may still be present in surveyed areas that were not surveyed. Based on the geographic location, altitude, climate and likely habitat types, RLA plant species or animal species may be present within the search area and or were identified being rare and present in the study area, but not included on the RLA. The seismic acquisition lines will intersect with several types of forest/ habitats which are listed in Annex I of the EU Habitats Directive.

The extent and duration of the potential negative impacts identified in **Section 5.1** consider the project activities associated with the execution of the project as described in **Chapter 2, Project Description**.

A summary of receptors, potential impacts, impact extent and duration is provided in Table 5-8.

Table 5-8 Summary of Potential Impacts, Duration and Extent

Receptor	Potential Impact	Impact Extent	Impact Duration
Soils and Geology	Degradation of soil quality	Fly camps Seismic lines	During the project timeline Could extend beyond project time line
	Soil erosion	Seismic lines Roads	During the project timeline; Could extend beyond project time line
	Soil compaction	Fly camps Seismic lines Helicopter Landing Pad	During the project timeline; Could extend beyond project time line
Groundwater	Deterioration of groundwater quality as a result of accidental leaks/spills or explosive residue	Fly camps Seismic lines Roads	During the project timeline;
	Strain on water resources	Local communities	During the project timeline
Surface Water	Degradation of water quality	Fly camps Seismic lines	During the project timeline;
	Sedimentation of water bodies	Seismic lines	During the project timeline;
	Alteration of stream morphology	Seismic lines crossing streams	During the project timeline; Could extend beyond project time line
Biodiversity	Loss / Disturbance of natural habitat through vegetation clearance or damage	Fly camps Seismic lines Helicopter Landing Pad	Based on the restoration time (1 to 4 years)
	Loss / Disturbance of plant species of conservation concern.	Camps Seismic lines Helicopter Landing Pad	Based on the restoration time (1 to 4 years)
	Contamination of terrestrial or aquatic habitats	Camps Seismic lines	During the project timeline Could extend beyond project time line
Air Quality	Degradation of air quality by atmospheric	Project area	During the project timeline

Receptor	Potential Impact	Impact Extent	Impact Duration
	emissions (greenhouse gases and particulate matter)		
	Climate change resulting from air emissions	Unspecified/Global	negligible
Noise	Noise and vibration from increased road traffic	Fly camps Seismic lines and surrounding area Roads	During the project timeline
	Nuisance to communities due to noise	Fly camps Seismic lines and surrounding area Helicopter Landing Pad and flight routes	During the project timeline
	Disturbance of religious ceremonies	Fly camps Seismic lines and surrounding area Helicopter Landing Pad and flight routes	During the project timeline
Light	Disturbance to Human receptors (local residents, businesses etc.)	Base, explosives magazine, Fly camps and surrounding area	During the project timeline
	Disturbance to Ecology	Fly camps and surrounding area	During the project timeline
	Impacts on Visual Amenity	Fly camps and surrounding area	During the project timeline
Waste	Littering – environmental degradation	Fly camps and surrounding area Seismic lines and surrounding area	During the project timeline and beyond
	Environmental contamination as a result of hazardous waste	Base, Helipad, Fly camps and surrounding area Seismic lines and surrounding area	During the project timeline and beyond
	Environmental contamination as a result of non-hazardous, operational and domestic waste	Base, Helipad and Fly camps and surrounding area Seismic lines and surrounding area	During the project timeline and beyond
Social Communities	Clearance of crops or pasture from seismic lines and access routes.	Seismic lines and access routes.	During the project timeline
	Clearance of crops or pasture from area used for camp(s)	Footprint of camp(s)	During the project timeline
	Access restriction to agricultural areas during seismic acquisition activity	Seismic lines	During the project timeline
	Disturbance to livestock, potentially affecting behaviour.	Areas adjacent to seismic lines	During the project timeline
	Noise and vibration disturbance to local residents	Areas adjacent to seismic lines and along helicopter routes.	During the project timeline
	Damage from vibration to structures, including buildings, sheds, fences, wells and septic tanks	Areas within and adjacent to seismic lines	During the project timeline and beyond
	Damage caused by the movement of project equipment and vehicles to structures such as fences.	Areas within and adjacent to seismic lines	During the project timeline and beyond
	Wear and damage on roads from movement of project equipment and vehicles, particularly	Road routes across the project area.	During the project timeline and beyond

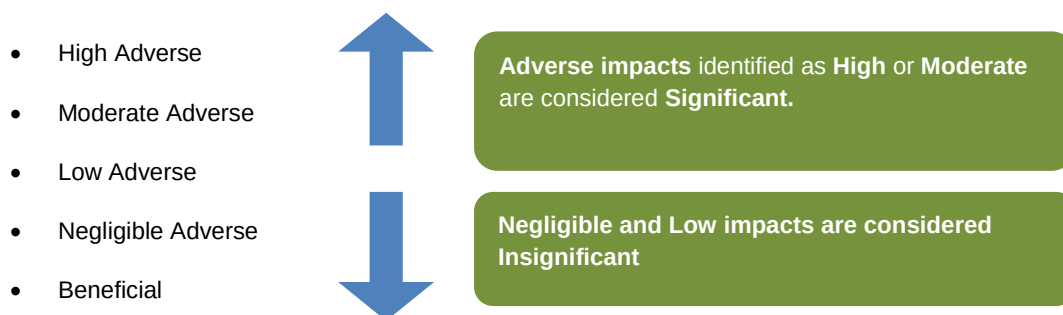
Receptor	Potential Impact	Impact Extent	Impact Duration
	for unpaved roads.		
	Increase in road traffic from project vehicles could lead to traffic delays for other road users in areas where road capacity is limited or in poor state of repair.	Road routes across the project area.	During the project timeline
	Disruption to community well-being from non-local project workers and associated increased noise and traffic or behaviours that are not aligned with local norms.	Communities across the project area, principally those where project workers are accommodated.	During the project timeline
	Disruption to landowners from project workers accessing their land	Seismic lines	During reconnaissance surveys, land access permitting, and project execution
	Decreased tourism in the area due to lower availability or increased cost of tourist accommodation, caused by demand from project workforce	Across Gjirokaštër county	During the project timeline
	Decreased tourist appeal of the area due to noise and disturbance created by the project and visual impact (impact on landscape)	Across Gjirokaštër county	During the project timeline, and potentially after as a result of impacts to tourists' perception of the area.
	Project use of local water sources could reduce the availability of that water to other users and / or increase the cost of water supply to users.	Across Gjirokaštër county	During the project timeline and for a period after
	Project employment creating increased income and a training and development opportunity for local people.	Across Gjirokaštër county	During the project timeline and for a period after
	The project will also procure some goods and services locally and nationally, which will create increased incomes for businesses and contribute to economic activity.	National level	During the project timeline and for a period after
Health and Safety	Movement of project vehicles could result in increased risk of road accidents for other vehicles, pedestrians and livestock.	Across Gjirokaštër county	During the project timeline
	Poor handling, transportation, storage and use of explosives could result in accidents (e.g. fires, explosions) and injury of workers and members of the public.	Across Gjirokaštër county	During the project timeline and beyond
	Introduction or spread of communicable diseases within local communities from the presence of non-local workers and / or unsanitary accommodation and proximity to cattle.	Across Gjirokaštër county	During the project timeline
	Any inappropriate behaviour or excessive use of force by project security personnel would impact community safety and wellbeing.	Across Gjirokaštër county	During the project timeline
Tangible Cultural Heritage	Physical damage or destruction of tangible cultural heritage assets through site clearance, vehicle movements, shot hole drilling and shooting of seismic changes	Fly camps Seismic lines	Permanent
	Disturbance to appreciation of tangible cultural heritage by tourism and local population through noise and dust creation from vehicle movements and helicopter flights.	Fly camps Seismic lines Helicopter Flight paths Vehicle movement routes	During the project timeline
Intangible Cultural Heritage	Disruption to pastoral and agricultural practices through noise, dust, light pollution and presence of personnel	Fly camps Seismic lines Helicopter flight paths	During the project timeline

Receptor	Potential Impact	Impact Extent	Impact Duration
		and landing pads Vehicle movement routes Light emissions Night working Land expropriation	
	Disruption to folk practices, specifically practices associated with iso-polyphony, local folk festivals and the Gjirokastër folk festival through noise and dust, and presence of project personnel	Fly camps Seismic lines Helicopter flight paths and landing pads Vehicle movement routes	During the project timeline
Archaeology	Physical damage or destruction of archaeological sites through site clearance, site levelling, shot hole drilling and shooting of seismic charges	Fly camps Seismic lines	Permanent
Landscape and Visual	Alteration to visual landscape due to the clearance of vegetation from seismic lines and along access routes and the placement of camps and storage areas.	Seismic lines and access routes.	During the project timeline and until vegetation has re-grown

5.2.3 Significance of impacts

Once the receptor sensitivity and impact magnitude have been rated, the overall significance of the impact is predicted. This is assisted by an impact assessment matrix (see Table 5-9) and the impact significance definitions (see Table 5-10), which provides a consistent approach throughout the impact assessment. The significance matrix provides basic guidance for the determination of impact significance. However, the resulting significance level is also interpreted based on professional judgement and expertise, and adjusted if necessary.

The assessment of the level of impacts has used a five-point scale as follows:



The framework for assessing the level of impact is provided in Table 5-9. A combination of the magnitude of the effect under consideration and the sensitivity of the receiving environment determines the level of the impact. Impacts assessed as *high* or *moderate* are considered to be **significant**. An impact predicted to be *low* or *negligible* is considered to be manageable or **insignificant**.

Table 5-9 Impact significance matrix

		Receptor Sensitivity (vulnerability and value)			
		Negligible	Low	Moderate	High
Impact Magnitude (extent, frequency, reversibility, duration)	Negligible	Insignificant	Insignificant	Insignificant	Insignificant / Low*
	Low	Insignificant	Low	Low / Moderate*	Moderate
	Moderate	Insignificant	Low / Moderate*	Moderate	High
	High	Insignificant / Low*	Moderate	High	High

The significance of impacts was assessed pre and post mitigation which allowed the effectiveness of mitigation to be gauged and further mitigation developed if required. The assessment provides an assessment of residual impacts, i.e. those that remain after the application of mitigation measures. In the case of unavoidable residual impacts, appropriate compensation measures for the biological environment or the local communities have been recommended. The impact significance definitions are provided in Table 5-10.

Table 5-10 Impact Significance Definitions (Adverse Impacts)

Significance	Definitions
High	Significant. Impacts with a “ High ” significance are likely to have damaging and lasting changes to the functioning of a receptor, and may have broader consequences (e.g. on ecosystem health or community well-being). These impacts are a priority for mitigation in order to avoid or reduce their significance.

Significance	Definitions
Moderate	Significant. Impacts with a “ Moderate ” significance are likely to be noticeable and result in lasting changes to baseline conditions, which may cause hardship to or degradation of the receptor. Broader consequences for the ecosystem or community are not anticipated. These impacts are a priority for mitigation in order to avoid or reduce their significance.
Low	Detectable but insignificant. Impacts with a “ Low ” significance are expected to be noticeable changes to baseline conditions, beyond what would naturally occur, but are not expected to cause hardship or degradation. However, these impacts warrant the attention of decision-makers, and should be avoided or mitigated where practicable.
Negligible/Insignificant	Negligible/Insignificant. Any impacts are expected to be indistinguishable from the baseline or within the natural level of variation. These impacts do not require mitigation and are not a concern of the decision-making process.

The matrix and significance definitions will be used to assess adverse impacts of the Project. Significance ratings determined for beneficial impacts will use the same matrix where the result is a positive of beneficial impact.

For all significant impacts identified by the assessment, mitigation measures have been proposed to reduce impacts to as low as reasonably practicable (ALARP). These measures are either directly related to amendments to the current project design or operational recommendations to control remaining identified risks.

5.2.4 Impact Assessment

The assessments of impacts that have identified in **Section 5.1** consider the project activity that would have potential to cause an impact and the nature of the impact. The initial impact assessment is done based on the project design as described in **Chapter 2, Project Description** and any embedded mitigation or control measure. Mitigation measures that are part of the project design controls and measures that have been adopted based on guidance provided by authorities are considered to be embedded mitigation measures. The embedded mitigation measures are provided in Table 5-11.

In order to reduce the significance of the potential impacts, additional mitigation measures are then proposed. The project impacts are then re-assessed for the residual impacts assuming the mitigations measures are employed. The residual impacts take into consideration both the embedded mitigation measures and the additional mitigation measures. The mitigation proposed for each potential negative impact is presented in **Chapter 8, Mitigation Measures**.

Table 5-11 Summary of Embedded Mitigation Measures

No.	Description of Embedded Mitigation Measure
EM-001	Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition
EM-002	A 200m buffer zone for cultural heritage monument where no explosive or vibroseis activities are to be undertaken.
EM-003	A 50 m buffer zone where no explosive or vibroseis activities are to be taken will be adopted for natural monuments with the exception of Zheij and Zagori.
EM-004	Chance find procedure to ensure that any archaeological artefacts encountered are properly recorded and left in situ. A stop work policy will be implemented
EM-005	Prior to data acquisition, the site conditions will be assessed (pre-testing) to determine the geological conditions and appropriate setbacks for structures; buffer zones will be extended, if necessary
EM-006	The cutting of trees (greater than 10 cm DBH) will be avoided. Where clearance is necessary, vegetation will be cut approximately 10 cm above the ground level to preserve rootstock and promote sprouting

No.	Description of Embedded Mitigation Measure
EM-007	If levelling is required organic-rich topsoil will be removed and stockpiled in appropriate locations for later use in the restoration of affected areas
EM-008	River crossings by trucks and equipment will be kept to a minimum
EM-009	Vehicles will cross rivers and streams along suitable alignment to protect geomorphology and integrity of the banks. In case this is practically not achievable, vehicles will only cross at officially designated crossing points.
EM-010	Temporary bridges or other support structures will be removed prior to line abandonment unless it is determined these structures will benefit local communities
EM-011	Road conditioning will be minimized by using portable drilling equipment, especially in mountainous areas
EM-012	Engage a Community Liaison Officer (CLO) to inform and consult with communities
EM-013	Maintaining a community feedback mechanism to receive and resolve community complaints which will include a Grievance Mechanism
EM-014	Implement SUA Land Acquisition & Resettlement Framework
EM-015	Implement SUA Community Feedback and Compensation Procedure
EM-016	Seismic Contractor will employ locally available work force as suitable and practicable to the skill requirements
EM-017	The permit crew will visit the landowner after the line survey and after completion of works to document any damage to crops/property, agree compensation, if any, and address any complaints
EM-018	In places where there are sensitive receptors potentially susceptible to environmental, social or health impacts, the cables and geophones will be hand carried into position by the front crew
EM-019	The location of the energy source points and geophones may be offset in the field to avoid a sensitive receptor
EM-020	No shot holes will be drilled near water lines and shot holes that result in flow of ground water to the surface (i.e. artesian) will be plugged immediately and the shot hole location relocated
EM-021	No shot holes will be drilled in a buffer zone of up to 200m of water supply source; during permitting and site reconnaissance local wells will be identified for avoidance
EM-022	No chemicals or specialized muds will be used for drilling
EM-023	Project will use non-toxic degradable explosives
EM-024	Before recording activities commence along each seismic line, the surveyors will determine the minimum safe offset distance for the area of operations to prevent impacts to the existing infrastructure or protected areas
EM-025	All misfired charges will be abandoned in the well boring and left to decompose, while any casing will be removed from the ground
EM-026	The wire leads to the charges must be cut below the surface to a minimum of 50 cm
EM-027	Base, explosive magazine and fly camp sites selected to avoid, where possible, the flow of daily camp traffic passing through towns, villages or busy roads;
EM-028	Siting of base in an industrial area; where possible
EM-029	Fly camp sites will be located on previously disturbed land wherever possible
EM-030	Fly camp will be as far as practicable on level, open ground using natural or existing clearings to the maximum extent possible

No.	Description of Embedded Mitigation Measure
EM-031	Fly camp site to be located with a 200m offset distance from sensitive environmental receptors (e.g. protected zones, water bodies, sensitive habitats like riparian zones, forests) to ensure no or minimal disturbance to flora and fauna species
EM-032	Fly camp site to be located at least 1 km offset distance from sensitive social receptors (e.g. residential zones, schools, mosques and churches, recreational areas, and cultural heritage sites) to ensure no /minimal disturbance by noise, workforce and vehicles
EM-033	Fly camp sites will be located such that the drainage from and through the camp will not endanger any aquifer, domestic or public water supply
EM-034	Fly camp sites will be located so as to minimize impact on any local wildlife but also to minimize the risk of animal incursion to the camp
EM-035	Fly camp sites will be located outside of areas of archaeological significance
EM-036	Fly camps will be sited to reduce visual impact as much as practicable
EM-037	The base will include medical facilities, to provide first aid care and treat emergency patients. The Project will have access to a helibase as close as possible to the base, and this may be used for emergency transport to hospitals. Project to provide adequate medical (nurse and doctor) availability and monitor referrals to and use of local medical facilities.
EM-038	All fuels and chemicals will be stored in contained bunded areas and refueling will be carried out in dedicated areas with hard standing/ impermeable layer. Lubricants will also be stored in bunded areas to contain potential spills or leaks
EM-039	Waste management areas will be installed for waste separation and storage before being collected for disposal. Portable toilets, dry latrines or a septic system will be installed if no connection to sewage system is available
EM-040	The management of the camp wastewater will be guided by the national legislation and GIIP; discharge of contaminated effluents into the open environment will not be allowed
EM-041	There will be waste segregation procedures applied and there will be no mixing of hazardous waste (if generated) with non-hazardous waste
EM-042	No waste will be disposed of on-site or in the surrounding area. All waste will be removed from the base by a licensed waste management contractor and disposed of at an appropriately licensed waste facility
EM-043	All waste will be removed from the fly camps and stored at the base until final disposal
EM-044	Waste minimization efforts will be adopted

5.2.4.1 Soils

The principle project activities that have the potential to affect soils is the movement of heavy vehicles, the clearance of vegetative cover, the storage and use of fuels, maintenance of equipment and waste generation.

The impact assessment relies on the determination of the sensitivity of the soils in the Project area that are likely to be impacted. Impacts to soils principally relate to the following key sensitivities that exist within the project area:

- Soil erosion - In Gjirokastrë region the potential for soil erosion is considered as medium to high level of erosion. Soils on mountain slopes tend to be shallow as a result of weathering and are prone to erosion. Erosion rates are more intensive during the wet season which lasts from October to February. The most erosion prone areas include exposed slopes areas along the Luftinja Sub/Municipality, especially the hill system at Zhapokika village. Other areas prone to erosion include the abandoned agricultural land along the Drinosi river valley. The sensitivity of soils to erosion is considered to be moderate.
- Soil compaction – Some soils are more prone to compaction than others. Although there is a range of soil types within the seismic survey area; soils characterized as silty shale, silty clayey limestone and silt loam are present in the seismic survey area. Clayey and silty soils are most susceptible to compaction because

their particles hold more water for longer duration than other soils. Clay loam, silt loam and silty clay loam are moderately susceptible to compaction. Compaction is more severe when the soil is wet and less able to withstand compression. Soil compaction can also lead to increased runoff and in some cases increased erosion. Furthermore, approximately 29% of the land use within the 500m seismic corridors is used for agriculture, pastures and permanent crops indicative of fertile soils. Wheel traffic or pressure (weight per unit area) exerted on the soil surface by large objects (such as cabins or heavy equipment), vehicles, and people can cause soil compaction. The sensitivity of soils to compaction is considered to be moderate.

- Degradation of soil quality – Spills and leaks of fuels, oils and lubricants, uncontrolled waste effluents and leachates can degrade soil quality in addition to erosion and compaction. For the purpose of the impact assessment, erosion and compaction impacts are assessed separately. Due to the presence of agriculture soils in the area, the sensitivity of soils to degradation from contamination is considered to be moderate.

The determination of the sensitivity or importance of soil was made primarily based on the moderate capacity of the receptor to absorb change. Change refers to the soils ability to have the same value or condition (i.e. same land use) as before the Project. In this case, the soil must be returned to a status for agricultural use after Project. A moderate capacity to absorb change means that most impacts would not materially change the soils from their existing condition. Mountain soils sustain the vegetation on the mountain side and serve to stabilize the soils. Hence, the overall sensitivity of soil was therefore determined to be moderate across the Project area.

The mitigation measures to avoid or reduce the adverse impacts to soils are addressed in **Chapter 8, Table 8.1** in **Section 8.1** and **Table 8.2** in **Section 8.1**

Mobilisation and Support Facilities

The main impacts on soil conditions during the mobilisation phase are related to damage to existing unpaved roads and tracks to the fly camp and ground contamination by fuels, oils and lubricants from vehicle and plant leakages. The principal activities in the camp set up and operation phase with potential to impact on soil quality include removal of vegetation and soils for camp construction; bulk storage of explosives, fuels and chemicals; vehicle refueling and maintenance; and waste generation includes hazardous and non-hazardous.

Damage to existing roads and tracks by heavy plant and increased usage could result in rutting of the surface leading to the potential for local gulying and soil erosion. Soil erosion may be exacerbated by the clearance of topsoil and vegetation when preparing ground surfaces for construction of fly camps result in exposed soils, stockpiling of loose material, and vehicle and equipment movement over unpaved surfaces. Grading of sites can alter surface runoff patterns. Earthen bunding can be prone to erosion due to steep slopes and exposed soils. The construction of fly camps and removal of vegetation will result locally in the exposure of surface soils, potentially leading to erosion and the loss of the surface soil layer. The stripped material will be retained in the area for subsequent restoration of the sites. Any soil removed will be stored in stockpiles surrounding the site, which would be contoured to reduce the risk of gulying and soil erosion. The sensitivity of soils to erosion is considered to be moderate due to the localized and temporary nature of the impact, the magnitude is low and the significance is low. Measures will be adopted to minimise the potential for soil erosion such keeping vehicle movements to a minimum and the development of soil erosion prevention procedures and there should be no significant residual impact.

Soil compaction can occur as heavy vehicles transport equipment to the site. The movement of vehicles, foot traffic and the placement of fly camp facilities can result in localized soil compaction. However, the impacts would be localized and of short duration. The magnitude of the impact is low and the impact significance is considered to be low. Upon site restoration efforts which will include the de-compaction of soils, the residual impact will be reduced from low to negligible or **insignificant**.

There is potential for localised contamination of the soil as a result of leakages or spillages of fuel from equipment and site vehicles, including any resulting from road accidents. During mobilization, the impact magnitude is low and the impact significance is low. With the adoption of mitigation measures such as the proper maintenance of vehicles and the implementation of a Land Transport Safety Plan the residual impact significance will be reduced to negligible or **insignificant**.

Fuel and oils will be used for vehicles and electricity generators. In the absence of controls on the storage and use of these substances at the fly camps, spillage would present a potential risk to soil quality and an impact of low to moderate significance depending on the quantity of material released. For example, the rupture of the fuel tank of a standard pick-up truck would release up to 140 liters of fuel whereas the release of oil from the failure of an oil pan would not be expected to exceed 2 liters. The fuels and chemicals will be stored in bunded areas of sufficient capacity to minimise the potential for spillages to enter the underlying soil profile at the base. Although the area of impact would be localized, without the implementation of mitigation measures, there would be

a moderate impact on soil conditions of moderate significance. The residual impact will be **insignificant** with the use of containment equipment such as drip trays and impermeable surfaces in work areas at the support facilities.

Wastes will be generated that if not properly managed could result in soils contamination from leachate from uncontrolled waste. The construction of latrines if not properly designed and remediated after fly camp demobilisation could result in soils contaminated with potentially pathogenic organisms. It is considered that the effects of the site set up operations on soil quality are moderate to low. Soils are considered to be of moderate sensitivity, the significance ground contamination impacts are considered to be moderate. With the timely remediation of contaminated soils, the residual impact will be **insignificant**.

Mitigation measures such as siting camps outside of agricultural areas, the minimization of vegetation clearance and controls on hazardous and non-hazardous materials would be adopted to minimise any environmental impacts. In the event of leakages or spillages of fuel or oil, any contaminated soils will be excavated and removed for treatment and/or disposal.

It is considered that with the implementation of the proposed control measures, there will be no significant residual impacts on the soil conditions from the mobilisation and camp set up and operation of the project.

Seismic Survey

The principal activities during the seismic survey phase with potential to impact on soil quality include removal of vegetation and soils during seismic line clearance, vehicle movements and equipment lay down and spills and leakages from vehicle and equipment use and refueling.

Prior to line clearance, a desk top study and a line scouting exercise will have been carried out to identify the precise routes of the survey lines. Seismic tracks of up to 5 meters wide will be used for vehicle and road access to survey lines. The clearance of the seismic survey lines for clear lines of sight and at the shot-hole drilling locations may result in the exposure of the surface soils, potentially leading to erosion and loss of the surface soil layer. Given the temporary nature of the impact, and the low number and operations and activities, the impact significance is considered to be low and reduced to negligible by minimizing vegetation clearance.

Heavy plant and vehicle movement could lead to soil compaction, deterioration and erosion rendering land less suitable for agriculture and cattle grazing. However, given the temporary nature of the impact, and the low number and transient movement of vehicles, the impact significance is considered to be low. The residual impact will reduce to negligible by using wide tires and minimizing and limiting vehicle movements within the seismic corridors.

Throughout the seismic survey, there is the potential for spills and leakages from vehicles and equipment. In addition, vibroseis machines and motorized drill rigs and vegetation clearance equipment will be refueled in the field. The proper maintenance of vehicles and equipment, limiting maintenance activities to the base and the use of spill containment will reduce the residual impact to negligible.

Once the survey lines and drilling locations have been established, the potential additional impact on soil conditions is related to management of the cuttings generated by the 'up-hole' survey boreholes; shot-holes will be filled immediately after drilling and placing explosives. There is no evidence that the underlying ground is contaminated and therefore the drilling cuttings will be suitable for re-use without any prior treatment. Drilling fluid to be used for drilling will consist of water and bentonite (natural clay mineral) and do not represent harm to the environment, including soils. Soils could also be contaminated due to the burial of explosive charges. Pentolite is the type of explosive to be used. Pentolite is degradable and specifically design for seismic surveys. It is considered that the use of the explosives does not pose a long term risk to soil quality.

Standard mitigation measures would be adopted during the seismic survey activities to minimise any environmental impacts. It is concluded that the effects of the seismic surveys are low to negligible and adoption of mitigation measures there would be no or negligible residual significant impact on soil conditions.

Demobilisation and Restoration

Following completion of the seismic survey, all survey equipment and wastes from fly camps will be removed to the Base for final disposal at licensed facilities. The seismic survey lines, the Base and fly camp will be demobilised and restored. The principle of restoration is to return the ground conditions to the baseline conditions or to a situation very similar to that before commencement of the project.

All the facilities in the camps will be fully removed and any remedial measures will have been completed before the stripped soils are replaced to allow the natural vegetation to re-establish. All potentially contaminated

materials, including any soils contaminated by fuels and/or chemicals, will be removed off-site for treatment/disposal at licensed facilities or managed in-situ in line with best industry practice.

It is considered that the magnitude of this effect will be low and that there will be no significant impact on soil conditions from this phase of the project provided

Impact assessment summary

A number of additional mitigation measures will be adopted during all phases of work to minimise potential impacts to soils and human health. These include establishing environmental monitoring programmes, developing health, safety and environment policies and procedures, controls on vehicle movements within the seismic corridor, minimising the extent of removal of vegetation and soil cover, appropriate storage of potentially hazardous materials and use of secondary containment, minimising stockpile and storage areas, and ensuring the adoption of spill control measures.

Through the adoption of design controls and the implementation of additional mitigation measures, all residual impacts on soil during all phases of the Project have been assessed as negligible or **insignificant**.

Table 5-12 summarises the impact assessment for soils.

Table 5-12 Summary of impact assessment and residual impact for soils

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Mobilisation and support facilities					
Mobilization, fly camp site set up	Soil erosion from vehicle movement Nature of impact: Adverse, Indirect, Footprint, Temporary	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
	Loss of vegetation cover and exposure of soils to erosion Nature of impact: Adverse, Indirect, Footprint, Temporary	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
	Ground contamination by fuel and chemicals from plant leakages and road accidents Nature of impact: Adverse, Direct Footprint, Temporary	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
Mobilisation and Camp set up	Soil compaction from vehicle and staff movement and facilities. Nature of impact: Adverse, Direct. Footprint, Temporary	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
Camp Operations	Ground contamination from fuel and chemicals spills and leakages Nature of impact: Adverse, Direct and Indirect, Temporary	Moderate	Low	Moderate (Significant)	Negligible (Insignificant)

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
	Ground contamination from waste Nature of impact: Adverse, Direct and Indirect, Temporary	Moderate	Low	Moderate (Significant)	Negligible (Insignificant)
	Ground contamination from hazardous waste Nature of impact: Adverse, Direct and Indirect, Temporary	Moderate	Low	Moderate (Significant)	Negligible (Insignificant)
Seismic Survey					
Seismic line vegetation clearance	Loss of vegetation cover and exposure of soils to erosion Nature of impact: Adverse, Direct, Footprint, Temporary	Moderate	Negligible	Low (Insignificant)	Negligible (Insignificant)
Seismic drilling	Contamination of soil by drill cuttings Nature of impact: Adverse, Direct, Footprint, Temporary	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
Movement of heavy vehicles	Soil compaction, deterioration and erosion Nature of impact: Adverse, Direct, Footprint, Temporary	Moderate	Negligible	Low (Insignificant)	Negligible (Insignificant)
Vehicles and equipment	Soil contamination from spills and leakages Nature of impact: Adverse, Direct, Footprint, Temporary	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
Use of explosives	Chemical contamination of soil associated with explosive charges Nature of impact: Adverse, Direct, Footprint, Temporary	Moderate	Negligible	Negligible (Insignificant)	Negligible (Insignificant)
Demobilisation and Restoration					
Removal of waste material and earthwork	Soil contamination due to the moving of potentially contaminated materials Nature of impact: Adverse, Direct, Permanent	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)

5.2.4.2 Geology

The principle project activities that have the potential to impact geology are the setup of fly camps and seismic acquisition data acquisition activities.

The impact assessment relies on the determination of the sensitivity of the geological features in the Project area that are likely to be impacted.

- Damage to geological monuments and features - Designated natural monuments based on their geological significance or value includes the Lisat e Manastirit at Nivan, Pylli i Gurte at Nderan and Mezhgorani Cave are within the Project area. Much of the geology is limestone and karst which may be fragile (see **Section 4.2**). As such, the sensitivity of geological monuments and features is considered to be of high sensitivity. Undesignated unique geological features are considered to have a moderate sensitivity.
- Karst collapse – The cave system is a feature of karst geology. Cave ceilings may be close to the surface. Drilling of shot holes and the vibrations generated can cause the cave ceiling to collapse. Cave collapse can have indirect impacts to subsurface hydrogeology where springs in the project area are groundwater fed (See **Section 4.8**). The sensitivity of the karst geology is considered to be high.

The mitigation measures to avoid or reduce the adverse impacts to geology are addressed in **Chapter 8, Table 8.1** in **Section 8.2** and **Table 8.2** in **Section 8.2**

Mobilisation and Support facilities

Protected surface geological features include the Lisat e Manastirit at Nivan and Pylli i Gurte at Nderan. During the mobilization, project activities will be non-intrusive and no or negligible impact to the local protected natural monuments. There may be undesignated geological features that are unique and not designated. Fly camps will be required and sites may need to be levelled to accommodate the camps and the undesignated features could be damaged. In the absence of controls, the impact magnitude to designated monuments will be negligible and of low significance. The impact to undesignated geological features is assessed to be of low magnitude and impact significance of low. With the adoption of controls and mitigation measures such as 200m buffer zone around natural monuments and scouting the area to identify and avoid unique and possibly fragile geological features in the area will reduce the residual impact to negligible or **insignificant**.

Seismic Survey

The principal activities during the seismic survey phase with potential to impact on geology include the shot hole drilling and the use of vibroseis machines. Both surface and subsurface geological monuments and undesignated but unique geological features could be damaged by the data acquisition activities.

Surface geological features including the Lisat e Manastirit at Nivan and Pylli i Gurte at Nderan may be fragile and could be damaged by the data acquisition using explosives or vibroseis methods. Without controls the impact magnitude is assessed to be moderate and of moderated significance. With the adoption and observance of a 200m protection zone and prior to the data acquisition field studies will be conducted to establish an extended protection area, if required, will reduce the impact. Hence, negligible if any impacts to the protected natural geological monuments are anticipated and the residual impact will be insignificant. Unique geological features that are not designated have a sensitivity to be considered as moderate and without controls will have a low impact magnitude and of low significance. By scouting the area for fragile geological features and pre-testing to determine seismic data acquisition offsets, the impact significance will be reduced to **insignificant**.

Subsurface features caves, in particular Shepelle e Mzhgorani (Mezhgorani Cave), can be damaged by the drilling of the shot holes into the cave ceilings and the vibrations generated during seismic data acquisition can potentially result in the collapse of the cave; particularly in areas where the cave ceilings are not deeper than 12-15 meters (shallow). In addition, cave collapse can have indirect impacts on the subsurface hydrogeology and springs. Furthermore, the shot hole borings open a pathway for surface water to infiltrate the cave system causing damage to the cave tunnel geology. There may be additional undocumented cave systems within the survey area. However as the areas has not been surveyed with the view to identify all caves, any change in the lines would require careful field verification to ensure caves are identified and risks to them are managed through the proposed mitigation. In the absence of controls, activities the seismic survey would have a high impact magnitude and high significance. Undertaking a desktop study to identify the extent of the subsurface geology (i.e. extent and depth of cave system) at Shepelle e Mzhgorani the residual impact is assessed to be of **moderate** significance.

Demobilisation and Restoration

No impacts during the demobilisation and restoration have been identified.

Impact assessment summary

Mitigation measures to reduce the impacts include: undertaking a study prior to seismic data acquisition to better understand the subsurface geology in the vicinity of designated areas (i.e. cave system), a protection zone of 200m where no seismic source activities (shot holes/vibroseis) will occur and preliminary tests to understand the geological characteristics of the project area to determine site specific offsets to be adopted during the actual seismic survey.

Through the adoption of design controls and the implementation of additional mitigation measures, all residual impacts on undesignated geological features during all phases of the Project have been assessed as negligible or **insignificant**. The residual impacts to designated geological monuments are to low/negligible or **insignificant**. The residual impact of karst collapse is moderate or **impact assessment summary**.

Table 5-13 summarises the impact assessment for geology.

Table 5-13 Summary of impact assessment and residual impact for geology

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Mobilisation and Support Facilities					
Mobilisation and camp set up	Damage to designated geological monuments Nature of impact: Adverse, Direct, Footprint, Permanent	High	Negligible	Low (Insignificant)	Negligible (Insignificant)
	Damage to undesignated geological features Nature of impact: Adverse, Direct, Footprint, Permanent	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
Seismic Survey					
Seismic survey data acquisition	Damage to surface geological monuments Nature of impact: Adverse, Direct, Footprint, Permanent	High	Moderate	Moderate (Significant)	Low (Insignificant)
	Damage to undesignated geological features Nature of impact: Adverse, Direct, Footprint, Permanent	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
	Karst collapse Nature of impact: Adverse, Direct, Footprint, Permanent	High	High	High (Significant)	Moderate (Significant)
Demobilisation and Restoration					
None identified	N/A	N/A	N/A	N/A	N/A

5.2.4.3 Groundwater

The principle project activities that have the potential to affect groundwater are the movement of vehicles and equipment, the storage and use of fuels, maintenance of equipment and waste generation.

Specific impacts identified with respect to groundwater are:

- Degradation of groundwater quality

- Groundwater resources will not be used by the Project directly as no water supply boring will be installed. Water demands from the project will be met by local water suppliers which may utilize groundwater sources (See **Section 5.1.5**)

Groundwater quality can be degraded as a result of the spills of fuel or chemicals or residual explosive products migrating to the underlying aquifer. If soak always or septic systems are utilized, biological contamination can migrate to the aquifer.

The key sensitivities to groundwater are its use as a water supply for drinking water and irrigation in the Project area.

The groundwater in the underlying strata is widely used by local communities across the project area. Groundwater is also likely to provide flow to the water courses and the public water supply. The karst and porous aquifers are the main groundwater resources in the Study Area, supplying drinking and irrigation water to the local communities, and comprise:

- Aquifer along the lower valley of the Vjosa
- Aquifer around Saranda and Butrint; and
- Aquifer in the Drino valley around Gjirokastër.

There is limited information of the depth to groundwater in the Project area. Depth to groundwater in the Vjosa basin in Buduk and Budrishte within Block 4 ranges from approximately 2.8 meters below ground to 12 m below ground level (See **Section 4.8**). Groundwater level fluctuations are driven by seasonal climate changes, with highest levels typically observed during the wet season. Given the characteristic features of karst geology such as the presence of cracks and fissures, the aquifers are likely to be unconfined. The aquifers are a source of drinking water and a major source water for irrigation. In addition, the karst aquifers discharge to local springs. Drinking water supply is provided by local wells and from the natural springs. Moreover, there are undefined numbers of water wells that receive water from the shallow aquifers and used for irrigation and drinking purposes. Water supply zones that have been identified have been mapped (see **Annex 4**). Hence, surface water therefore considered to be of high sensitivity.

The proposed activities associated with the seismic survey programme have the potential to impact groundwater quantity however it is not expected that groundwater wells will be used for the Project and water required for the project will be supplied from commercial suppliers. The impact on groundwater resources in this regard is addressed in **Section 5.2.4.1**

The mitigation measures to avoid or reduce the adverse impacts to groundwater are addressed in **Chapter 8, Table 8.3 in Section 8.1** and **Table 8.2 in Section 8.3**

Mobilisation and Support facilities

The major elements of work that could affect groundwater quality are vehicle movement, the storage of fuels and chemicals, refueling and maintenance of plant; and liquid and solid waste disposal. Spillages and leaks of fuel, oils and lubricants and subsequent infiltration into the underlying ground could result in contamination of the groundwater. Routine spills and leakages, unless remediated will have a local impact on groundwater unless preventative measures are taken and the area remediated in a timely manner. The sensitivity of the groundwater is high, the magnitude of the impact is low and the impact significance reduced from moderate to insignificant taking these measures into consideration.

Untreated sanitary sewage, arising from camp activities, which if discharged on to the ground has the potential to contaminate groundwater, leading to elevated nutrient levels and microbial contamination. No direct discharges to the ground will be allowed. Portable toilets, dry latrines or a septic system will be installed if no connection to sewage system is available. If a septic system is not working properly or is located too close to a drinking water well, contaminants from the wastewater can end up in drinking water. The characteristic features of karst (e.g. cracks and fissures) provide a pathway for migration of contaminated water into the groundwater. The sensitivity of groundwater resources is high; the magnitude is moderate and the impact significant moderate. With the adoption of a waste management plan, there will be no residual impact.

Uncontrolled waste, such an incident or inappropriate storage or disposal, has the potential to generate leachate that can migrate to groundwater, however waste management areas will be installed for waste separation and storage before being collected the disposal. No waste will be disposed of on-site or in the surrounding area. The magnitude of the impact is negligible and the impact significance is low however with mitigation measures in place the residual impact will be **insignificant**.

With these mitigation measures the significance of the residual impact on groundwater quality would be **insignificant**.

Seismic Survey

The residues from detonating explosives during seismic surveys can also be a potential source of groundwater contamination as a result of leaching. This would be of particular importance in the deeper shot-holes, located closer to the water table. However, the type of non-toxic biodegradable explosives planned to be used for the survey is not harmful to the environment and the impact magnitude is therefore considered as negligible, leading to an impact of low significance. The materials will degrade in the environment. As discussed in **Chapter 3, Project Alternatives**, Pentolite is composed of equal parts pentaerythritol tetranitrate (PETN) and trinitrotoluene (TNT). The majority of detonation products are gaseous³. The only 2 products that are of any concern are ammonia and nitric oxide, which both occur at low levels, so will likely react with any water present, to become harmless. With respect to misfires, the charges will degrade within 6-12 months depending upon the water content of the soils. Hence, there will not be a long term residual impact.

Drilling fluids that may be used for drilling will consist of water and bentonite (natural clay mineral) and do not represent harm to the environment including groundwater. The sensitivity of groundwater is high; the magnitude of the impact is low and the significant low which, with the containment of drill fluids, the residual impact will be **insignificant**.

Spillages and leaks from vehicles and equipment and subsequent infiltration into the underlying ground could result in contamination of the groundwater. Routine spills and leakages, unless remediated will have a local impact on groundwater unless preventative measures, such as the use of spill containment, are taken and the area remediated in a timely manner. The sensitivity of the groundwater is high, the magnitude of the impact is low and the impact significance reduced from moderate to insignificant taking these measures into consideration.

With these mitigation measures the significance of the residual impact on groundwater quality would be **insignificant**.

Demobilisation and Restoration

Routine spills and leakages, unless remediated will have a local impact on groundwater unless preventative measures are taken and the area remediated in a timely manner. The sensitivity of the groundwater is high, the magnitude of the impact is low and the impact significance reduced from moderate to insignificant taking these measures into consideration.

Site clean-up and demobilisation will include the removal of all remaining waste. Upon remediation of the potentially contaminate soils from incidental spills and leaks and the removal and restoration of the septic system the residual impact will be **insignificant**.

Impact Assessment Summary

Mitigation measures for the protection of groundwater quality are primarily those which have been proposed for the protection of soils from contamination such as the use of drip trays, appropriate waste management strategies. The use of a degradable explosive product will reduce the impacts on groundwater quality.

Through the adoption of design controls and the implementation of additional mitigation measures, all residual impacts on soil during all phases of the Project have been assessed as negligible or **insignificant**.

Table 5-14 summarises the impact assessment for groundwater.

Table 5-14 Summary of impact assessment and residual impacts for groundwater

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Mobilisation and Support Facilities					

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Vehicle movement and Camp operations	Water contamination by fuels and chemicals from plant leakages and traffic accidents Nature of impact: Adverse, Direct and Indirect, Footprint, Temporary	High	Low	Moderate (Significant)	Negligible (Insignificant)
Camp sanitary treatment and operational effluents	Pollution of surface waters by operational effluents Nature of impact: Adverse, Indirect, Footprint, Temporary	High	Moderate	Moderate (significant)	Negligible (Insignificant)
Camp waste management	Pollution of surface waters by operational wastes. Nature of impact: Adverse, Indirect, Footprint, Temporary	High	Negligible	Low (Insignificant)	Negligible (Insignificant)
Seismic Survey					
Use of explosives	Potential groundwater contamination due to explosives residues Nature of impact: Adverse, Direct, Footprint, Temporary	High	Negligible	Low (Insignificant)	Negligible/ None (Insignificant)
Drilling of shot holes	Run-off from drilling cuttings and fluids polluting water courses and infiltrating into groundwater Nature of impact: Adverse, Indirect, Footprint, Temporary	High	Low	Low (Insignificant)	Negligible/ None (Insignificant)
Movement of vehicles and equipment	Water contamination by fuels and chemicals from plant leakages and traffic accidents Nature of impact: Adverse, Direct and Indirect, Footprint, Temporary	High	Low	Moderate (Significant)	Negligible (Insignificant)
Demobilisation and Restoration					
Vehicle movement	Water contamination by fuels and chemicals from plant leakages and traffic accidents Nature of impact: Adverse, Direct and Indirect, Footprint, Temporary	High	Low	Moderate (Significant)	Negligible (Insignificant)
Site clear up and removal of Base infrastructure	Potential contamination of waters due to remaining waste streams	High	Low	Moderate (Significant)	Negligible (Insignificant)

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
	Nature of impact: Adverse, Direct, Footprint, Temporary				

5.2.4.4 Surface water

The main potential impacts on surface water quality resulting from the Project are related to the exposure of the ground strata to physical disturbance from the loss of vegetation groundcover, vehicle movement, equipment and fuel use and waste generation. The impacts associated with stream morphology result from the need to cross streams.

The main rivers crossing the seismic corridors include Vjosa River and its tributaries Drinos, Suha, Zagoria, Bënça, as well as the Luftinja stream which dissect the planned layout of seismic lines in many locations (see **Figure 4-12**) have a permanent regime; smaller tributaries and water features are within the survey area.

The key sensitivities to surface water are as follows:

- Degradation of water quality –The rivers in the project area are characterized by irregular seasonal flow which peaks in autumn or winter and reduce in summer, sometimes to 10% of the average winter flow (See **Section 4.8**). The flow gradient in the uplands is steep and the sediment loading results in braided channel morphology. The upland rivers can experience torrential flows and periodic flooding caused by rainfall, particularly during the winter months. In the summer months the smaller rivers and streams can dry out completely. Drinking and irrigation water is sourced from surface water, including natural springs. Water supply zones that have been identified have been mapped (see **Annex 4**). The sensitivity of surface is considered to be of high sensitivity.
- Alterations in stream bank morphology and integrity – A stream bank is the terrain alongside the bed of a river or creek. The stream banks range from steep rock outcrops as the mountains reach the valleys to nearly flat in the low lying areas of the valleys (see **Figure 4-11**). The stream banks in the valleys are comprised of soils (i.e. sediment deposition) and rocks and the steeper stream banks show evidence of erosion. The stability of the valley stream banks is uncertain therefore they are considered to have a moderate sensitivity. Areas with rock outcroppings are considered to have a low sensitivity as they would be more resilient to change.

The mitigation measures to avoid or reduce the adverse impacts to soils are addressed in **Chapter 8, Table 8.1** in **Section 8.4** and **Table 8.2** in **Section 8.4**.

Mobilisation and Support facilities

There is a potential for erosion of the exposed soils (see **Section 5.2**) from the loss of vegetation cover during the construction of fly camps which could result in the mobilisation of sediment causing deterioration in the quality of the receiving water course through the discharge of sediment-rich run-off. The anticipated impact would be of moderate significance. Implementing the standard mitigation measures to prevent soil erosion would residual the residual impact will be low or **insignificant**.

Surface water contamination due to hydrocarbon spills and leaks could potentially occur during vehicle movement, which could cause visible pollution and deterioration in water quality if the incident occurs close to a water course. Other sources of contamination include potential run-off of hydrocarbon spills from the base or fly camps during vehicle refueling and maintenance fuel storage leakage, or leachate from uncontrolled waste. Leakages and contaminated runoff can result in localised impacts to the surrounding surface water bodies. The effects of hydrocarbon contamination of water courses does not tend to cease when project activity finishes although, with the potential exception of very large spills (not expected for this project), they will eventually disappear due to natural recovery of the environment. The magnitude of the impact on surface water quality storm water runoff that may contain sediments, contaminated soils and uncontrolled waste is low and the impact significance is moderate. The residual impacts after mitigation measures including the proper maintenance of vehicles, spill containment the use of perimeter ditch to divert runoff and the timely remediation of spills will be reduced to low or **insignificant**.

Untreated sanitary waste discharged near surface water has the potential to migrate to surface water. Untreated sanitary waste effluents can lead to elevated nutrient levels and microbial contamination. Additionally, hazardous waste (including contaminated wash water from vehicles and equipment and maintenance activities) could also migrate to surface water if adequate control measures for storage or proper management for disposal are not in place. The magnitude of the impact to surface water from sanitary waste effluent is considered to be negligible and of low significance. The residual impacts will be of negligible or **insignificant** with the implementation of a waste management plan.

Seismic Survey

Drilling fluids and cuttings can be entrained in run off and migrate to surface waters. Drilling fluids that may be used for drilling will consist of water and bentonite (natural clay mineral) and do not represent harm to the environment, including water. Bentonite is a fine powdered material and may temporarily increase turbidity if flushed into the water course. The magnitude of the impact is considered to be low and the impact significance is moderate. By containing drilling fluid and properly managing cuttings it is considered that the residual impact would be reduced to negligible or **insignificant**.

While no seismic data acquisition is envisaged within river beds, vehicle crossing is likely to take place. Potential erosion from the river bed by such crossings may contribute to temporary increase in water turbidity of rivers and tributaries as disturbed sediments are mobilized in the water column. Crossing streams under high flow conditions is not likely due to health and safety considerations. Crossings when the river is dry would not have an impact on water quality. Therefore, only the impact of crossing streams under low flow conditions is considered. The magnitude of the impact is considered to be negligible during low stream flow conditions and the impact significance is low. By adopting good stream crossing techniques such as crossing at right angles and with straight approaches and gentle grades, it is considered that the residual impact would be reduced to negligible or **insignificant**.

The construction of temporary bridges can alter the stream bank morphology by the failure or collapse of the stream bank. Based on the terrain of the project area; temporary crossings are not practicable and unlikely in areas of outcropping therefore it has been assumed that crossings will be in the low lying areas. The magnitude of the impact of the construction of temporary bridges is considered to be moderate having a moderate significance. The residual impact will be reduced to low or **insignificant** with the by designing the bridges to prevent alterations on stream bank morphology.

Demobilisation and Restoration

Potential contamination due to sediment-rich run-off caused by replacement of stripped soils at could migrate to surface waters. The magnitude of the impact is considered to be negligible and the impact significance is low. It is considered that the residual impact would be reduced to negligible or **insignificant** once the vegetation is re-established.

There is a potential contamination of waters due to leachate from remaining waste streams migrating to surface waters. The impact magnitude is moderate and the impact significance is moderate. Once all wastes are removed from site and any contaminated soils remediated, the residual impact will be negligible or **insignificant**.

Impact assessment summary

Mitigation measures for the protection of soils from contamination will also protect surface waters as well as the observance of buffer zones and setbacks and containment of drilling fluids. Stream bank morphology and bank integrity can be protected by carefully selecting crossing locations and crossing techniques such as crossing at right angles to minimize the creation ruts that can be eroded.

Table 5-15 summarises the impact assessment for surface water

Table 5-15 Summary of impacts assessment and residual impact for surface water

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Mobilisation and Support Facilities					
Vegetation and terrain clearance	Loss of vegetation cover and exposure of soils to erosion causing pollution of water courses Nature of impact: Adverse, Direct, Footprint, Temporary	High	Low	Moderate (Significant)	Low (Insignificant)
Fly camp set up	Degradation of water quality from camp storm water off that may contain sediments, contaminated soils or uncontrolled waste Nature of impact: Adverse, Direct, Footprint, Temporary	High	Low	Moderate (Significant)	Negligible (Insignificant)
Vehicle movement and Fly camp operations	Siltation and contamination of water courses due to vehicles crossing over fords Nature of impact: Adverse, Direct, Footprint, Temporary	High	Low	Moderate (Significant)	Negligible (Insignificant)
	Water contamination by fuels and chemicals from plant leakages and traffic accidents Nature of impact: Adverse, Direct, Footprint, Temporary	High	Low	Moderate (Significant)	Negligible (Insignificant)
Fly camp sanitary treatment	Pollution of surface waters by operational effluents Nature of impact: Adverse, Direct, Footprint, Temporary	High	Negligible	Low (Insignificant)	Negligible (Insignificant)
Seismic Survey					
Shot hole drilling	Run-off from drilling cuttings and fluids polluting water courses Nature of impact: Adverse, Direct, Footprint, Temporary	High	Low	Moderate (Significant)	Negligible (Insignificant)
River crossings	Degradation of water quality from crossing of streams Nature of impact: Adverse, Direct, Footprint, Temporary	High	Negligible	Low (Insignificant)	Negligible (Insignificant)
	Alterations in stream bank geomorphology and integrity resulting from river crossings	High	Moderate	Moderate (Significant)	Low (Insignificant)

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
	Nature of impact: Adverse, Direct, Footprint, Permanent				
Demobilisation and Restoration					
Site restoration and removal of Fly camp infrastructure	Potential contamination due to sediment-rich run-off caused by replacement of stripped soils Nature of impact: Adverse, Direct, Footprint, Temporary	High	Negligible	Low (Insignificant)	Negligible (Insignificant)
	Potential contamination of waters due to remaining waste streams Nature of impact: Adverse, Direct, Footprint, Temporary	High	Moderate	Moderate (Significant)	Negligible (Insignificant)

5.2.4.5 Biodiversity

The potential negative impacts to surface water identified in **Section 5.1.2** assessed include:

Potential impacts to biodiversity include:

- loss / disturbance of natural habitat through vegetation clearance or damage;
- loss / disturbance of animal/plant species of conservation concern; and
- contamination of terrestrial or aquatic habitats

All of these protected areas have high sensitivity because they are designated at a national and/or international level with the objective of protecting or conserving either flora, fauna, cultural heritage or other natural monument features. Annex I habitats present in the area and the designated areas and their associated/qualifying features and therefor are defined as receptors of high sensitivity. For the purpose of the impact assessment, flora is considered to a receptor of moderate sensitivity

The mitigation measures to avoid or reduce the adverse impacts to soils are addressed in **Chapter 8, Table 8.1** in **Section 8.5** and **Table 8.2** in **Section 8.5**

Mobilisation, Support Facilities and Demobilisation and Restoration

Air pollution, dust and exhaust fumes from ground transportation may affect a range of habitats within close proximity to roads and access tracks. Dust is likely to be primarily an issue in during dry conditions and close to the camps where vehicle movement is more frequent. All operations will be completed in a limited time, reducing the cumulative impact of these activities. The Magnitude of impacts is considered to be low resulting in the overall low significance.

Transport of people, equipment and materials may cause water and soil pollution from oil or fuel leakages and potential receptors include all habitats and fauna. This is of particular importance for water bodies including wetlands and the species living there (i.e. fish and amphibians) and is most applicable in areas surrounding the Base and fly camps. Spills and leakages may be produced during refueling, material loading and offloading, malfunctioning machinery as well as during road accidents. The impacts from spills and leaks would be localised and infrequent with potentially low magnitude and low significance.

Incidental transport of seeds and other propagating materials can expedite the colonisation by invasive species into new areas. This has the potential to impact on all habitat types across the project area. No invasive species

were identified as a specific risk during the baseline assessment although they may be present or carried in with equipment or machinery. The magnitude of impacts is considered to be moderate, resulting in an impact of moderate significance.

Noise from the moving vehicles may disturb the animal community including mammals and herptiles potentially resulting in a reduction in feeding, overall fitness and breeding success. A number of sensitive fauna were recorded during the baseline survey all endemic to Albania. The highest potential risk will be experienced in high traffic areas including areas around Base and fly camp and seismic lines. The magnitude of effect is considered to be moderate resulting in an impact of moderate significance if no control measures are in place.

Direct fauna mortality is possible due to collisions with moving vehicles, particularly mammals and herptiles. The potential for such collisions will be highest in areas which support the greatest diversity of fauna or areas with predicted high traffic movements. Despite the sensitivity of fauna in the project area, vehicular collisions are unlikely to have a long term impact upon the overall populations of these species and therefore the Magnitude of impacts is considered to be low resulting in an impact of moderate significance if no control measures are in place.

Removal of vegetation to facilitate camp construction may result in habitat loss or degradation. The proposed sites for setting up base and fly camps consist mostly of valley habitats (low sensitivity receptors) outside of highly protected areas and with flat topography and limited number of trees there will be minimal vegetation disturbance. However, effects from camp operation could impact upon local flora and fauna species. The magnitude of effect is considered moderate, with an impact of low significance.

Disturbance from noise and lighting from the camp and presence of workers in the region may disturb fauna by affecting their reproduction, and behaviour in the vicinity of the camps. The fly camp is sited within the least sensitive environment (previously disturbed areas) and the sensitivity of fauna in this area is accepted as low. Disturbance has the potential to affect the character of the baseline conditions, if only in the short term. The magnitude of impacts is considered to be moderate and overall impact of low significance.

There is potential for fauna direct mortality as a result of accidental entrapment in excavations and pits - particularly high risks are posed by plastic lined liquid pits. Reptiles, amphibians and mammals are primary receptors for entrapment. Amphibian species were recorded within the Project area. The Magnitude of impacts is considered to be moderate resulting in an impact of low significance.

Fauna, particularly mammals and fish, are also at risk from overfishing and hunting by local inhabitants with the aim of for provisioning Base with wildlife products and illicitly by the workforce). This can disturb the ecosystem balance and affect some protected species. Such direct effects are predicted to have a Magnitude of impacts considered to be moderate with an impact of moderate significance if no control measures are in place.

Leaks and spills, wastewater and solid waste can have impacts on the environment and its consequent pollution effects can impact multiple sensitive flora and fauna identified in the baseline. This is of particular importance to the riverine ecosystems around the rivers and tributaries. The direct effect of contamination, however, was considered to be moderate; therefore, the magnitude of the indirect impact on biodiversity is considered to be low and overall significance low.

Seismic Survey

Seismic line preparation may result in the loss or disturbance of several different types of habitat within the area, due to the vegetation clearance of approximately 5m wide seismic lines to facilitate the movement of seismic equipment.

Wooded areas may experience habitat loss resulting in the baseline being fundamentally changed as the nature of the impacts are considered permanent and therefore the magnitude of impacts is classified as high and the impact of moderate significance.

Habitat loss may also affect wetlands. Aquatic habitats are sensitive and susceptible to habitat loss. This effect is considered to be temporary as it is likely that the habitat will be able to absorb change due to natural regeneration and succession processes. However, as some valued faunal receptors may be indirectly impacted, the magnitude is considered moderate resulting in an impact of moderate significance.

Areas of woodland, maquis and grassland will also experience habitat loss as this habitat type is crossed by the seismic survey lines. The sensitivity of receptors is low as there were a minimal number of endangered or sensitive faunal species associated with this habitat during the baseline study. There is also potential for recovery and replacement of the habitat due to natural regeneration and succession processes. The Magnitude of impacts is considered to be moderate and temporary, resulting in an impact of Low significance.

As well as loss of habitat areas, the above habitat types may also experience degradation which is represented by reduction in habitat quality resulting from the seismic survey activities, not associated with the actual clearance of habitat. This may include for example the impacts of offline trampling and fragmentation.

Habitat degradation in wooded areas may cause a direct and permanent adverse effect as fragmentation may fundamentally affect this habitat. Seismic activities can also uproot trees or remove trees for clear lines of sight in the forest. Due to the sensitive nature of the receptors the Magnitude of impacts is considered moderate as the character of the baseline may be affected, resulting in an impact of moderate significance.

Wetlands may become fragmented due to the seismic survey which will affect this habitat. There are some sensitive fauna associated with these habitats, particularly birds; however, as the nature of the effect is considered temporary due to natural regeneration and succession processes, the magnitude of impacts is considered moderate. This will result in an impact of moderate significance.

Habitat degradation may occur in areas of woodland, maquis and /grasslands. There is also potential for bush fires as a result of human activities in these areas. Due to the temporary nature of the impacts in areas of low sensitivity and their unlikely occurrence, only be a minor shift from baseline conditions is expected and the magnitude of impacts is considered to be low with no significance.

Vegetation clearance may also result in direct individual mortality, particularly as the seismic survey activities bisect the woodlands. There is also risk of opportunistic hunting whilst habitat clearing is being conducted. This effect magnitude is classed as moderate for mammals and as low magnitude for reptiles and amphibians, given their wide distribution throughout the project area and the absence of species of conservation importance. This results in significance of impacts of moderate (significant) and low respectively.

Seismic noise disturbance generated by seismic charges is expected to be minimised by the depth they are buried. Nevertheless, the presence of workers and machinery might disrupt local fauna. Also potential direct mortality can occur resulting from the collision with vehicles. These effects will have a medium magnitude for mammals and birds and a low magnitude for reptiles and amphibians, given their distribution throughout the project area and the absence of species of conservation importance. This results in significance of impacts of moderate (significant) and low, respectively.

Similarly to mobilisation, the movement of seismic vehicles may lead to incidental transport of seeds and other propagating materials can expedite the colonisation by invasive species into new areas. The magnitude of impacts is considered to be moderate, resulting in an impact of moderate significance.

In all cases the residual impact after the adoption of mitigation measures will be **insignificant**.

Impact Assessment Summary

There are a large number of biodiversity receptors assessed within this ESIA, which reflects the relatively undisturbed nature of the Project Area. These biodiversity receptors include:

- Protected and Designated Areas and the features that define them as such;
- natural habitats include EU Habitats Directive Annex I habitats, including one Annex I Priority Habitat;
- threatened species of flora and fauna or species otherwise considered to be of conservation concern, including bird, mammals, herptiles and plant species.

The assessment considers the various phases and activities of the project and considers how the identified receptors may be affected, taking into account the magnitude of change including initially, embedded mitigation, and then considering how additional mitigation that has been identified and agreed will reduce the level of impact. Significant impacts are those which are defined as moderate or higher.

The assessment indicates that there could be a number of potential significant impacts prior to mitigation. These include impacts on habitats and fauna from vehicle movements and camp operations. However, most potential (pre-mitigation) impacts defined as significant are associated with the seismic acquisition stage, where habitats may be damaged, species disturbed although most of these potential impacts are likely to be temporary.

The main additional mitigation measures to avoid or reduce the impact significance include:

- Avoidance of most sensitive habitats and features such as protected areas, annex 1 habitats and critical habitat identified by the biodiversity specialist
- A biodiversity specialist will accompany the line clearance crew and ensure that the SUA standards as outlined in the Line Clearance and Restoration Guidelines (to be developed) are maintained for the clearance process to ensure that habitat degradation is minimised

- Avoid tree removal and minimise vegetation clearance areas; especially in sensitive and forested areas
- Where required lines will deviate lines and/or equipment will be laid by hand through vegetation stands

However, once the mitigation is taken into account all residual impacts for all receptors and for all stages are defined as either negligible or no impact and therefore all impacts are ultimately Insignificant.

Table 5-16 summarises the impact assessment and residual impacts for biodiversity.

Table 5-16 Impact assessment and residual impact to biodiversity

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Mobilisation and Demobilisation and Restoration					
Increased vehicle traffic	Disturbance of habitats located close to roads and access tracks due to dust and physical damage Nature of impact: Adverse, Indirect, Footprint, Temporary	Moderate	Low	Low (Insignificant)	None
	Habitat contamination and damage to species caused by spills and leakages Nature of impact: Adverse, Indirect, Footprint, Temporary	Moderate	Low	Low (Insignificant)	None
	Habitat disturbance due to the incidental transport of seeds leading to colonisation of invasive species Nature of impact: Adverse, Indirect, Footprint, Temporary	Moderate	Moderate	Moderate (Significant)	Low (Insignificant)
	Disturbance of fauna due to traffic noise Nature of impact: Adverse, Indirect, Footprint, Temporary	High	Moderate	Moderate (Significant)	Low (Insignificant)
	Mortality of fauna caused by collisions with vehicles Nature of impact: Adverse, Indirect, Footprint, Temporary	High	Low	Moderate (Significant)	Low (Insignificant)
Support Facilities					
Vegetation clearance and camp set up	Habitat loss and degradation Nature of impact: Adverse, Indirect, Footprint, Temporary	Low	Moderate	Low (Insignificant)	Negligible (Insignificant)
	Disturbance of fauna due to	Low	Moderate	Low	Negligible

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
	noise, lights and presence of workers Nature of impact: Adverse, Indirect, Footprint, Temporary			(Insignificant)	(Insignificant)
Camp operations	Disturbance of fauna due to noise, lights and presence of workers Nature of impact: Adverse, Indirect, Footprint, Temporary	Low	Moderate	Low (Insignificant)	Negligible (Insignificant)
	Mortality of fauna caused by increased hunting Nature of impact: Adverse, Indirect, Footprint, Temporary	High	Moderate	Moderate (Significant)	Negligible (Insignificant)
	Mortality of fauna caused by entrapment in excavations and pits Nature of impact: Adverse, Indirect, Footprint, Temporary	Low	Moderate	Low (Insignificant)	Negligible (Insignificant)
Vehicle workshop and fuel storage and sanitary treatment	Habitat contamination and damage to species caused by spills and leakages Nature of impact: Adverse, Indirect, Footprint, Temporary	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
Seismic Survey					
Vegetation clearance and seismic activities	Habitat loss and degradation due to reduced habitat quality Nature of impact: Adverse, Indirect, Footprint, Temporary	High (Annex 1 habitats)	Moderate	Moderate (Significant)	Low (Insignificant)
		Moderate (Wetland, riparian forest)	Moderate	Moderate (Significant)	(Low (Insignificant))
		Low (Degraded forest)	Moderate	Low (Insignificant)	Negligible (Insignificant)
	Habitat degradation due to reduced quality, tramping and fragmentation	High (Annex 1 habitats)	Moderate	Moderate (Significant)	Low (Insignificant)

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Vegetation clearance and seismic activities	Nature of impact: Adverse, Indirect, Footprint, Temporary	Moderate (Wetland, riparian forest)	Moderate	Moderate (Significant)	Low (Insignificant)
		Low (Degraded forest)	Low	Negligible (Insignificant)	Negligible (Insignificant)
	Nature of impact: Adverse, Indirect, Footprint, Temporary	High (Mammals)	Moderate	Moderate (Significant)	Low (Insignificant)
		Low (Reptiles, amphibian)	Moderate	Low (Insignificant)	
		Low (Birds)	Moderate	Low (Insignificant)	
	Disturbance of fauna due to noise and presence of workers Nature of impact: Adverse, Indirect, Footprint, Temporary	Low	High	Moderate (Significant)	Low (Insignificant)
	Mortality of fauna caused by collisions with vehicles Nature of impact: Adverse, Indirect, Footprint, Temporary	High	Moderate	Moderate (Significant)	Low (Insignificant)
Survey vehicles	Disturbance of fauna due to noise, lights and presence of workers Nature of impact: Adverse, Indirect, Footprint, Temporary	High (Mammals)	Moderate	Moderate (Significant)	Low/None
		Low (Reptiles, amphibian)	Low	Negligible (Insignificant)	
		Low (Birds)	Moderate	Low (Insignificant)	
	Mortality of fauna caused by collisions with vehicles Nature of impact: Adverse, Indirect, Footprint, Temporary	High (Mammals)	Moderate	Moderate (Significant)	Low (Insignificant)
		Low (Reptiles, amphibian)	Low	Low (Insignificant)	

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
	Habitat disturbance due to the colonisation of invasive species Nature of impact: Adverse, Indirect, Footprint, Permanent	Moderate	Moderate	Moderate (Significant)	Negligible (Insignificant)
	Habitat disturbance caused by contamination of water sources due to spills and leakages from survey vehicles Nature of impact: Adverse, Indirect, Footprint, Temporary	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
Survey vehicles and equipment	Habitat contamination and damage to species caused by spills and leakages Nature of impact: Adverse, Indirect, Footprint, Temporary	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
Major non-routine events	Damage to flora and fauna and loss of habitats due to fire, explosion Nature of impact: Adverse, Indirect, Footprint, Temporary	Moderate	High	Major (Significant)	Low (Insignificant)
	Disturbance to fauna and loss of habitats due to major spill of fuel Nature of impact: Adverse, Indirect, Footprint, Temporary	Moderate	Moderate	Moderate (Significant)	

5.2.4.6 Air emissions

The main sources of air emissions (continuous or non-continuous) resulting from oil exploration activities include combustion sources from power and heat generation, and fugitive emissions. The most common pollutant involved in fugitive emissions is dust or particulate matter (PM), which occurs during transport operations and from exposed soil surfaces, including unpaved roads.

The key sensitivity of the ambient air quality has been established as follows:

- Degradation of air quality due to emissions -The air quality in the region is generally good with no known industrial sources of emissions being identified in the study area. The locations of villages in proximity to the seismic survey are shown in **Figure 4-33**. Air quality is assessed for human receptors, considered to be of high sensitivity.
- Climate change is of global concern hence the sensitivity of the climate is high.
- Emissions resulting from unplanned activities would have a local impact on air quality. The sensitivity of local air quality is considered to be high.

Air quality could potentially be detrimentally affected during the seismic operations due to power generation, vehicle and equipment exhaust emissions. Principal pollutants from these sources include nitrogen oxides (NO_x), sulphur oxides (SO_x), carbon dioxide and monoxide (CO₂ / CO), and particulates (PM). The generation of dust is also likely from vehicle movements, particularly during the summer.

The mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Table 8.1** in **Section 8.6** and **Table 8.2** in **Section 8.6**.

Mobilisation and Support facilities

The main sources of air emissions during this phase will be associated with vehicle movements (transport and equipment), earthworks and the use of generators.

During mobilization the movement of trucks and heavy equipment will generate dust and particles, particularly on roads in poor condition or on unpaved road sections. This is of particular importance in the summer and will have potentially higher impacts to the communities located close to the roads. Due to the transient nature of moving vehicles the impact is deemed to be of low magnitude and the impact significance low. Vehicle emissions will be fairly limited in quantity and duration and therefore not considered to contribute considerably to baseline levels of NO_x or CO_x. The magnitude of this impact is therefore considered to be negligible and in consideration of the high sensitivity of human receptors the significance will be low. The overall residual impact significance with respect to vehicle movements will be negligible or **insignificant** with the adoption of mitigation measures such as the properly maintaining vehicles and equipment and turning them off when not in use.

Emissions and particulates during the base and fly camp set up and operation will be generated primarily by the use of construction equipment (front end loaders, bulldozers); and the use of generators. Some earthwork is expected given the topography of the area, primarily for the construction of the fly camps. Guidance on the assessment of dust from construction activities (Institute of Air Quality Management (IAQM, 2014)²⁶⁵ indicate that up to 350 meters distance from a construction site the area could be affected by increased fine particulate matter concentrations that can affect human health and increased dust deposition which can be a nuisance. Local settlements will be located further away from the fly camp sites therefore dust impact from construction activities is assessed to be of negligible magnitude and low significance. By implementing dust control strategies such as damping the ground will reduce the residual impact to negligible or **insignificant**.

Exhaust emissions from vehicles and machinery will be fairly limited in duration, with overall low impact significance. For static sources (e.g. two diesel generators in fly camps), potential impacts caused by diesel combustion engine emissions vary in intensity according to the distance of potential receptors from the source. The magnitude of the emissions is considered to be negligible and given the short term temporary nature of fly camps, and their relatively remote locations, impact significance is anticipated to be low. Electricity will be provided to the base, helipad facility and the explosive magazine facility by the national power grid, thereby minimising air emissions from the site. Implementation of mitigation measures such as; properly maintaining vehicles and equipment and truing the engines off when not in use will reduce the residual impacts to negligible or **insignificant**.

The emission of greenhouse gases such as carbon dioxide from vehicles and machinery is directly linked to global warming (an issue of very high Importance/Sensitivity). However, considering the short duration of the Project (less than 6 months), the incremental effect of carbon dioxide emissions from the project are considered to be negligible with the overall cumulative global warming impact being of negligible or **insignificant**.

Fires and accidents with explosives (i.e. non-routine events) and their associated air emissions may have a more intense albeit short term effect on air quality if the fire is intense. These effects are of potentially particular relevance at the base due to the storage of larger quantities of explosives in magazines, resulting in a low impact magnitude and moderate significance. Uncontrolled fires originating from fly camp sites can result in forest fires. However, forest fires can degrade air quality over a larger area and for a longer duration but will dissipate with rain and wind. Robust safety measures will be put in place to minimise the risk of accidental fires and explosions.

Seismic survey

Helicopters during routine operations (**TRANSPORTATION**) Potential sources of air emissions during the seismic survey are associated with vehicle movement, drilling of shot-holes and establishing the seismic grid (vegetation clearance, earthworks).

Helicopters used to transport heliportable drill rigs and during non-routine (emergency evacuations) landings could potentially decrease the air quality in its immediate surroundings for a limited period of time. However, the helicopters will fly from the Base to remote areas of the project area; as such impacts to local communities are not significant. Trucks and heavy vehicles may generate dust and emit combustion products. These activities are expected to have greater significance for local communities located close to the seismic lines. In addition to

²⁶⁵ IAQM (2014). Guidance on the assessment of dust from demolition and construction , Institute of Air Quality Management, 2014

http://iaqm.co.uk/wp-content/uploads/guidance/iaqm_guidance_report_draft1.4.pdf

human nuisance, there could be some localised impacts associated with dust deposition on nearby crops and grazing fields from dust generated by the movement of vehicles. Diesel powered drill rigs can also emit combustion products. Given the low numbers of vehicles involved and short duration survey activities at any specific location the magnitude of impact of from vehicle movements is low and the impact significance is moderate. Vehicle and equipment emissions is anticipated to be negligible and significance of effect, low. With the adoption of mitigation measures such as limiting vehicle movements, abiding by designated speed limits and maximising the use of paved roads, the significance of impacts from dust and emissions will be reduced to negligible or **insignificant**.

No impacts on air quality are expected from the detonation of charges. However, uncontrolled explosions and fire (and associated air emissions) generated by accidents with explosives (non-routine events) may have a short term impact on air quality. The magnitude of this effect (negligible) is limited by the small amount of explosives transported in seismic vehicles during each day's activities. The overall significant of effect is considered low or **insignificant**.

Demobilisation and restoration

The potential changes in air quality during demobilisation and restoration phase would be similar to those associated with the mobilisation phase, including increased traffic and need of heavy machinery to restore the camp sites and rehabilitate the vegetation. Although the significance of these effects is considered to be low, standard control mitigation measures should be implemented to reduce the residual impact to negligible or **insignificant** significance.

Impact assessment summary

Mitigation measures for the protection of air quality include the setting of speed limits, proper maintenance of vehicles and equipment and turning off engines and equipment when not in use.

Through the adoption of design controls and the implementation of additional mitigation measures, all residual impacts on air quality from normal operations during all phases of the Project have been assessed as negligible or **insignificant** significance.

Table 5-17 summarises the impact assessment and residual impacts on air quality.

Table 5-17 Summary of impact assessment and residual impacts on air quality

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Mobilisation, Support Facilities and Demobilisation and restoration					
Vehicle movements	Air emissions from transport vehicles Nature of impact: Adverse, Direct, Footprint, Temporary	High	Low	Low (Insignificant)	Negligible (Insignificant)
Vegetation clearance and earthworks	Increased level of dust Nature of impact: Adverse, Direct, Footprint, Temporary	High	Negligible	Low (Insignificant)	Negligible (Insignificant)
Use of generators	Increased air emissions Nature of impact: Adverse, Direct, Temporary	High	Negligible	Low (Insignificant)	Negligible (Insignificant)
	Emissions effect on Global Climate change Nature of impact: Adverse, Indirect, Regional, Permanent, Cumulative	High	Negligible	Low (Insignificant)	Negligible (Insignificant)
Storage of	Uncontrolled explosions and fire activities	High	Low	Moderate (Significant)	Low (Insignificant)

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
explosives camp site operations	Nature of impact: Adverse, Direct, Footprint, Temporary, Non-routine				
Seismic Survey					
Helicopter routine and non-routine landings	Increased level of dust Nature of impact: Adverse, Direct, Footprint, Temporary	High	Negligible	Low (Insignificant)	Negligible (Insignificant)
Vehicle movements; shot-hole drilling	Increased level of dust Nature of impact: Adverse, Direct, Footprint, Temporary	High	Low	Low (Insignificant)	Low (Insignificant)
	Air emissions Nature of impact: Adverse, Direct, Footprint, Temporary	High	Negligible	Low (Insignificant)	Negligible (Insignificant)
Use of explosives	Uncontrolled explosions and fire activities resulting in deteriorated air quality Nature of impact: Adverse, Direct, Local, Temporary, Non-routine	High	Negligible	Moderate (Significant)	Low (Insignificant)
Demobilisation and Restoration					
Vegetation clearance and earthworks	Increased level of dust Nature of impact: Adverse, Direct, Footprint, Temporary	High	Negligible	Low (Insignificant)	Negligible (Insignificant)

5.2.4.7 Noise and vibration

There is the potential for noise to be generated during all phases of project operations, including during vehicle mobilisation, construction activities, camp operation, air or road transportation and seismic acquisition. This section evaluates the potential noise and vibration impacts on human receptors.

Noise and vibration have the potential to disturbance to surrounding fauna and is discussed in the section on Biodiversity (**Section 5.2.2**). The potential impacts from vibration to geological and cultural heritage monument are discussed in **Section 5.2.1.2** and **Section 5.2.5**, respectively. Damage to landowner property such as building and domestic wells are discussed in **Section 5.2.4**.

The seismic survey area is primarily located in rural areas. In rural areas ambient equivalent sound levels are very low and therefore, any increase in noise levels has the potential to disturb local fauna and residents of surrounding settlements. The locations of settlements within 500m of the seismic corridors are shown in **Figure 4-33**.

The key sensitivities of the local communities to noise have been considered as follows:

- Noise and vibration will occur across the project area. Different human receptors have different sensitivity to noise; people in residential areas, health and educational establishments are more sensitive to noise than those in commercial and industrial areas. Vehicles (including helicopters) will cross the municipalities of Gjirokaštër, Tepelene, Kelcyre, Libohovë, Permet and Memaliaj. The primary receptors located in the surroundings of the project area comprise villages and agricultural areas (e.g. animal rearing and grazing)

which have medium sensitivity to noise. Industrial areas will have a low sensitivity to noise. To be conservative and as most of the survey activities will take place in the rural areas, the receptor sensitivity is considered to be medium in all cases.

- Religious ceremonies and cultural events may occur within or close to villages. The rural ambient noise and vibration environment is considered to be of high sensitivity.

The mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Table 8.1 in Section 8.7** and **Table 8.2 in Section 8.7**.

Mobilisation and Support facilities

The main sources of noise and vibration will be associated with increased road traffic during the mobilisation phase, construction activities in the camp set up and operation of generators.

Noise and vibration associated with the vehicle movements in the project area will have a limited duration, as vehicles move through the area. During the initial stages of project mobilisation and demobilization there will be increased level of traffic while equipment and materials are transported to the base or fly camps that is expected to decrease once completed. Therefore, the magnitude of effect is considered to be low and the impact significance reduced from low to negligible or **insignificant** by properly maintaining vehicles and abiding by designated speed limits.

Noise from vehicle movements could also be disruptive to religious ceremonies and cultural events. If places of religious significance are located in the vicinity of project activities, an engagement with the community leaders should allow the prevention of noisy vehicle movements during the time of any particular ceremony taking place. Without mitigation measures the magnitude of effect is considered moderate resulting in a moderate significance impact assuming the sensitivity of these activities. Early engagement by the Community Liaison Officer with communities and stakeholders to identify the venue and timing of events will reduce the residual impact to low or **insignificant**.

Operational and construction activities within the base and fly camps will result in an increase in ambient noise levels, for example attributable to vehicle engines, diesel generators, pumps, compressors, etc. In quiet rural settlements; such activities and the continual use of camp generators have the potential to cause considerable nuisance, when close to homes or other noise sensitive receptors.

Potential noise impacts of these static sources will vary in their intensity according to the distance from potential receptors. Table 5-18 provides the intensity propagation based on the distance to the noise source, based on a simplified linear noise dispersion model²⁶⁶, which predicted at what distances the IFC guidance noise levels (IFC, 2007a) could be achieved. Based on its results, it is considered that only receptors located within 40m of fly camps that will use generators and 400m of the base and the fly camp construction activities can be considered as potentially affected by noise impacts.

Table 5-18 Intensity propagation of noise and vibration according to distance to source

Noise intensity	Criteria ²⁶⁷	Distance to source (m)	
		Diesel Generators	Construction activities*
High	> 55 dB(A)	< 20m	< 200m
Medium	50 to 55 dB(A)	20 - 40m	200 - 400m
Low	45 to 50 dB(A)	40 - 60m	400 - 600m

²⁶⁶ The calculations were based on propagation of noise over distance. No allowances for ground/air absorption, screening, or other attenuation (e.g. due to land characteristics) have been included in the calculations

²⁶⁷ Criteria adapted from IFC guidelines, which advise average 1-hour noise level of 55 dB(A) outside residential receptors during daytime (0700-2200), and 45 dB(A) during night-time (2200-0700).

Noise intensity	Criteria ²⁶⁷	Distance to source (m)	
		Diesel Generators	Construction activities*
Negligible	<45 dB(A)	> 60m	> 600m

* based on noise levels from HGV movements

Based on criteria in Table 5-18 and that camp sites are to be located at least 1 km offset distance from sensitive social receptors in surrounding communities are expected experience a negligible impact from noise and vibration associated with fly camp operations and a low impact significance. With mitigation measures including the proper maintenance of equipment; residual impacts associated with the operation of equipment, machinery and generators will be reduced to negligible or **insignificant**.

Seismic Survey

Noise generated by helicopters during routine and non-routine operations could potentially create a disturbance to communities. The level of noise generated will vary due to factors such as helicopter model and flight path (which in turn depends on the weather). It is assumed that landing would be the greatest source of noise. Landings associated with routine operations will take place at the helipad facility. Considering the distances to nearest communities from the base and the fact that the noise source will be of short duration, the magnitude of impact is considered to be negligible and the significance of impact low. Mitigation measures such as avoiding communities as much as possible when planning the flight path and maintaining sufficient altitude will reduce the residual impact to negligible or **insignificant**.

Noise from vehicle movements along seismic lines is unlikely to be of a sufficient intensity or duration in any individual location to lead to a significant disturbance impact on humans. Although opening of seismic lines will involve heavy machinery and some vegetation clearance, it is unlikely that these noise sources will all be together in one place, but rather spread out over a distance. Furthermore, the noise sources will be moving so at any particular point along the route the noise impact caused by equipment will be of limited duration, negligible magnitude, and therefore of low significance to people living in the vicinity of the seismic lines.

Noise and vibration from the various activities along the seismic lines, notably shot-hole drilling and detonation of explosives and the use of vibroseis machines, may result in increased level of nuisance to local communities, depending on the distance from source and other factors such as topography.

When an explosive detonates, a large amount of energy is rapidly released and the shock and pressure react against the area around the explosion (ground and air). An explosion in a shot-hole will produce a pressure wave in the ground. The noise attributable to the detonation of the shots is described as a muffled 'thump' (as opposed to an explosive 'bang'). Human response to blast-induced ground vibration is a relatively complex phenomenon and is dependent on a range of factors of which the actual vibration magnitude is only one and not necessarily the most important. Noise frequencies to be felt are low in terms of human hearing (20Hz to 20kHz) and residents will not be able to differentiate between the air blast and ground motion effects (IAGC, 2007)²⁶⁸ similar to heavy traffic moving.

Seismic survey activities will be confined to daytime hours when the potential for disturbance is less. Although data acquisition may cause momentary disturbance, the effects of which will cease once it has been completed. The effect of noise and vibration on the local community and any religious ceremonies is therefore considered to be short-term, localised and of low magnitude provided safety distances are maintained between shot-hole locations and human receptors. Although most the seismic survey activities will be in remote areas, local villages may still be in the vicinity of project activities. Therefore the anticipated effect of seismic data acquisition would be of moderate significance. Informing communities of the schedule of seismic survey and engagement by the Community Liaison Officer will reduce this impact to negligible or **insignificant**.

The potential noise impacts of the demobilisation and restoration of the project would be similar to those associated with the mobilisation phase. The significance of impact is considered to be **insignificant**.

²⁶⁸ IAGC (2007). Minimum Offset Guidelines for Land Seismic Surveys, 2007. Rev 1. . International Association of Geophysical contractors (IAGC), Houston, USA

Impact assessment summary

The implementation of mitigation measures which include a traffic management plan for vehicles, maintenance of vehicles, and planning flight times and routes for helicopters will reduce the residual noise and vibration impacts to negligible or **insignificant**. Effective stakeholder engagement will reduce the residual impacts to negligible or **insignificant**.

Table 5-19 summarises the impact assessment and residual impacts to ambient noise.

Table 5-19 Summary of impact assessment and residual impacts on ambient noise

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Mobilisation, Support facilities, and Demobilisation and Restoration					
Vehicle movement	Nuisance to communities from noise and vibration from increased road traffic Nature of impact: Adverse, Direct, Temporary	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
	Disturbance of religious ceremonies and cultural events Nature of impact: Adverse, Direct, Temporary	Medium	Moderate	Moderate (Significant)	Low (Insignificant)
Operation of equipment, generators and machinery	Nuisance to communities due to noise and vibration Nature of impact: Adverse, Direct, Temporary	Medium	Negligible	Low (Insignificant)	Negligible (Insignificant)
Seismic survey					
Helicopter flights	Nuisance to communities due to noise Nature of impact: Adverse, Direct, Temporary	Medium	Negligible	Low (Insignificant)	Negligible (Insignificant)
Seismic vehicle movements	Noise and vibration from increased traffic Nature of impact: Adverse, Direct, Temporary	Medium	Negligible	Low (Insignificant)	Negligible (Insignificant)
Seismic data acquisition	Nuisance to communities due to noise and vibrations Nature of impact: Adverse, Direct, Temporary	Medium	Moderate	Moderate (Significant)	Negligible (Insignificant)
	Disturbance of religious ceremonies Nature of impact: Adverse, Direct, Temporary	Medium	Moderate	Moderate (Significant)	Negligible (Insignificant)

5.2.4.8 Light

Light will appear as a new and uncharacteristic feature in the night environment resulting from fly camp operations, security lighting at the base and explosive storage magazine. Light emissions are only anticipated to

be generated during base, fly camp operation (inclusive of operation of the explosive storage magazine), with all other project activities undertaken during daylight hours.

The seismic survey area is primarily located in rural areas. In rural areas ambient light levels are very low and therefore, any increase in night time light levels has the potential to disturb local fauna and residents of surrounding settlements, as well as impacting on visual amenity.

This section evaluates the potential impacts of light emissions on human receptors, considered as of high sensitivity to light emission impacts in general. The key sensitivities of local communities to light emissions have been considered as follows:

- Disturbance to human receptors (local residents, businesses etc.) - Different human receptors have different sensitivity to light; people in rural areas, residential areas and health establishments are generally more sensitive to light than those in commercial and industrial areas. Human receptors located in the surroundings of the project area are rural villages which would have minimal night lighting consistent with what would be expected in residential areas. Although industrial areas such as Gjirrokastër may be less sensitive to light emissions, the project lighting scheme may be inconsistent with the existing night lighting. In both cases, the sensitivity of the human receptors is considered to be medium. The locations of villages and towns in the project area are shown in **Figure 4-33**.
- Impacts on visual amenity- Much of the seismic survey area is rural where there are little or no sources of ambient light, existing ambient light sources are primarily around villages and larger towns. Residents of villages are considered to have a high sensitivity to light emissions.

Potential disturbance to surrounding fauna is discussed in the section on Biodiversity (**Section 5.2.2**)

The mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Table 8.1** in **Section 8.4** and **Table 8.2** in **Section 8.4**.

Support facilities, Seismic Surveys and Demobilisation and restoration

No vehicular transport will be permitted at night (with the exception of emergency vehicles) hence no impacts are anticipated to result from vehicle movements associated with any phase of project. Camp set up, seismic surveying and demobilisation/restoration is also anticipated to be undertaken during daylight hours, and therefore no impacts are anticipated during these phases.

The energy consumption required for lighting in bases and fly camps also has the potential to indirectly impact on climate change and resource. However, considering the short duration of the Project (less than 6 months), the incremental effect of energy consumption from the project lighting is considered to be of negligible and not further considered.

Night lighting in rural areas has the potential to be seen for a distance, depending on the terrain. Fly camps will be located in rural areas with the potential to disturb any human receptors (residential) in the vicinity, as well as potentially impacting visual amenity (glare/sky glow). The magnitude of the impact is low and the impact significance is low

Light emissions will also result from base operation. Although base location is anticipated to be in an existing industrial area, there remains the potential for disturbance to human (business and residential) receptors, and loss of visual amenity (glare/sky glow). However, the contribution of base light emissions to ambient light in an existing industrial area is considered to be minimal and of negligible magnitude, resulting in a low impact. The lighting design should be carried out by a suitably qualified and competent professional to achieve the lighting requirements of the Project with the least light spill or sky glow which will reduce the residual impact to negligible or **insignificant**.

Impact Assessment Summary

Mitigation measures such as having a qualified profession carry out the lighting design and the use of directional lighting will minimize the potential light impacts. Through the adoption of design controls as part of additional mitigation measures, all residual impacts on ambient light have been assessed as negligible or **insignificant**.

Table 5-20 summarizes the impact assessment and residual impacts for light emissions.

Table 5-20 Summary of impact assessment and residual impacts for light emissions

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Support facilities					
Base and Fly Camp operation (including explosives magazine)	Light pollution causing disturbance to human receptors (rural areas) Nature of impact: Adverse, Indirect, Local, Temporary	Medium	Low	Low (insignificant)	Negligible (Insignificant)
	Light pollution causing disturbance to human receptors (industrial areas) Nature of impact: Adverse, Indirect, Local, Temporary	Medium	Negligible	Low (insignificant)	Negligible (Insignificant)
	Loss of visual amenity Nature of impact: Adverse, Direct, Local, Temporary	Medium	Low	Low (insignificant)	Negligible (Insignificant)

5.2.4.9 Waste

Wastes will primarily be generated at the base, helipad, fly camps and from seismic survey activities (broken geophones, packaging etc.). Details of waste management within the survey area are provided in **Chapter 4 Baseline (Section 4.11)**.

The main sensitivities associated with waste generation and management impacts identified with respect to waste are:

- Littering – environmental degradation - A large part of the seismic survey area is comprised of protected and designated areas including Zagori Natural Park, Bredhi-Hotves-Dangelli National Park and the Gjirokastër Important Bird Area. Nuisance litter diminishes the character of an area to a resident or tourist and hence the sensitivity is considered to be medium (human receptors).
- Environmental contamination as a result of hazardous waste, non-hazardous, operational and domestic waste – The seismic survey is primarily located in rural areas; an environment expected to have low capacity to absorb changes resulting from waste impacts and is of high environmental value therefore considered to represent a receptor of moderate sensitivity (resources).

The availability and capacity of licensed waste disposal options have been considered in this section and further addressed in Section 5.1.8, **Cumulative Impacts**.

The mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Table 8.1 in Section 8.9** and **Table 8.2 in Section 8.9**.

Mobilisation and Support facilities

No waste is anticipated to arise from the mobilisation activities, and therefore no impacts are anticipated from waste during this phase of works.

There is potential for uncontrolled waste to result in nuisance litter in the vicinity of the base and fly camps; this can lead to environmental degradation and contamination, poses a risk to fauna through ingestion or entrapment, and can also be an eyesore with implications for visual amenity. It is therefore considered that the magnitude of impact will be low, and the overall significance of impact will also be low. With control measures, such as implementing a waste management plan and training in how to implement the plan in place, the residual impact will be negligible or **insignificant**.

Hazardous and non-hazardous waste will be generated over the time line of the project (approximately 6 months). Wastes from fly camps will be transferred to the base for storage until final disposal. It is anticipated that waste will be properly managed, waste minimisation efforts will be adopted and that no waste will be disposed of on-site or in the surrounding area, unless at a licensed waste disposal site. It is therefore considered that the magnitude of impact will be negligible and the overall significance of impact will also be negligible or **insignificant**.

Poor or the lack of appropriate waste management, particularly at fly camps, can result in secondary impacts to soils, groundwater and surface water through contamination. These impacts have been considered in **Sections 5.2.4.1, 5.2.4.3 and 5.2.4.4**, respectively.

Wastes will be disposed of in licensed facilities; this may put a strain on existing available facilities. Without approved facilities, wastes, in particular hazardous waste will need to be appropriately stored and managed to avoid risks of environmental contamination.

Seismic Survey

The seismic survey activities will generate waste materials (i.e. broken geophones, flags and markers, packaging etc.) which should be brought back to camp for storage and disposal. However, if left along the seismic corridor it would constitute littering. It is therefore considered that the magnitude of impact will be low, and the overall significance of impact will also be low. Induction training on waste management and the prohibition of littering in the field, the residual impact will be negligible or **insignificant**.

Demobilisation and restoration

The base, helicopter facilities, explosive magazine and fly camps will be closed. Fly camps will be closed and restored throughout the seismic survey data acquisition phase as they will be relocated in the vicinity of the seismic corridors as necessary. Following the data acquisition, a clean-up team will be deployed to survey the acquisition lines, removing any waste and restoring areas affected by the seismic survey as necessary. This includes, but not limited to removing pegs, flagging, cap wires and survey markers. All waste is to be collected, transported and disposed under a Duty-of Care and in accordance with national legislation. Waste minimisation efforts will be adopted and that no waste will be disposed of on-site or in the surrounding area, unless at a licensed waste disposal site. The residual impact is assessed to be negligible or **insignificant**.

Impact Assessment Summary

The most important mitigation measures to reduce the potential impacts from waste generation are the implementation of a waste management plan, waste management training and the designation of personnel to be stewards of good housekeeping practices. Through the adoption of these additional mitigation measures, all residual impacts on have been assessed as negligible or **insignificant**.

Table 5-21 summarises the impact assessment and residual impacts for waste.

Table 5-21 Summary of impact assessment and residual impacts for waste

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Support facilities					
Camp Set up and Operation	Littering (environmental degradation)	Medium	Low	Low (Insignificant)	Negligible (insignificant)
	Environmental contamination as a result of hazardous waste	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
	Environmental	Moderate	Low	Low	Negligible

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
	contamination as a result of non-hazardous, operational and domestic waste			(Insignificant)	(Insignificant)
Seismic Survey					
Seismic Survey	Littering (environmental degradation)	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
Demobilisation and Restoration					
Demobilisation and Restoration	Littering (environmental degradation)	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
	Environmental contamination as a result of hazardous waste	Moderate	Negligible	Negligible (Insignificant)	Negligible (Insignificant)
	Environmental contamination as a result of non-hazardous, operational and domestic waste	Moderate	Negligible	Negligible (Insignificant)	Negligible (Insignificant)

5.2.4.10 Social and Health

Social and health impacts principally relate to the following five key sensitivities that exist within the project area:

- The presence of small rural villages with a predominantly elderly population that have high reliance on crops and livestock for household consumption and income. Residents of these villages are potentially vulnerable to the loss of even small areas of crops, disruption to their livestock, damage to their buildings, and disturbance from the presence of project workers and from noise generated during the acquisition phase. The engagement, land permitting and compensation processes must be designed with recognition of the specific vulnerabilities that exist in these rural communities.
- Limited availability of water, with shortages occurring in municipalities and in villages at some times of year. Water use by the project needs to be managed to avoid a reduction in availability for other users.
- Many of the access roads to villages are in poor condition, being single lane and un-paved. Some are not passable during winter, when rain, snow, ice and landslides block the roads, leaving villages with no accessible routes out to the main towns. Further deterioration of these roads would further reduce accessibility, impacting residents' ability to travel to buy or sell goods and to access health and other services.
- Limited availability of medical facilities and nurses or doctors in rural areas. Many villages have no medical service provision and residents are reliant on travelling to larger communities to access medical services. It is important that the project does not use limited medical provision (except in cases of emergency or for referral to larger centres) as it would affect the ability of local residents to access already strained medical services and facilities.
- Tourism is an important part of the economy, providing diversification from the traditional agricultural economy. Tourism is still in development and impacts that could affect this development should be avoided.

The mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Table 8.1** in **Section 8.10** and **Table 8.2** in **Section 8.10**.

Mobilisation and Support facilities

Land use impacts from establishment of camps

Subject to the location of the base and 'fly' camps, there will be a requirement to acquire permission for use of land and for the clearance of crops or pasture from that land, as well as exclusion of any grazing livestock. The area impacted may be limited to one or a small number of landowners at each camp location. The embedded design approaches for siting of camps will mean that any land with sensitive uses will be avoided. The SUA Land Acquisition and Resettlement Framework and the Community Feedback Mechanism and Compensation Procedure will be implemented during the permitting process include key mitigation for impacts to crops or pasture, such as identifying options for avoidance or impact reduction where possible, seeking agreements for land access, and paying compensation for impacts. The permitting process will address the local factors that are outlined below.

To mitigate the vulnerabilities described above, the Land Permitting process must address the following local factors:

- In many cases local residents may not have documentation to prove land ownership. In order to verify ownership and usage rights the Permitting Team will need to use input from the impacted household, from village heads, and potentially from other community members.
- Where possible within the schedule for the survey, provide opportunity for any impacted crops to be harvested by the owner before clearance.
- Impacts to crops that are used for household-use must be valued to fully reflect the costs of buying replacement food. This valuation must include recognition of the travel costs and time required to get to the closest market / shop to buy replacement food.
- The permitting process must plan for situations where land owners are absent and cannot be reached to provide consent for land access. Consent will not be assumed when land owners cannot be identified or contacted.

The robust approaches to permitting will mean that impacted households are given fair compensation for their lost assets, which reduces the residual impact to Low.

Accommodation of project workers in hotels and guesthouses

Project workers who are accommodated in hotels and guest houses will create revenues for those business owners. The reduced availability and/or increased cost of hotel rooms caused by Project-related demand could displace tourists, with such an impact being particularly noticeable during the peak tourist season and for major events that take place in Gjirokastër and Permet. That displacement would reduce the number of tourists paying for other services (e.g. use of restaurants, attractions) and so would impact local tourism businesses. However, the number of tourist beds available in the region (approximately 800 in Gjirokastër and 400 in Permet) is high compared to the total workforce of 190, not all of whom would require accommodation as some will be local. This means that any displacement impact would be minimal, except during peak tourist season (April to October) and for major events when it may be noticeable. The development and implementation of a Workforce Accommodation Plan to manage numbers of workers living in local communities will help to reduce the residual impact to a negligible or *insignificant*.

Accommodation of project workers in temporary accommodation developed by the project

As well as the option to use camp accommodation or existing hotels or guesthouses, the Project Contractor may use existing houses or facilities (e.g. old schools) within local communities. This would be used in remote areas as an alternative to fly camps, and would help to minimise the requirement for daily travel to / from the main accommodation camp or hotels / guest houses. The Contractor would lease the houses or facilities under agreement with the owner or the relevant authority, and would then undertake any necessary repairs or enhancements to make them suitable for accommodating Project workers. The duration would typically be 6 months and the number of workers living in any one village would be a maximum of 30.

Without mitigation this form of worker accommodation could create impacts to the host village due to noise and traffic, excess use of local water sources to the extent that supply to residents is impacted, littering of waste, and unsanitary discharge of sewage. Such impacts would be significant if the host community were small or isolated, which applies to many of the rural communities in proximity to the seismic lines.

In order to mitigate the impacts of this accommodation option there must be controls over where the Contractor can decide to establish this form of temporary accommodation, and management measures must be applied to reduce impacts

The Workforce Accommodation Plan will specify the requirement to engage with the communities that will be used for temporary accommodation. If workers are accommodated in houses or other buildings (e.g. schools) within villages then community engagement must take place in advance to ensure that host villages are aware of the planned use of the village for temporary accommodation, and can provide feedback on any concerns or preferences. This engagement process must be adequate to address the potentially high vulnerability of some small, isolated communities to the presence of Project workers.

For temporary accommodation within local communities there must also be:

- An agreement on rental fees, either paid locally to private owners (for houses) or to the governing authority for public infrastructure such as old schools.
- An agreement on the use of water, roads and any sanitation infrastructure, with appropriate fees paid for such use.
- An agreement on how houses or public infrastructure that are altered for use will be passed back to the owner or community, i.e. whether restoration or retention of changes is preferred.

If adequate sanitation systems are not present or cannot be installed or upgraded then all sewage must be taken offsite. All waste must be transferred off site. With these measures in place the impact is reduced to low or **insignificant**.

Presence of non-local project workers in or near the local community

The workers that are not from local communities will be housed in existing hotels and guesthouses, in the camps, and / or in temporary accommodation in communities developed by the Project. The presence of non-local workers in local communities can create disturbance to existing residents, particularly if the camp is located in or close to a rural village. There is the potential for disruption to the local community from increased noise and traffic, as well as behaviours that may not be aligned with local norms, such as increase in alcohol use by non-local project workers or conflict between local residents and workers.

Undertaking appropriate training with the non-local project workers on code of conduct and respectful interaction with local residents will be required, as well as engagement with village heads and residents and the implementation of a Community Feedback Mechanism and Compensation Procedure to manage grievances. These mitigation measures will reduce the residual impact to a low or **insignificant**.

This impact description also applies to the impact of non-local project workers being present in or in close proximity to local villages during the seismic survey phase. The same mitigation measures will apply during this phase, also resulting in low or **insignificant** residual impact.

Use of water for operation of camps

The camps will require water for domestic sanitation and for various other project uses, e.g. washing and maintaining machinery. Bases may be connected to the Gjirokaštër / Permet water supply grid, while water requirements for the 'fly' camps or temporary accommodation within villages and drilling activities will potentially be acquired through water trucks from an approved water supplier. Water supply within the municipalities is limited, especially during the summer months, and in the villages it is an important resource for irrigation and domestic use. Due to the limited availability of water there is the risk that project water use at the camps could contribute to water shortages and reduced supply to other users. While total water use at the camps will not be high relative to total consumption in the region, due to the sensitivity of water supply in the region this impact requires careful mitigation through the application of a robust Water Management Plan and ensuring that the workers' induction training includes the importance of water conservation and restrictions on use of local water sources, e.g. natural springs. This will help ensure that water supply from municipal or local supply points can be done without noticeably impacting supply to other users and it will reduce the residual impact level to low.

This impact description also applies to the impact of water use for drilling during the seismic survey phase. The same mitigation measures will apply during this phase, also resulting in low or **insignificant** residual impact.

Movement of project equipment and vehicles

The movement of project vehicles to and from the camps will increase traffic on the road and could contribute to an increased risk of road accidents for other vehicles, pedestrians and livestock. This impact will be limited for Bases located close to major towns as roads are wider and better maintained in those areas. In rural areas project traffic going along small roads through villages and in areas of livestock could create an elevated risk of accidents involving pedestrians and livestock, and could lead to delays for other road users. Increased movement of project equipment could damage structures in close proximity to the roads (e.g. fences, walls) and there will be

an increase in wear and damage of roads from movement of project equipment and vehicles, particularly for unpaved roads.

The Transport Management Plan will implement a number of measures to reduce traffic risks from project vehicles, as well as the risks to project personnel from poor road conditions. The implementation of these mitigation measures will reduce the residual impact to a low or **insignificant** residual impact.

This impact description also applies to the impact of traffic during the seismic survey phase. The same mitigation measures will apply during this phase, also resulting in low or **insignificant** residual impact.

Introduction or spread of communicable diseases within local communities

The operation of the camps and the presence of non-local workers working in local communities create a potential risk of the spread of communicable disease and creation of unsanitary conditions. During the stakeholder engagement and social research stakeholders did not refer to any specific health or disease issues in the local area. However, it is noted that the management of any disease risk is important due to the limited medical facilities that are available locally, and the significant distances that some local residents have to travel to receive care.

It is not yet known where project workers will come from, and so the profile of disease risk cannot be established. However, it is likely that a large part of the workforce will be local Albanian workers, reducing the risk of the introduction of disease to the area. The Base will include medical facilities which will help to treat and monitor any diseases amongst the workforce. Domestic waste and sewage will be created at the camps, and will be managed to avoid the creation of unsanitary conditions for local residents. Based on this mitigation the health risks to local residents are reduced to an **insignificant** residual impact.

This impact description also applies to the introduction or spread of communicable diseases during the seismic survey phase. The same mitigation measures will apply during this phase, also resulting in low or **insignificant** residual impact.

Provision of security at camps

Security personnel may be used to protect assets and personnel at the camp. Their role will be to provide a deterrent to crimes (e.g. theft) and to respond to any security incidents. Security will be unarmed, or equipped proportionate to security threat. Any inappropriate behaviour or excessive use of force by project security staff would impact community safety and wellbeing. For camps located close to a rural village the local residents could be vulnerable to any inappropriate behaviour or excessive use of force. In order to mitigate this risk to local residents, security personnel must be trained and must be directed on the appropriate use of force. Any security incidents and any grievances related to security must be investigated to verify that behaviour and use of force was appropriate. Following the implementation of these mitigation measures the residual impact will be low.

This impact description also applies to the impact of security personnel used at work sites during the seismic survey phase. The same mitigation measures will apply during this phase, also resulting in low or **insignificant** residual impact.

Seismic Survey

Clearance of seismic lines and access to land

In rural areas, households typically grow vegetables and fruits close to their residences, and so these will typically be avoided when seismic lines are defined to avoid residences. However, there may be some areas where crops grown for household consumption are further away from the residence, and these crops could be impacted. Given the high reliance on land in the Project Area for crop cultivation and livestock rearing and the dependency on these activities for income and livelihood generation, there is a high sensitivity to this impact. In rural areas, clearance of crops or pasture would impact an important food source that cannot be readily replaced by shop bought produce due to the significant travel times to the closest shops and the limited incomes made by many residents.

The SUA Land Acquisition and Resettlement Framework will be implemented during permitting to provide the key mitigation for impacts to crops or pasture. This includes providing advance notice to impacted households, identifying options for avoidance or impact reduction where possible, seeking agreements for land access, and paying compensation for impacts. The robust approaches to land permitting will mean that impacted households are given fair compensation for their lost assets, which reduces the residual impact to low or **insignificant** residual impact.

Disturbance to livestock from seismic survey activity, including from helicopter movements and detonations

Cows, sheep and goats are kept across the Project area, particularly in the upland areas. Project vehicles and work crews will frequently interact with livestock, either on access roads or in pasture lands. This interaction could create a low disturbance to the livestock. Helicopter movements and detonations may disturb livestock, and

potentially lead to the loss of livestock if they bolt away from the sound source and into risky areas such as roads, deeper valleys, or near cliffs. Disturbance to livestock creates a nuisance for their keeper, and potentially a financial impact if any are lost.

This impact will be mitigated through avoidance of particularly sensitive areas (e.g. cattle sheds) and through robust engagement by CLOs and the Permitting team with potentially impacted livestock keepers in advance of and during the seismic survey phase. If livestock are present in close proximity to the planned acquisition activity contact will be made with livestock keepers to arrange movement of the livestock. Grievances related to the impact of helicopter movement on livestock will be monitored and if they are occurring frequently then enhanced prior notification will be undertaken with potentially impacted farmers, and changes in helicopter movements will be made when viable.

Following the implementation of these mitigation measures the residual impact will be low or **insignificant**.

Damage from vibration to structures, including buildings, sheds, fences, wells and septic tanks

If seismic lines are not defined to avoid potentially sensitive buildings and infrastructure then the detonation of explosives and vibroseis could create physical impacts to those buildings and infrastructure. This could include buildings, sheds, fences, wells and septic tanks that local residents are reliant on. This impact will principally be mitigated through the land permitting process when the locations of sensitive buildings and infrastructure will be identified and seismic lines will be set with adequate separation distance. As a further safeguard, a Compensation Plan will be developed so that if damage is reported or identified by the survey crews it will be investigated and compensated. This will reduce the impact to negligible or **insignificant**.

Access restriction to agricultural areas during seismic acquisition activity

The project could temporarily block off access to roads or fields through inconsiderate positioning of vehicles and equipment, and through the imposition of exclusion zones around active shot holes. This impact will be temporary and low. Actions to be taken by the survey field crew will help to reduce this to a negligible or **insignificant** residual impact.

Disruption to landowners from project workers accessing their land

The seismic survey will require land access which will require project workers to engage landowners to discuss land access protocol and signing land access agreements. Local residents are highly dependent on agricultural activity for their livelihoods and time spent with project workers will reduce time available for that activity. However, due to the short-term nature of this disruption as well as the measures of implementing the SUA Land Acquisition and Resettlement Framework and having recourse to an efficient and effective Community Feedback Mechanism and Compensation Procedure to manage grievances, the residual impact is assessed as negligible or **insignificant**.

Decreased tourist appeal of the area due to noise and disturbance (e.g. traffic or visual disruption)

Tourism is an important economic sector in the Gjirokastër region. Tourists are attracted to the area for the rich natural environment and available outdoor recreation, cultural heritage sites, and local folk culture. Income for the local community is generated from providing tourism-related services such as guesthouses, restaurants and cafes, stores and local tours. There could be a temporary and localized impact on the tourist appeal of the area as a result of noise and disturbance from helicopters and increased traffic, as well as due to the visual impact to the local scenery from clearance of seismic lines. If this impact were noticeable then at an extreme it could reduce the number of tourists, leading to an impact on the income generated from tourism activities.

However, given the standard measures to minimise visual disruption such as avoiding tree cutting and to avoid sensitive cultural heritage sites, along with the temporary nature of the project, this impact will be low, leading to a negligible or **insignificant** residual impact.

Poor handling, transportation, storage and use of explosives

Poor handling, transportation, storage and use of explosives could result in accidents (e.g. fires, explosions) and injury of workers and members of the public. Transportation of hazardous materials gives rise to a risk from spills or accidents which can affect not just the environment, but residents and road users. There are a number of mitigation measures proposed to reduce the impact, including that all misfired charges will be abandoned in the well boring and left to decompose, any casing will be removed from the ground, security will be deployed to minimise any tampering and vandalism of shot holes and geophones, and signage will be provided to advise residents of drilling activity and to mark the exclusion area around shot-holes during acquisition. Following the implementation of these mitigation measures the residual impact will be lowered to low or **insignificant** residual impact.

Demobilisation and Restoration

During the demobilisation and restoration the impacts of the seismic survey phase will end and / or will be mitigated through restoration of impacted land. The exception is the ongoing impacts arising from the movement of Project vehicles and equipment, which will continue during Demobilisation. These impacts and required mitigation are the same as for the impacts arising from the movement of Project vehicles and equipment during the seismic survey phase.

Impact Assessment Summary

With mitigation measures in place, all social and health impacts are expected to be managed to a low or negligible level and *Insignificant* social and health residual impacts are anticipated. The principle mitigation measures include:

- Notification of landowners of the schedule for seismic survey activities in the area
- If livestock are present in close proximity to the planned seismic data acquisition activity the livestock keeper will be contacted to arrange for the movement of the livestock
- Implementation of a Worker Accommodation Plan to help ensure that impacts from workers accommodation are minimized. If worker accommodation is provided in villages then consultation will be undertaken with the villages and agreements will be made on the use of buildings and community water, roads and sanitation systems.
- Identification of the locations of buildings and other sensitive infrastructure; the seismic survey lines will be offset with consideration to the location of these assets
- Provision of medical facilities and personnel for Project workers to maintain a healthy workforce and reduce any burden on local medical facilities
- Project workers will be trained on a code of conduct for respectful behaviour in communities
- Implementation of a Water Management Plan to reduce impacts to local water supplies
- Implementation of a Transport Management Plan and Traffic Management Plan

Table 5-22 summarises the social impact assessment and residual impacts.

Table 5-22 Summary of social impact assessment and residual impact

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Mobilisation and Support facilities					
Establishing the camps	Clearance of crops or pasture from area used for establishing camps Nature of impact: Adverse, Direct, Temporary, Footprint	High	Low	Moderate (Significant)	Low (Insignificant)
Accommodation of project workers in hotels or guesthouses	Decreased tourism in the area due to lower availability or increased cost of tourist accommodation caused by demand from project workforce Nature of impact: Adverse, Direct, Temporary, Regional	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
Use of temporary accommodation (e.g. houses, old schools) in villages.	Disturbance to local residents due to noise and traffic, use of local water sources to the extent that supply to residents is impacted, littering of waste, and / or unsanitary discharge of sewage in the village. Nature of impact: Adverse, Direct, Temporary, Local	High	Medium	Moderate (Significant)	Low (Insignificant)

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Presence of non-local project workers in or near the local community	Disruption to community well-being from non-local project workers and associated increased noise and traffic or behaviours that are not aligned with local norms. Nature of impact: Adverse, Direct, Temporary, Regional	Medium	Medium	Moderate (Significant)	Low (Insignificant)
Use of water for operation of camps	Project use of local water sources could reduce the availability of that water to other users and / or increase the cost of water supply to users. Nature of impact: Adverse, Direct, Temporary, Regional	High	Medium	Moderate (Significant)	Low (Insignificant)
Movement of project equipment and vehicles traffic	Movement of project vehicles could result in increased risk of road accidents for other vehicles, pedestrians and livestock, as well as increased risk of traffic delays, damage to road-side structures and degradation of the roads. Nature of impact: Adverse, Direct, Temporary, Regional	High	Low	Moderate (Significant)	Low (Insignificant)
Presence of Non-local Project Workers in or near the Local Community	Introduction or spread of communicable diseases within local communities from the presence of non-local workers and / or unsanitary accommodation and proximity to cattle. Nature of impact: Adverse, Direct, Temporary, Regional	High	Low	Moderate (Significant)	Low (Insignificant)
Provision of security at camps	Any inappropriate behaviour or excessive use of force by project security personnel would impact community safety and wellbeing. Nature of impact: Adverse, Direct, Temporary, Local	High	Low	Moderate (Significant)	Low (Insignificant)
Seismic Survey					
Clearance of survey lines for access, shot holes and geophones.	Clearance of crops or pasture from seismic lines and access routes. Nature of impact: Adverse, Direct, Temporary, Local	High	Medium	Moderate (Significant)	Low (Insignificant)
Seismic acquisition activity	Access restriction to agricultural areas during seismic acquisition activity Nature of impact: Adverse, Direct, Temporary, Local	High	Negligible	Low (Insignificant)	Negligible (Insignificant)
Seismic acquisition activity, including helicopter movement and explosions	Disturbance to livestock, potentially affecting behaviour. Nature of impact: Adverse, Direct, Temporary, Local	High	Medium	Moderate (Significant)	Low (Insignificant)
Seismic acquisition activity	Damage from vibration to structures, including buildings, sheds, fences, wells and septic tanks Nature of impact: Adverse, Direct, Temporary, Local	High	Medium	Moderate (Significant)	Low (Insignificant)

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Movement of Project Equipment and Vehicles Traffic	Movement of project vehicles could result in increased risk of road accidents for other vehicles, pedestrians and livestock, as well as increased risk of traffic delays, damage to road-side structures and degradation of roads. Nature of impact: Adverse, Direct, Temporary, Regional	High	Low	Moderate (Significant)	Low (Insignificant)
Presence of Non-local Project Workers in or near the Local Community	Disruption to community well-being from non-local project workers and associated increased noise and traffic or behaviours that are not aligned with local norms. Nature of impact: Adverse, Direct, Temporary, Regional	Medium	Medium	Moderate (Significant)	Low (Insignificant)
Seismic acquisition activity	Disruption to landowners from project workers accessing their land Nature of impact: Adverse, Direct, Temporary, Local	High	Negligible	Low (Insignificant)	Negligible (Insignificant)
Seismic acquisition activity	Decreased tourist appeal of the area due to noise and disturbance resulting from the Project (e.g. traffic or visual disruption) Nature of impact: Adverse, Direct, Temporary, Regional	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
Use of Water for Drilling	Project use of local water sources could reduce the availability of that water to other users and/ or increase the cost of water supply to users. Nature of impact: Adverse, Direct, Temporary, Regional	High	Medium	Moderate (Significant)	Low (Insignificant)
Accommodation of Project Workers within Communities	Decreased tourism in the area due to lower availability or increased cost of tourist accommodation caused by demand from project workforce Nature of impact: Adverse, Direct, Temporary, Regional	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
Presence of Non-local Project Workers in or near the Local Community	Introduction or spread of communicable diseases within local communities from the presence of non-local workers and / or unsanitary accommodation and proximity to cattle. Nature of impact: Adverse, Direct, Temporary, Regional	High	Low	Moderate (Significant)	Low (Insignificant)
Handling, transportation, storage and use of explosives	Poor handling, transportation, storage and use of explosives could result in accidents (e.g. fires, explosions) and injury of workers and members of the public. Nature of impact: Adverse, Direct, Temporary, Local	High	Low	Moderate (Significant)	Low (Insignificant)

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Provision of security during seismic acquisition activity	Any inappropriate behaviour or excessive use of force by project security personnel would impact community safety and wellbeing. Nature of impact: Adverse, Direct, Temporary, Local	High	Low	Moderate (Significant)	Low (Insignificant)
Demobilisation and Restoration					
Movement of Project Equipment and Vehicles Traffic	Movement of project vehicles could result in increased risk of road accidents for other vehicles, pedestrians and livestock, as well as increased risk of traffic delays, damage to road-side structures and degradation of roads. Nature of impact: Adverse, Direct, Temporary, Regional	High	Low	Moderate (Significant)	Low (Insignificant)

5.2.4.11 Cultural heritage and archaeology

Project activities that have the potential to impact cultural heritage and archaeology are mainly from site clearance and levelling activities, the movement and use of vehicles and machinery and seismic data acquisition.

The assessment of impacts on cultural heritage depends on the sensitivity of individual cultural heritage assets. Impacts to cultural heritage that may arise from project activities are:

- Physical damage to cultural heritage sites and archaeological remains (tangible cultural heritage)
- Noise and visual intrusion on the setting of cultural heritage sites (tangible cultural heritage)
- Noise and visual intrusion on cultural or religious ceremonies or festivals (intangible cultural heritage)

The project area contains nationally protected sites, i.e. cultural monuments and objects of archaeological, paleontological, ethnographic and traditional interests designated under Albanian legislation. The fragility of the cultural monuments and undesignated cultural heritage (i.e. churches) is not known. Only the general locations of cemeteries are known and in most cases the boundaries are not demarcated. IFC PS 8 also classifies cemeteries and structures that embody religious values such as churches as cultural heritage even if they are not legally protected²⁶⁹. As such, all known cultural heritage sites have been afforded a sensitivity of high in relation to the impact assessment (resource).

As the project area has not been subject to systematic survey there is the potential for as yet unknown archaeological remains and cultural heritage sites to be present in the project area. The sensitivity of any such sites has been assessed as moderate.

For impacts associated with noise and visual intrusion on the setting of cultural heritage sites (tangible cultural heritage) the sensitivity of the receptor is considered to be medium (human receptor). The designated cultural monuments are tourist attractions. Furthermore, there may be noise and visual intrusion on cultural or religious ceremonies or festivals (intangible cultural heritage). Cultural events, such as the Gjirakastër Folk Festival, may be happening in the project area during the project. Similarly, religious ceremonies such as church services, wedding and funerals may also occur.

The mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Table 8.1 in Section 8.11** and **Table 8.2 in Section 8.11**.

Mobilisation and Support facilities

During mobilization, all activities will be non-intrusive and comprise vehicles moving through the project area and pose no direct risk to cultural monuments however the noise generated by the movement of vehicles can result in noise disturbance and a visual intrusion of vehicles and crew in a tranquil area. Similarly, cultural festivals and

²⁶⁹ IFC 2012 International Finance Corporation Performance Standard 8 Cultural Heritage

religious ceremonies can also be disturbed by vehicle movements. The magnitude of these impacts is moderate and the significance is moderate. The duration of these effects would be temporary. The implementation of stakeholder engagement and a traffic management plan can reduce the residual impacts to negligible or **insignificant**.

A 200m protection zone will be observed for designated cultural monuments; however they are not well demarcated and fly camps could inadvertently be located in the protection zone. Therefore the magnitude of impact is low and the impact significance moderate. Demarcating the protection zones will reduce the residual to negligible or **insignificant**.

It is not possible to ascertain or quantify the magnitude of impact on as yet unknown cultural heritage assets or archaeological sites. However, it is envisaged for all sites the likely effect will be adverse and of permanent duration. The generally low physical magnitude of impact of clearance operations for camps means that the significance of the impact is low. The implementation of a chance find procedure will reduce the residual impact to negligible or **insignificant**.

Seismic Survey

Seismic data acquisition will entail the generation of vibrations which could damage cultural monuments. In places where there are sensitive cultural monuments potentially susceptible to damage, the cables and geophones will be hand carried into position by the front crew. A 200 m protection zone will be established and observed and prior to data acquisition the site conditions will be assessed and the protection zone extended if necessary. The impact will be of low magnitude and moderate significance to designated cultural monuments and unknown archaeological sites. The significance of residual impacts can be reduced to negligible or **insignificant** with the adoption of additional mitigation measure including the evaluation of the integrity of the structures during the pre-acquisition phase and the final design adjusted accordingly and the support of a cultural heritage specialist to provide guidance.

Vehicle movements during the seismic data acquisition phase are likely to have noise and visual intrusion impacts similar to those occurring during the mobilisation phase.

Demobilisation and Restoration

During demobilization and restoration, all activities will be non-intrusive and comprise vehicles moving through the project area and pose no direct risk to cultural monuments however the noise generated by the movement of vehicles can result in noise disturbance and a visual intrusion of vehicles and crew in a tranquil area. Similarly, cultural festivals and religious ceremonies can also be disturbed by vehicle movements. The magnitude of these impacts is m and the significance is moderate. The implementation of stakeholder engagement and a traffic management plan can reduce the residual impacts to negligible or **insignificant**. The duration of these effects would be temporary.

A 200m protection zone will be observed for designated cultural monuments; however they are not well demarcated and fly camps could inadvertently be located in the protection zone. Therefore the magnitude of impact is low and the impact significance moderate. Demarcating the protection zones will reduce the residual to negligible or **insignificant**.

It is not possible to ascertain or quantify the magnitude of impact on as yet unknown cultural heritage assets or archaeological sites. However, it is envisaged for all sites the likely effect will be adverse and of permanent duration. The generally low physical magnitude of impact of clearance operations for camps means that the significance of the impact is low. The implementation of a chance find procedure will reduce the residual impact to negligible or **insignificant**.

Impact Assessment Summary

Principal additional measures to mitigate impacts are:

- Demarcate known cultural heritage sites/cemeteries around the camps and seismic lines to avoid any destruction or disturbance
- Prior to data acquisition, the site conditions will be assessed (pre-testing) to determine the geological conditions and appropriate setbacks for structures; buffer zones will be extended, if necessary
- An appropriately qualified and experienced cultural heritage specialist should be available to provide guidance
- Liaise with Municipalities, the Ministry of Tourism and Cultural Heritage authorities with regard to festival dates in order to minimize disruption that may be caused by project operations

- Develop and implement a Stakeholder Engagement Plan Implement Stakeholder Engagement Plan (to ensure planned religious events or cultural ceremonies are taken into account)

Through the adoption of these additional mitigation measures, all residual impacts on have been assessed as negligible or **insignificant**.

Table 5-23 summarises the impact assessment and residual impacts to cultural heritage.

Table 5-23 Impact assessment and residual impacts for cultural heritage and archaeology

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impact	Impact Significance (prior to mitigation)	Residual Impact
Mobilization and Support facilities					
Vehicle movement	Noise and visual intrusion (tangible) Nature of impact: Adverse, Direct, Footprint, Temporary	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
Vehicle movement	Noise and visual intrusion (intangible) Nature of impact: Adverse, Direct, Footprint, Permanent	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
Fly camp site clearance	Potential damage of cultural heritage sites Nature of impact: Adverse, Direct, Footprint, Permanent	High	Low	Moderate (Significant)	Negligible (Insignificant)
Fly camp site clearance	Potential damage to as yet unknown archaeological sites Nature of impact: Adverse, Direct, Footprint, Permanent	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
Seismic Survey					
Seismic data acquisition	Potential destruction of designated cultural heritage sites Nature of impact: Adverse, Direct, Footprint, Permanent	High	Low	Moderate (Significant)	Negligible (Insignificant)
	Potential damage to as yet unknown archaeological sites Nature of impact: Adverse, Direct, Footprint, Permanent	Moderate	Low	Low (Insignificant)	Negligible (Insignificant)
Demobilisation and Restoration					
Vehicle movement	Noise and visual intrusion (tangible) Nature of impact: Adverse, Direct, Footprint, Temporary	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
Vehicle movement	Noise and visual intrusion (intangible) Nature of impact:	Medium	Low	Low (Insignificant)	Negligible (Insignificant)

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impact	Impact Significance (prior to mitigation)	Residual Impact
	Adverse, Direct, Footprint, Permanent				

5.2.4.12 Landscape and Visual

Impacts to this resource are considered to be secondary or indirect impacts as a result of project activities. Landscape and visual amenity impacts are those changes to the existing environment that may alter the character of an area experienced by residents and tourists. The sensitivity is considered to be medium (human receptor).

Specific direct impacts include that could affect the landscape character and alter the visual amenity include:

- Deterioration of roads and unpaved tracks;
- Vegetation clearance;
- The presence of fly camps, machinery and equipment;
- Littering (see **Section 5.2.4.9**); and
- Light emissions (see **Section 5.2.4.8**).

The mitigation measures to avoid or reduce the adverse impacts are addressed in **Chapter 8, Table 8.1** in **Section 8.12** and **Table 8.2** in **Section 8.12**.

Mobilisation and Support facilities

During mobilization the deterioration of roads and land scarring from tracks can alter the visual landscape to residents and tourist. The deterioration of roads and land scarring is assessed to have an impact magnitude of low and an impact significance of low. Additional mitigation measures such as pre-survey road improvement, where necessary, to prevent deterioration of the existing road network will minimize the impact and the residual impact significant is low or **insignificant**.

The impacts associated with land clearance and the cutting of trees is considered to have a moderate impact significance that can be reduced to low with the adoption of mitigation measures. The minimisation of tree clearance and using previously disturbed land will reduce the residual impact significance to low or **insignificant**.

The presence of fly camps, machinery and equipment will disturb the tranquil rural environment. The impact associate with the presence of fly camps, equipment and machinery will have an impact significance of moderate however early engagement by the SUA CLO will sensitize the local communities to this impact. The residual impact is assessed to be of low or **insignificant**.

Litter can be windblown and affect the visual amenity of the area; particularly near fly camps. The impact of littering is assessed of low significance with can be reduced to **insignificant** with mitigation measures such as implementation of a waste management plan and worker indication training.

Light emissions from fly camps, base and the explosive magazine can alter the night time ambient light in both rural and industrial areas. The hilly terrain will allow the camps to visible from long distances. The base and explosive magazine will have night lighting that may be uncharacteristic of the existing night-time light environment. The impact significant is considered to be low. By having the lighting for the support facilities design by a qualified and competent professional, the residual impact significant is negligible or **insignificant**.

Seismic survey phase

As with the mobilization phase, roads and tracks be deteriorate by the movement of vehicles and equipment and the presence of machinery and equipment will disturb the tranquil rural environment and litter will be affect the visual amenity. Vegetation clearing for clear lines of sight will leave noticeable pathways, particularly in wooded areas. These impacts will have moderate impact significance. However, by implementing addition mitigation measures the residual impact will be reduced to low or **insignificant**.

The impact of littering is assessed to be of low significance with can be reduced to negligible or **insignificant** with mitigation measures in place.

Demobilisation and Restoration

The impacts during this phase of the project are similar to those anticipated during the mobilization phase. The removal of camps will leave bare spots until the vegetation regrows. Site restoration efforts will remove all wastes (litter) and roads will be repaired where necessary from project related impacts. These efforts will reduce the residual impacts to insignificant.

Impact assessment summary

Additional mitigation measures to avoid or reduce the impacts include:

- pre-survey road improvement, where necessary, to prevent deterioration of the existing road network;
- minimisation of tree clearance and using previously disturbed land;
- early engagement by the SUA CLO will sensitize the local communities to the presence of the seismic survey crew and equipment; and
- implementation of a waste management plan and worker indication training.
- lighting for the support facilities design by a qualified and competent professional.

The residual impacts will be reduced to low/negligible or **insignificant**.

Table 5-24 summarises the impact assessment and residual impacts for landscape and visual amenity.

Table 5-24 Summary of impact assessment and residual impacts for landscape and visual amenity

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Mobilisation, Support facilities, Demobilisation and Restoration					
Vehicle Movements	Deterioration of roads and land scarring due to off road tracks Nature of impact: Adverse, Direct, Temporary, Footprint	Medium	Low	Moderate (Significant)	Low (Insignificant)
Vegetation clearance and camp set up	Alteration to visual landscape due to the clearance of vegetation for the placement of camps and storage areas and along access routes. Nature of impact: Adverse, Direct, Temporary, Local	Medium	Moderate	Moderate (Significant)	Low (Insignificant)
Camp Set up Operation mobilization	Presence of fly camps, equipment and machinery Nature of impact: Adverse, Direct, Temporary, Footprint	Medium	Low	Moderate (Significant)	Low (Insignificant)
	Littering Nature of impact: Adverse, Direct, Temporary, Footprint	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
	Light emissions Nature of impact: Adverse, Direct, Temporary, Footprint	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
Seismic survey					

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance (prior to mitigation)	Residual Impact
Vehicle Movements	Deterioration of roads and land scarring due to off road tracks Nature of impact: Adverse, Direct, Temporary, Footprint	Medium	Low	Moderate (Significant)	Low (Insignificant)
Vegetation clearance and seismic activities	Alteration to visual landscape due to the clearance of vegetation from seismic lines and along access routes Nature of impact: Adverse, Direct, Temporary, Local	Medium	Moderate	Moderate (Significant)	Low (Insignificant)
Presence of fly camps, equipment and machinery	Presence of fly camps, equipment and machinery Nature of impact: Adverse, Direct, Temporary, Local	Medium	Low	Moderate (Significant)	Low (Insignificant)
Littering	Uncontrolled waste resulting litter Nature of impact: Adverse, Direct, Temporary, Footprint	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
Demobilisation and Restoration					
Seismic Survey restoration and Demobilisation	Littering Nature of impact: Adverse, Direct, Temporary, Footprint	Medium	Low	Low (Insignificant)	Negligible (Insignificant)
	Alteration to visual landscape from vegetation clearance. Nature of impact: Adverse, Direct, Temporary, Footprint	Medium	Low	Moderate (Significant)	Negligible (Insignificant)
Vehicle movements	Deterioration of roads and land scarring due to off road tracks Nature of impact: Adverse, Direct, Temporary, Footprint	Medium	Low	Moderate (Significant)	Low (Insignificant)

5.3 Impact Assessment Summary

The assessments of impacts identified in **Section 5.1** consider the project activity that would have potential to cause an impact and the nature of the impact. The initial impact assessment is done based on the project design as described in **Chapter 2, Project Description** and any embedded mitigation or control measure. Mitigation measures that are part of the project design controls and measures that have been adopted based on guidance provided by authorities are considered to be embedded mitigation measures. In order to reduce the significance of the potential impacts, additional mitigation measures are then proposed. The project impacts are then re-assessed for the residual impacts assuming the mitigations measures are employed. The residual impacts take into consideration both the embedded mitigation measures and the additional mitigation measures. The mitigation proposed for each potential negative impact is presented in **Chapter 8, Mitigation Measures**.

For the purpose of the impact assessment, the project is divided into to four phases:

- Mobilization;
- Support facilities (e.g. set up and operations of base, fly camps, helipad facility and explosives magazine) ;
- Seismic Survey; and
- Demobilization and restoration

Potential impacts may be common to all phases such as the movement of vehicles and equipment however; there are some aspects of the project which are unique to the seismic survey (e.g. drilling of shot holes).

The potential impacts, mitigation measures and significance of impacts prior to mitigation and the residual impacts post mitigation include:

- Biophysical features including soils, geology, groundwater, surface water and biodiversity (**Section 5.3.1**);
- Project emissions including air emissions, noise and vibration, light and waste (**Section 5.3.2**); and
- Social and Health, Cultural Heritage and Landscape and visual amenity (**Section 5.3.3**).

For each of the above noted sections, impact assessment summary tables are provided that include the significance of potential impacts before additional mitigation measures have been adopted (pre-mitigation) and the residual impact significance after mitigation measures (post-mitigation) have been adopted for each phase of the Project. In some cases, a range of impact significance may be presented (e.g. Low/Moderate). The range indicates that there may be specific project aspects that could potentially result in the same impacts with difference degree of magnitude or the sensitivity of a receptor may vary depending upon whether it is protected or not under Albanian legislation (e.g. designated or undesignated). Protected areas include natural monuments designated for their biological, geological or hydrogeological uniqueness, cultural monuments and water supply zones. Impacts to protected areas are considered within the impact assessment for the relevant topics (e.g. biodiversity, geology etc.)

5.3.1 Impacts to biophysical features

The potential impacts to biophysical features identified and the significance of these impacts is summarized in the **Section 5.3.1** and includes:

- Soils
- Geology
- Groundwater
- Surface water
- Biodiversity

The significance of potential impacts before additional mitigation measures have been adopted (pre-mitigation) and the residual impact significance after mitigation measures (post-mitigation) have been adopted for each phase of the Project are shown in Table 5-26

Soils

The main impacts on soils conditions are soil erosion, soil compaction and degradation of soil quality from contamination. Soils are considered to have a moderate sensitivity.

- Soil erosion may be exacerbated by the clearance of topsoil / vegetation when preparing ground surfaces for construction, stockpiling of loose material and vehicle and equipment movement over unpaved surfaces. During heavy rain events, excessive storm water flows across disturbed areas can cause erosion.
- Soil compaction can result from the movement of heavy machinery or stockpiling (i.e. laydown) of equipment or excavated soils.
- Soil quality impacts can result from accidental spills or leaks of waste, fuels, chemicals, or oils from Project vehicles, equipment, and storage facilities throughout the duration of the Project. The impacts of soil contamination are expected to be localised, however if not appropriately and immediately cleaned-up then contaminants could be carried or leached to surface and groundwater sources respectively. Impacts to soil quality from the release of contaminated materials to ground may also impact the residents / wildlife utilising land which has been contaminated.

A number of additional mitigation measures will be adopted during all phases of work to minimise potential impacts to soils and human health. These include establishing environmental monitoring programmes, developing health, safety and environment policies and procedures, controls on vehicle movements within the seismic corridor, minimising the extent of removal of vegetation and soil cover, appropriate storage of potentially hazardous materials and use of secondary containment, minimising stockpile and storage areas, and ensuring the adoption of spill control measures.

Through the adoption of design controls and the implementation of additional mitigation measures, all residual impacts on soil during all phases of the Project have been assessed as negligible or **insignificant**.

Geology

The main impacts to geology are damage to geological monuments and features and karst collapse.

- Damage to geological monuments and features can occur during fly amp set up and during seismic data acquisition (i.e. shot hole drilling and the use of vibroseis machines). Designated natural monuments based on their geological significance or value includes the Lisat e Manastirit at Nivan, Pylli i Gurte at Nderan and Mezhorani Cave are within the Project area. Much of the geology is limestone and karst which may be fragile. As such, the sensitivity of geological monuments and features is considered to be of high sensitivity. Undesignated unique geological features are considered to have a moderate sensitivity.
- The cave system within the project area is a feature of karst geology. Cave ceilings may be close to the surface. Drilling of shot holes and the vibrations generated can cause the cave ceiling to collapse. Cave collapse can have indirect impacts to subsurface hydrogeology where springs in the project area are groundwater fed. The sensitivity of the karst geology is considered to be high.

Mitigation measures to reduce the impacts include: undertaking a study prior to seismic data acquisition to better understand the subsurface geology in the vicinity of designated areas (i.e. cave system), a protection zone of 200m where no seismic source activities (shot holes/vibroseis) will occur and preliminary tests to understand the geological characteristics of the project area to determine site specific offsets to be adopted during the actual seismic survey.

Through the adoption of design controls and the implementation of additional mitigation measures, all residual impacts on undesigned geological features during all phases of the Project have been assessed as negligible or **insignificant**. The residual impacts to designated geological monuments are to low/negligible or **insignificant** significance. The residual impact of karst collapse is moderate or **significant**.

Groundwater

The potential effects of the project activities on groundwater can be separated into aspects relating to groundwater quality and groundwater resources. Groundwater is considered to have a high sensitivity as the drinking water supply is provided by local wells and from natural springs fed by groundwater.

- Groundwater quality can be degraded as a result of the spills of fuel or chemicals or residual explosive products migrating to the underlying aquifer. If soak always or septic systems are utilized, biological contamination can migrate to the aquifer.
- Groundwater resources will not be used by the Project directly as no water supply boring will be installed. Water demands from the project will be met by local water suppliers which may utilize groundwater sources.

Mitigation measures for the protection of groundwater quality are primarily those which have been proposed for the protection of soils from contamination such as the use of drip trays, appropriate waste management strategies. The use of a degradable explosive product will reduce the impacts on groundwater quality.

Through the adoption of design controls and the implementation of additional mitigation measures, all residual impacts on groundwater during all phases of the Project have been assessed as negligible or **insignificant**.

Surface Water

The potential impacts of the project activities on surface water are the degradation of water quality and alterations of stream bank morphology and integrity.

- Degradation of water quality could result direct or indirect accidental discharges of contaminants, such as fuel oils, chemicals or from contaminated/untreated surface runoff entering surface waterbodies close to Project worksite. The sensitivity of surface is considered to be of high as it is utilized as a water resource for drinking water and irrigation.
- Alterations in stream bank morphology and integrity can result from vehicle crossings of streams and the construction temporary bridges. The stability of the valley stream banks is uncertain therefore they are considered to have a moderate sensitivity. Areas with rock outcroppings are considered to have a low sensitivity as they would be more resilient to change.

Mitigation measures for the protection of soils from contamination will also protect surface waters as well as the observance of protection areas and containment of drilling fluids. Stream bank morphology and bank integrity can be protected by carefully selecting crossing locations and crossing techniques such as crossing at right angles to minimize the creation of ruts that can be eroded.

Through the adoption of design controls and the implementation of additional mitigation measures, all residual impacts on surface water quality during all phases of the Project have been assessed as negligible or **insignificant**. The residual impacts to stream bank morphology are considered to be of low or **insignificant**.

Biodiversity

There are a large number of biodiversity receptors assessed within this ESIA, which reflects the relatively undisturbed nature of the Project Area. These biodiversity receptors include:

- Protected and Designated Areas and the features that define them as such;
- natural habitats include EU Habitats Directive Annex I habitats, including one Annex I Priority Habitat;
- threatened species of flora and fauna or species otherwise considered to be of conservation concern, including bird, mammals, herptiles and plant species.

The potential impacts on biodiversity in the project area throughout the seismic survey and associated activities include:

- loss / disturbance of natural habitat through vegetation clearance or damage;
- loss / disturbance of plant species of conservation concern; and
- contamination of terrestrial or aquatic habitats.

The main additional mitigation measures to avoid or reduce the impact significance include:

- Avoidance of most sensitive habitats and features such as protected areas, annex 1 habitats and critical habitat identified by the biodiversity specialist
- A biodiversity specialist will accompany the line clearance crew and ensure that the SUA standards as outlined in the Line Clearance and Restoration Guidelines (to be developed) are maintained for the clearance process to ensure that habitat degradation is minimised. Avoid tree removal and minimise vegetation clearance areas; especially in sensitive and forested areas
- Where required lines will deviate lines and/or equipment will be laid by hand through vegetation stands

However, once the mitigation is taken into account all residual impacts for all receptors and for all stages are defined as either negligible or no impact and therefore all impacts are ultimately **insignificant**.

Table 5-25 Summary of Impacts for biophysical features

Potential Impact	Impact Significance							
	Mobilization		Support Facilities		Seismic Survey		Demobilization	
	Pre-mitigation	Post - mitigation	Pre-mitigation	Post - mitigation	Pre-mitigation	Post - mitigation	Pre-mitigation	Post - mitigation
5.1 Soils								
5.1.1 Soil erosion	Low	negligible	Low	negligible	Low	negligible	Low	negligible
5.1.2 Soil compaction	Low	negligible	Low	negligible	Low	negligible	Low	negligible
5.1.3 Soil contamination	Low	negligible	Moderate	negligible	Low	negligible	Low	negligible
5.2 Geology								
5.2.1 Damage to Geological Monuments and Features	Low	negligible	Low	negligible	Low/Moderate	Negligible/Low	None	None
5.2.2 Karst collapse	None	None	None	None	High	Moderate	None	None
5.3 Groundwater								
5.3.1 Degradation of water quality	Low/Moderate	negligible	Low/Moderate	negligible	Low/Moderate	negligible	Low/Moderate	negligible
5.4 Surface Water								
5.4.1 Degradation of water quality	Low/Moderate	negligible	Low/Moderate	negligible	Low/Moderate	negligible	Low/Moderate	negligible
5.4.2 Alterations in stream bank morphology and integrity	Low/Moderate	negligible	Low/Moderate	negligible	Low/Moderate	negligible	Low/Moderate	negligible
5.5 Biodiversity								
5.5.1 Loss/disturbance to habitats	Low	None	Low	negligible	Low/Moderate	Low/negligible	Low	None
5.5.2 Loss/disturbance to species of conservation concern	Moderate	Low	Low/Moderate	negligible	Low/Moderate	Low/negligible	Low	None
5.5.3 Contamination of terrestrial and aquatic habitats	Low	None	Low	negligible	Low	negligible	Low	None

Note: Low and negligible impacts are considered to be insignificant; Moderate and High impacts are considered to be significant.

5.3.2 Impacts from Project emissions

The potential impacts to from Project emissions identified and the significance of these impacts include:

- Air quality
- Noise and vibration
- Light emissions
- Waste

The significance of potential impacts before additional mitigation measures have been adopted (pre-mitigation) and the residual impact significance after mitigation measures (post-mitigation) have been adopted for each phase of the Project are shown in Table 5-26.

Air quality

The potential identified with respect to air quality are:

- Degradation due to atmospheric emissions (greenhouse gases and particulate matter);
- Climate change resulting from air emissions; and
- Uncontrolled explosions and fire activities resulting in deteriorated air quality.

The primary source of atmospheric emissions will be from vehicle exhausts and operation of diesel generators at the fly camps. Fugitive emissions such as dust and particulate matter will occur during transport operations and from exposed soils surfaces including unpaved roads. Dust emissions could also be expected during vegetation clearing and ground levelling for fly camps, if required. Air quality is considered to have a high sensitivity.

Mitigation measures for the protection of air quality include the setting of speed limits, proper maintenance of vehicles and equipment and turning off engines and equipment when not in use.

Through the adoption of design controls and the implementation of additional mitigation measures, all residual impacts on air quality from normal operations during all phases of the Project have been assessed as negligible or **insignificant**. The emission of greenhouse gases and the impact on global warming is **insignificant**.

Noise and vibration

The key sensitivities of the local communities to noise have been considered as follows:

- Noise and vibration will occur across the project area. Vehicles (including helicopters) will cross the municipalities of Gjirokastër, Tepelene, Kelcyre, Libohove, Permet and Memaliaj. The primary receptors located in the surroundings of the project area comprise villages and agricultural areas (e.g. animal rearing and grazing) which have medium sensitivity to noise. Industrial areas will have a low sensitivity to noise. To be conservative and as most of the survey activities will take place in the rural areas, the receptor sensitivity is considered to be medium in all cases.
- Religious ceremonies and cultural events may occur within or close to villages. The rural ambient noise and vibration environment is considered to be of high sensitivity.

Impacts to natural and physical structures from vibration are discussed in the relevant sections. Potential impacts to geological natural monuments, damage to personal property (i.e. houses) and cultural heritage are addressed under geology, socio economics and cultural heritage, respectively.

The implementation of mitigation measures which include a traffic management plan for vehicles, maintenance of vehicles, and planning flight times and routes for helicopters will reduce the residual noise and vibration impacts to negligible or **insignificant**. Effective stakeholder engagement will reduce the residual impacts to negligible or **insignificant**.

Light emissions

The key sensitivities of local communities to light emissions have been considered as follows:

- Local residents may be disturbed by the light emissions resulting from Project support facilities (e.g. fly camp operations, security lighting at the base and explosive storage magazine). Different human receptors have different sensitivity to light; people in rural areas, residential areas and health establishments are generally more sensitive to light than those in commercial and industrial areas. Human receptors located in the surroundings of the project area are rural villages which would have minimal night lighting consistent with what would be expected in residential areas. Although industrial areas such as Gjirokastër may be less

sensitive to light emissions, the project lighting scheme may be inconsistent with the existing night lighting. In both cases, the sensitivity of the human receptors is considered to be medium.

- Light emissions from the seismic survey support facilities will have impacts on visual amenity. Much of the seismic survey area is rural where there are little or no sources of ambient light, existing ambient light sources are primarily around villages and larger towns. Residents of villages are considered to have a high sensitivity to light emissions.

Mitigation measures such as having a qualified profession carry out the lighting design and the use of directional lighting will minimize the potential light impacts. Through the adoption of design controls as part of additional mitigation measures, all residual impacts on ambient light have been assessed as negligible or **insignificant**.

Waste

The main sensitivities associated with waste generation and management impacts identified with respect to waste are:

- Nuisance litter diminishes the character of an area to a resident or tourist and hence the sensitivity is considered to be medium (human receptors).
- Environmental contamination can result in the absence of the appropriate management of hazardous waste, non-hazardous, operational and domestic waste. The seismic survey is primarily located in rural areas; an environment expected to have low capacity to absorb changes resulting from waste impacts and is of high environmental value therefore considered to represent a receptor of moderate sensitivity (resources).

The most important mitigation measures to reduce the potential impacts from waste generation are the implementation of a waste management plan, waste management training and the designation of personnel to be stewards of good housekeeping practices. The implementation of these additional mitigation measures, all residual impacts have been assessed as negligible or **insignificant**.



Table 5-26 Summary of Impact Significance for Project emissions

Potential Impact	Impact Significance							
	Mobilization		Support Facilities		Seismic Survey		Demobilization	
	Pre-mitigation	Post -mitigation	Pre-mitigation	Post -mitigation	Pre-mitigation	Post -mitigation	Pre-mitigation	Post -mitigation
5.6 Air quality								
5.6.1 Degradation of air quality	None/negligible	None/negligible	None/negligible	None/negligible	None/negligible	None/negligible	None/negligible	None/negligible
5.6.2 Climate change (GHG emissions)	None/negligible	None/negligible	None/negligible	None/negligible	None/negligible	None/negligible	None/negligible	None/negligible
5.7 Noise and vibration								
5.7.1 Nuisance to communities	Low	negligible	Low	negligible	Moderate	negligible	Low	negligible
5.7.2 Disturbance to religious ceremonies and cultural events	Moderate	Low	None	None	Moderate	negligible	Moderate	Low
8.8 Light emissions								
8.8.1 Disturbance to communities	None	None	Low	negligible	None	None	None	None
8.8.2 Loss of visual amenity	None	None	Low	negligible	None	None	None	None
8.9 Waste								
Environmental degradation resulting from litter	None	None	Low	negligible	Low	negligible	Low	negligible
Environmental contamination from hazardous, non-hazardous, operational and domestic waste	None	None	Low	negligible	None	None	negligible	negligible

Note: Low and negligible impacts are considered to be insignificant; Moderate and High impacts are considered to be significant.

5.3.3 Impacts for socio-economics, cultural heritage and landscape and visual amenity

The potential impacts and the significance of impacts summarized below include:

- Social and Health
- Cultural heritage
- Landscape and visual amenity

The significance of potential impacts before additional mitigation measures have been adopted (pre-mitigation) and the residual impact significance after mitigation measures (post-mitigation) have been adopted for each phase of the Project are shown in Table 5-27.

Social and Health

The principal social and health impacts relate to the requirement to access and use land that is currently used for cultivation or grazing, the potential development of or use of worker accommodation within villages, potential damage to buildings and disturbance from seismic survey activity, the potential for excessive use of community water sources and medical facilities, and the risk of disturbances created by workers or traffic.

- Access to land and removal of vegetation will be required for the base and fly camps and for along the seismic acquisition lines. This may require removal of vegetation from land that is cultivated or used for livestock grazing. Given the subsistence use of land for these activities this could noticeably impact food availability and livelihoods for impacted households.
- For worker housing, the development or use of accommodation within villages will have an impact on the way-of-life for those villages for the short duration that the accommodation is used, and the use of water, sanitation systems and roads could also affect availability of those systems for the community.
- Without adequate siting, the detonation of explosives and vibroseis could create physical impacts to nearby buildings and infrastructure. Livestock may be disturbed by helicopter movements, detonations and the movement of workers and traffic.
- Water supply is limited in many areas and excessive use by the Project would impact availability to other users. Medical facilities and availability of medical staff is highly limited in rural areas and excessive use by the Project would impact availability to local residents.
- The presence of workers and traffic in local communities could impact local residents due to noise, increased traffic on local roads, and disrespectful behaviour such as littering.

The principal mitigation measures applied for these impacts are:

- Application of the SUA Land Acquisition and Resettlement Framework, with due consideration to the local conditions related to lack of documentation to prove land ownership or land owners being absent or uncontactable, taking steps to reduce impacts to cultivated land, and providing fair compensation for crops given that shop-bought alternatives are expensive.
- Application of a Worker Accommodation Plan to help ensure that impacts from workers accommodation are minimised. If worker accommodation is provided in villages then consultation will be undertaken with the villages and agreements will be made on the use of buildings and community water, roads and sanitation systems.
- The land acquisition process and broader stakeholder engagement process will be used to identify the location of buildings and other sensitive infrastructure, and the seismic survey lines will be set with consideration to the location of these assets. The Community Feedback Mechanism and Compensation Procedure provide a further safeguard that if any accidental damage or disturbance to people and livestock does occur this will be investigated and remedied.
- Provision of medical facilities and personnel for Project workers to maintain a healthy workforce and reduce any burden on local medical facilities.
- Project workers will be trained on a code of conduct for respectful behaviour in communities, and a Community Feedback Mechanism will be applied to help resolve and prevent grievances.
- Water Management Plan will be applied to reduce impacts to local water supplies, including requirement to train workers on water conservation and not using water sources that haven't been authorised.

- Transport Management Plan to impacts arising from Project traffic, including disturbance to local residents and accident risks.

With these mitigation measures in place all social and health impacts will be managed to a low or negligible level. The social and health residual impacts are considered to be **insignificant**.

Cultural heritage

Impacts to cultural heritage that may arise from project activities are:

- Physical damage to cultural heritage sites and archaeological remains (tangible cultural heritage)
- Noise and visual intrusion on the setting of cultural heritage sites (tangible cultural heritage)
- Noise and visual intrusion on cultural or religious ceremonies or festivals (intangible cultural heritage)

Project activities that have the potential to impact cultural heritage and archaeology are mainly from site clearance and levelling activities, the movement and use of vehicles and machinery and seismic data acquisition.

- Access to land and removal of vegetation will be required for the base and fly camps and along the seismic acquisition lines. This work may also involve ground levelling. These activities have the potential to physically impact on cultural heritage monument and as yet unknown archaeological sites.
- Without adequate siting, the detonation of explosives and vibroseis could create physical impacts to nearby cultural heritage monuments.
- Noise and visual intrusion generated by movement of project vehicles could disrupt the quiet appreciation of cultural heritage monuments by tourists and local people. This could also affect cultural and religious ceremonies and festivals that coincide with the project timeline.

Principal additional measures to mitigate these impacts are:

- Demarcate known cultural heritage sites/cemeteries around the camps and seismic lines to avoid any destruction or disturbance
- A suitable offset from the known extent of cultural heritage sites and cemeteries should be agreed with community leaders, religious representatives and key stakeholders.
- Prior to data acquisition, the site conditions will be assessed (pre-testing) to determine the geological conditions and appropriate setbacks for structures; buffer zones will be extended, if necessary
- Evaluation of the integrity of the structures should be undertaken during the Pre-acquisition phase and final design discussed with affected parties and key
- An appropriately qualified and experienced cultural heritage specialist should be available to provide guidance
- Liaise with Municipalities, the Ministry of Tourism and Cultural Heritage authorities with regard to festival dates in order to minimize disruption that may be caused by project operations
- Develop and implement a Stakeholder Engagement Plan Implement Stakeholder Engagement Plan (to ensure planned religious events or cultural ceremonies are taken into account)

Landscape and visual amenity

Landscape and visual amenity impacts are those changes to the existing environment that may alter the character of an area experienced by residents and tourists. Impacts are considered to be secondary or indirect impacts as a result of project activities.

Specific direct impacts include:

- Deterioration of roads and unpaved tracks
- Vegetation clearance
- The presence of fly camps, machinery and equipment

Additional mitigation measures to avoid or reduce the impacts include:

- pre-survey road improvement, where necessary, to prevent deterioration of the existing road network;
- minimisation of tree clearance and using previously disturbed land;
- early engagement by the SUA CLO will sensitize the local communities to the presence of the seismic survey crew and equipment;
- implementation of a waste management plan and worker indication training; and

- lighting for the support facilities design by a qualified and competent professional.

The residual impacts will be reduced to low/negligible or ***insignificant***.

Table 5-27 Summary of impact significance for socioeconomics, cultural heritage and landscape and visual amenity

Potential Impact	Impact Significance							
	Mobilization		Support Facilities		Seismic Survey		Demobilization	
	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
5.10 Socio-economics								
5.10.1 Land use within camps and seismic lines Clearance of crops or pasture from area used for establishing camps, seismic lines and access roads	Moderate	Low	Moderate	Low	Moderate	Low	None	None
5.10.2 Accommodation of project workers in hotels and guest houses Decreased tourism in the area due to lower availability or increased cost of tourist accommodation caused by demand from project workforce	Low	Negligible	Low	Negligible	Low	Negligible	None	None
5.10.2 Accommodation of project workers in Base and fly camps Disturbance to local residents due to noise and traffic, use of local water sources to the extent that supply to residents is impacted, littering of waste, and / or unsanitary discharge of sewage in the village.	Moderate	Low	Moderate	Low	Moderate	Low	None	None
5.10.4 Presence of non-local workers in or near communities Disruption to community well-being from non-local project workers and associated increased noise and traffic or behaviours that are not aligned with local norms.	Moderate	Low	Moderate	Low	Moderate	Low	None	None
5.10.5 Use of Water Project use of local water sources could reduce the availability of that water to other users and / or increase the cost of water supply to users.	Moderate	Low	Moderate	Low	Moderate	Low	None	None
5.10.6 Movement of project equipment and vehicles Movement of project vehicles could result in increased risk of road accidents for other vehicles, pedestrians and livestock, as well as increased risk of traffic delays, damage to road-side structures and degradation of the roads.	Moderate	Low	Moderate	Low	Moderate	Low	Moderate	Low
5.10.7 Introduction or spread of communicable disease within communities	Moderate	Low	Moderate	Low	Moderate	Low	None	None



Potential Impact	Impact Significance							
	Mobilization		Support Facilities		Seismic Survey		Demobilization	
	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
Introduction or spread of communicable diseases within local communities from the presence of non-local workers and / or unsanitary accommodation and proximity to cattle.								
5.10.8 Provision of Security Any inappropriate behaviour or excessive use of force by project security personnel would impact community safety and wellbeing.	Moderate	Low	Moderate	Low	Moderate	Low	None	None
5.10.9 Access restrictions to land and agricultural areas Access restriction to land and agricultural areas during seismic acquisition activity	None	None	None	None	Low	Negligible	None	None
5.10.10 Disturbance to livestock Disturbance to livestock, potentially affecting behaviour, from seismic survey.	None	None	None	None	Moderate	Low	None	None
5.10.11 Damage to structures by vibrations Damage from vibration to structures, including buildings, sheds, fences, wells and septic tanks	None	None	None	None	Moderate	Low	None	None
5.10.12 Decreased tourist appeal Decreased tourist appeal of the area due to noise and disturbance resulting from the seismic survey (e.g. traffic or visual disruption)	None	None	None	None	Low	Negligible	None	None
5.10.13 Handling, transportation and use of explosives Poor handling, transportation, storage and use of explosives could result in accidents (e.g. fires, explosions) and injury of workers and members of the public.	None	None	None	None	Moderate	Low	None	None
5.11 Cultural Heritage								
5.11.1 Damage to cultural heritage cultural monuments	None	None	Moderate	Negligible	Moderate	Negligible	None	None
5.11.2 Damage to archaeological sites	None	None	Low	Negligible	Low	Negligible	None	None
5.11.3 Noise and visual intrusion to cultural heritage monuments	Low	Negligible	Low	Negligible	Low	Negligible	Low	Negligible

Potential Impact	Impact Significance							
	Mobilization		Support Facilities		Seismic Survey		Demobilization	
	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation	Pre-mitigation	Post-mitigation
5.11.4 Noise and visual intrusion to cultural and religious festivals or ceremonies	Low	Negligible	Low	Negligible	Low	Negligible	Low	Negligible
5.12 Landscape and visual amenity								
5.12.1 Deterioration of roads and unpaved tracks	Moderate	Low	None	None	Moderate	Low	Moderate	Low
5.12. 2 Vegetation clearance	None	None	Moderate	Low	Moderate	Low	None	None
5.12.3 Presence of fly camps, vehicles, machinery and equipment	Moderate	Low	Moderate	Low	Moderate	Low	None	None
5.12.4 Littering	None	None	Low	Negligible	Low	Negligible	Low	Negligible
5.12.5 Light emissions	None	None	Low	Negligible	None	None	None	None

Note: Low and negligible impacts are considered to be insignificant; Moderate and High impacts are considered to be significant.

6 Analysis of Transboundary Impacts

Transboundary impacts may be considered as “impacts that extend to multiple countries, beyond the host country of the project, but are not global in nature.”²⁷⁰ In order to generate a transboundary impact, activities from the Project would need to generate an impact that has the potential to cross national jurisdictions.

As the Block 4 2D Seismic Survey is wholly within Albania, there is limited potential for Project activities to generate transboundary impacts. Nevertheless, this chapter considers the potential for transboundary impacts resulting from the Project.

Where applicable, the chapter draws upon the impact assessment methodology and impact assessments as described in **Chapter 5 Potential Negative Impacts**. The mitigation measures provided in **Chapter 8, Mitigation** Measures have been considered. All receptors that may have transboundary impacts are assumed to have a high sensitivity.

In general, potential impacts generated by planned activities of the Project will typically be temporary in nature and localised in extent. However, there is the potential for unplanned events which are those events that are unintended and that may pose risks to environmental and socio-economic receptors that may result in wider transboundary impacts.

It is anticipated that some planned Project activities (e.g. use equipment) have the potential to result in transboundary environmental impacts. Project activities with the potential to cause adverse transboundary impacts have been identified and discussed below include:

- Impacts on migratory birds; and
- Impacts from alien invasive species; and
- Impacts on surface water.

Albania is a migratory route for birds and the Gjirokaštër Important Bird Area (IBA) is within the Project area. Migratory birds, including Egyptian vulture and the lesser kestrel have been identified in the Project area. However, the seismic survey is temporary in nature.

In the context of the wider bird migratory route along the Adriatic coastline, the scale of the survey area is very small. The Project will not result in the formation of any barriers that could result in a change to bird migration patterns.

Project activities, primarily associated with seismic data acquisition and fly camps, will not cause long term levels of disturbance to migratory birds or the ecological features upon which they depend. Overall, no significant adverse impacts to the transboundary activities of migratory birds are expected.

Some of the equipment such as drill rigs or vibroseis machines may originate from locations outside of the region. There is a possibility that some equipment could introduce alien invasive species to the project area or after the completion of the survey be introduced into the country of origin. Overall, no significant adverse transboundary impacts are expected.

Project activities have the potential to impact on surface water quality. However, none of the rivers that flow through the Project area cross or extend into other countries before they enter the sea. Furthermore, it is highly unlikely that any project activities would affect water quality in the Adriatic Sea into which these rivers drain.

Therefore there is no potential for transboundary effects from water quality impacts associated with the Project.

Table 6.1 is a summary of the transboundary impact assessment and residual impacts, following application of embedded and additional mitigation as defined in **Chapter 8, Mitigation Measures**.

²⁷⁰ IFC Guidance Note 1: Assessment and Management of Environmental and Social Risks and Impacts. January 2012.

Table 6.1 Summary of Transboundary Impact Assessment and Residual Impacts

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of impacts	Impact Significance	Residual Impact
Seismic survey data acquisition	Disturbance to Migratory Birds Nature of impact: Adverse, Direct, Temporary, Transboundary	High	Low	Low (Insignificant)	Negligible (Insignificant)
Use of imported equipment (e.g. vibroseis machines and drill rigs)	Colonization of invasive species Nature of impact: Adverse, Direct, Temporary, Transboundary	High	Low	Low (Insignificant)	Negligible (Insignificant)
Seismic survey data acquisition	Reduction in surface water quality Nature of impact: Adverse, Direct, Temporary, Transboundary	High	Low	Low (Insignificant)	Negligible (Insignificant)

7. Analysis of Potential Positive Impacts

The Project will create positive impacts through the employment of Albanian labour and through the procurement of accommodation, goods and services. These positive impacts are described in the sections below and are summarised in Table 7-1.

7.1 Creation of employment opportunities

The project will require 190 crew members. It is anticipated that 50-60 of these will require specific skills and therefore most are likely to be non-Albanians. For the remaining 130/140, local recruitment will be favoured. However, this will depend on whether the skills and other requirements will be available locally.

Some of the labour requirements will be for semi-skilled and unskilled personnel, and the Project will aim to recruit these roles locally, from the Project area, the broader region and the country as a whole; hiring locally will be a priority. The types of jobs that local workers may be hired to do, include; drivers, line clearing and security, placement of geophones, assisting in clean up and restoration of the lines, vehicle drivers, mechanics, welders, electricians, plumbers, radio technician, cleaners, cooks and other.

Within the rural parts of the Project area local communities have a high proportion of people who are either elderly and / or who whose time is mainly dedicated to agricultural activities (crops and livestock rearing). While employment opportunities will be made available to these people there may be limited uptake due to age and commitments to agriculture. In the larger towns and in the lowland villages there is expected to be a higher number of working age people who would be available to take up semi-skilled and unskilled jobs, and potentially some people will have experience for the skilled positions.

Uptake of employment opportunities by people from these areas will improve their household financial status for the duration of the employment. This will also lead to increased spending by those households in the local economy, though this will be dispersed across their home communities (which will be within and outside the Gjirokaštër region), and the scale of this indirect impact at the regional scale is unlikely to be noticeable.

The social receptor for this positive impact will be the workers who are provided with employment opportunities. In the fourth quarter of 2017 the official unemployment rate in Albania for the population aged 15 years and over was 13.4 % (INSTAT, 2017)²⁷¹. Given the existing employment levels, economic status and need for economic diversification in the Gjirokaštër region these receptors will have a medium sensitivity to new employment opportunities.

The impact magnitude will be low (positive) as the Project is relatively short in duration, the total labour requirements are modest and will be taken up by people across the region and country (i.e. not focused only in the local communities). This positive impact will be enhanced through the communication of Contractor job opportunities and hiring methods to local communities during pre-survey engagement with the villages in proximity to the seismic lines. This will help ensure that local people are aware of what opportunities are available and how to enquire and apply.

7.2 Increased income from the procurement of local accommodation services

Accommodation for the project workforce will be either in camps, local hotels and guesthouses, in-community living (e.g. use of existing houses or re-purposing old facilities such as closed schools), or a combination of the three options. There will be different benefits to the local community depending on the options taken and how they are implemented. These potential benefits include:

²⁷¹INSTAT, Quarterly Labour Force Survey, Fourth quarter 2017 <http://www.instat.gov.al/media/3839/lfs-q4-2017.pdf>

- Rental fees paid to land owners for the use of land for camps.
- Increased revenues for hotels and guesthouses for use of rooms by Project workers.
- Rental fees paid to private owners of local authorities for the use of houses or local facilities for in-community living.

Local businesses in the tourist accommodation and services sector already have revenues from tourists but as there is the intention to develop tourism in the area any additional revenue will provide a short-term boost to those businesses, potentially helping them to expand. There is therefore medium sensitivity to increased revenue.

Individual land owners or property owners that benefit from any fees paid for use of land and buildings could benefit substantially at the individual level, but there would be limited sensitivity to this impact at the community and regional level. The sensitivity to increased revenue or income is therefore assessed as medium. The impact magnitude will be low as the Project is relatively short in duration and while noticeable at the individual business or household level the boost to the local economy will be spread out over a wide area as project activities will be dispersed.

7.3 Increased business revenue from the procurement of goods and services

Decisions related to the procurement of goods and services will be made by the Contractor, and the sources and volumes cannot be confirmed in this ESHIA. The Contractor will endeavour to obtain as much equipment locally as is reasonably possible, though all locally contracted equipment must meet Albanian and Shell standards.

It is anticipated that the many of the goods and services (including some non-specialised equipment, vehicles, materials, and catering) will be procured regionally (i.e. within Gjirokastër county) or nationally. Specialized seismic equipment and materials will need to be brought into Albania. Procurement within the villages adjacent to the seismic lines is expected to be minor due to the limited availability of goods and services in those communities.

During their time off and while traveling to and from the work sites, the project workforce will also make use of services such as local restaurants, bars, stores and transportation, creating increased revenue for these businesses.

Businesses providing the types of goods and services that will be procured by the Project have existing customers and revenues and so sensitivity to increased revenues is therefore assessed as low. The impact magnitude will be low as the Project is relatively short in duration and while noticeable at the individual business level the boost to the economy will be spread out at the regional and national level.

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Table 7-1 Summary of Social Impact Assessment and Residual Impact

Project activity	Description and nature of impact	Sensitivity of receptors	Magnitude of effects	Positive Impact Significance ²⁷² (prior to enhancement)	Enhancement Measures	Residual Positive Impact
Labour requirement during all phases	Creation of employment opportunities. Nature of impact: Beneficial, Direct, Temporary, National	Medium	Low	Low (Insignificant)	The communication of Contractor job opportunities and hiring methods to local communities during pre-survey engagement with the villages in proximity to the seismic lines.	Low (Insignificant)
Procurement of accommodation services during all phases	Short-term boost to local businesses from the procurement of local goods and services. Nature of impact: Beneficial, Direct, Temporary, National	Medium	Low	Low (Insignificant)	N/A	Low (Insignificant)
Procurement of goods and services during all phases	Increased business revenue from the procurement of goods and services Nature of impact: Beneficial, Direct, Temporary, National	Low	Low	Low (Insignificant)	N/A	Low (Insignificant)

²⁷² Impact significance of the positive impacts is based on sensitivity of the principal receptor of the positive impact, the magnitude of the effects as well as the nature of the likely interactions.

8. Mitigation measures for negative impacts

The Project has been carefully planned and the potential negative impacts on environmental and social receptors will be minimised through the implementation of the Project design controls, mitigation measures proposed in the ESIA and consultation with relevant affected and interested parties. Mitigation is intended to avoid, reduce and offset potentially significant negative impacts as well as optimise the potential benefits that the project may generate.

- The objectives of mitigation are often established by:
- national regulatory requirements;
- international conventions;
- operators standards;
- Industry best practice requirements; and
- concerns raised by the stakeholders.

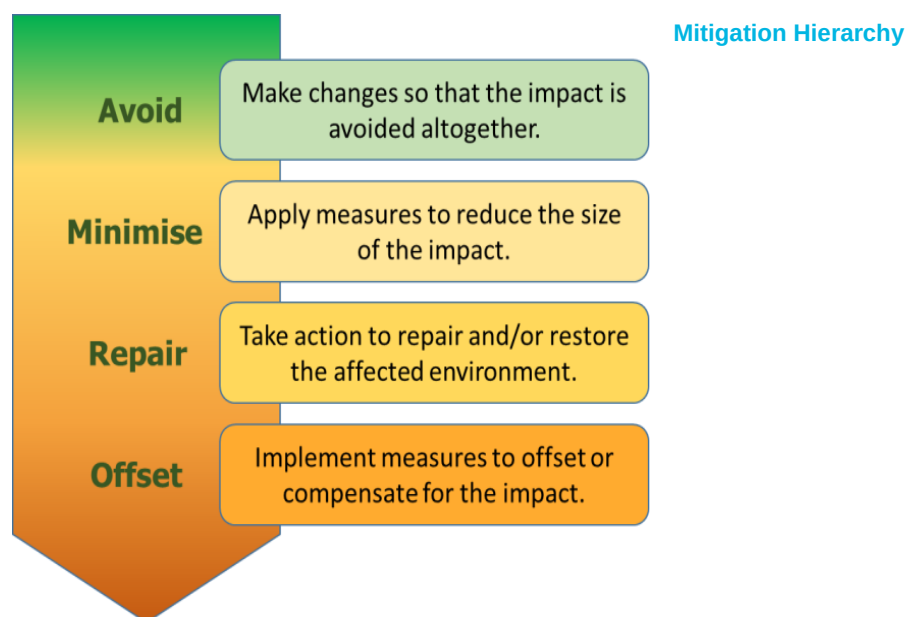
To alleviate possible impacts as far as possible, a mitigation hierarchy of prioritised steps through avoidance, minimisation (or reduction) and restoration are proposed. Mitigation measures are most effective when applied at the source of the impact; however, where this is not possible or does not completely mitigate the possible impact, other forms of mitigation are applied. The selection of mitigation measures will consider a standard mitigation hierarchy, whereby preference is given to avoiding impacts altogether and subsequently to minimising the impact, repairing its effects, and/ or offsetting the impact through actions in other areas as illustrated in

Figure 8-1.

Where mitigation measures are identified, they will be incorporated into the Project Environmental Management and Monitoring Plan and Social Management Plan.

This is a Draft version submitted for regulatory and public hearing feedback. AECOM and SUA will submit a Final version of the mitigation measures following public hearing and engagement of the Seismic contractor.

Figure 8-1



The assessments of impacts that have identified in **Chapter 5, Potential Negative Impacts** consider the project activity that would have potential to cause an impact and the nature of the impact. The initial impact assessment is done based on the project design as described in **Chapter 2, Project Description** and any embedded mitigation or control measure. Mitigation measures that are part of the project design controls and measures that have been adopted based on guidance provided by authorities are considered to be embedded mitigation measures. In order to reduce the significance of the potential impacts, additional mitigation measures are then proposed. The project impacts are then re-assessed for the residual impacts assuming the mitigations measures are employed. The residual impacts take into consideration both the embedded mitigation measures and the additional mitigation measures.

Additional mitigation measures comprised of standard mitigation measures that are commonly employed for seismic surveys and other projects with similar negative impacts and project specific measures. The standard mitigation measures have been derived from international industry practices (GIIP) outlined by:

- IFC General Environmental, Health, and Safety Guidelines²⁷³
- IFC Environmental, Health, and Safety Guidelines for Onshore Oil & Gas Development²⁷⁴
- IAGC Environmental Manual for Worldwide Geophysical Operations²⁷⁵
- IAGC Land Geophysical Safety Manual²⁷⁶,
- OGP Aircraft Management guidelines²⁷⁷

The project specific mitigation measures have been proposed to take into consideration the existing environmental and social conditions as described in **Chapter 4, Baseline** and the aspects and activities of the Project as described in **Chapter 2 Project Description**.

Mitigation measures apply to both direct and indirect impacts. It is expected that all the mitigation measures will implemented, hence only the principle mitigation measures to reduce the significance of a specific impact is provided. Therefore, each mitigation measure proposed has been given a unique number as a mitigation measure may be applicable to multiple receptors. Embedded mitigation measures have been given the prefix EM (e.g. EM-001) and additional mitigation measures given the prefix AM (e.g. AM-001). Table 8-1 provides mitigation measures impacts associated with Mobilization, Support Facilities Set up and Operations and Demobilization and Restoration activities. Table 8.2 provides mitigations for impacts associated with execution of the Seismic Survey data acquisition activities.

²⁷³ IFC (2007) General Environmental, Health, and Safety Guidelines, International Finance Corporation, World Bank Group

²⁷⁴ IFC (2017) - Environmental, Health, and Safety (EHS) Guidelines for Onshore Oil and Gas Development. Draft 2017, International Finance Corporation, World Bank Group

²⁷⁵ IAGC (2013) Environmental Manual for Worldwide Geophysical Operations, International Association of Geophysical Contractors (IAGC), Houston, USA

²⁷⁶ IAGC (2012) - Land Geophysical Safety Manual, 2012 10th Edition. International Association of Geophysical Contractors (IAGC), Houston, USA

²⁷⁷ OGP (2013)- Aircraft Management guidelines, 2013. International Association of Oil & Gas Producers Report 390

Table 8-1 Mitigation Impacts during Mobilization, Support Facilities Set up and Operations and Demobilization and Restoration phases

Environmental /Social Aspect and Potential Impact	Mitigation Measures
8.1 Soils	
8.1.1 Soil erosion	
Soil erosion from vehicle movement	[AM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition [AM-002] Off-road travel to be limited where practical [AM-003] Vehicle access limited to seismic tracks and access roads [AM-005] Keep vehicle movements to a minimum [AM-006] Use wide tires on vehicles where practical [AM 011] Road conditioning will be minimized by using portable drilling equipment, especially in mountainous areas
Soil erosion from loss of vegetation cover from fly camp construction	[EM-007] If levelling is required organic-rich topsoil will be removed and stockpiled in appropriate locations for later use in the restoration of affected areas. [AM-007] Development and implementation of Soil Erosion Prevention procedures to specifically address construction on soft ground, (i.e. use of load bearing materials such as bog mats, straw, geotextile membranes) as appropriate [AM-008] Avoid tree removal and minimise vegetation clearance areas; especially in sensitive and forested areas [AM-009] Stripped soils from earthworks stored in stockpiles on the site will be contoured to minimise erosion [AM-010] Minimise top soil removal
8.1.2 Soil Compaction	
Soil compaction vehicles, staff movement and facilities	[EM-029] Fly camp sites will be located on previously disturbed land wherever possible. [AM-012] Planned site selection for base and fly camps to avoid sensitive areas and cultivated land [AM-013] De-compaction of compressed soils will be undertaken by using a mechanical rake or mechanical harrow as a primary measure and manual raking as a secondary measure at fly camp sites; when appropriate

Environmental /Social Aspect and Potential Impact	Mitigation Measures
	[As above for soil erosion]
8.1.3 Soils Contamination	
Soil contamination from fuels and chemical spills and leakage	[EM-038] All fuels and chemicals will be stored in contained bunded areas and refueling will be carried out in dedicated areas with hard standing/ impermeable layer. Lubricants will also be stored in bunded areas to contain potential spills or leaks [AM-012] Planned site selection for base and fly camps to avoid sensitive areas and cultivated land [AM-014] Where required, equipment will have containment measures deployed [AM-015] Vehicle refueling, loading and offloading with hazardous materials to be conducted in dedicated areas with impermeable surface layer or using drip trays [AM-016] A spill control procedure will be implemented in the event of accidents. In the event of leakages or spillages of fuel or oil, a Spill Prevention and Response Plan will be implemented to contain any spillages and prevent adverse impacts on soils which could infiltrate into the groundwater or migrate to surface water [AM 017] Prepare and Implement a Land Transport Safety Plan to avoid road accidents resulting in spillages of hazardous wastes and substances [AM-018] Provide staff spill response training [AM-019] Spill kits are to be easily accessible on site [AM 020] All discharge locations will be remediated and soils disposed of with a licensed contractor [AM-021] Depending on the nature and extent of the spill, contaminated soil must be excavated and removed for appropriate disposal using approved waste handlers [AM-022] Excavation of contaminated soil will involve careful removal of soil using appropriate tools/machinery to storage containers [AM-023] If a spill occurs on an impermeable surface such as cement or concrete, the surface spill must be contained using oil absorbent materials [AM-024] Materials used for the remediation of spills must be used according to product specifications and guidance for use [AM-025] Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriately disposed of [AM 026] Implement a post survey clean-up (green team) to confirm the site has been restored to pre-survey conditions
Soil contamination from road accidents	[AM-016] A spill control procedure will be implemented in the event of accidents. In the event of leakages or spillages of fuel or oil, a Spill Prevention and Response Plan will be implemented to contain any spillages and prevent adverse impacts on soils which could infiltrate into the groundwater or migrate to surface water [AM-017] Prepare and Implement a Land Transport Safety Plan to avoid road accidents resulting in spillages of hazardous wastes and substances
Soil contamination from solid waste (hazardous and non-hazardous at Base and Fly	[See 8.9 Waste Management]

Environmental /Social Aspect and Potential Impact	Mitigation Measures
Camps	
Soil contamination from effluents	[See 8.9 Waste Management]
8.2 Geology	
8.2.1 Damage to Geological Monuments and Features	
Damage to geological monuments and features during camp set up	[AM-029] Scout the area to identify and avoid unique and possibly fragile geological features of the landscape
8.3 Groundwater	
8.3.1 Degradation of groundwater quality	
Water contamination from vehicle movements and traffic accidents	[AM-016] A spill control procedure will be implemented in the event of accidents. In the event of leakages or spillages of fuel or oil, a Spill Prevention and Response Plan will be implemented to contain any spillages and prevent adverse impacts on soils which could infiltrate into the groundwater or migrate to surface water [AM-017] Prepare and Implement a Land Transport Safety Plan to avoid road accidents resulting in spillages of hazardous wastes and substances
Water contamination leaks and spills at camps infiltrating to groundwater	[See 8.1.3 Soil Contamination]
Water contamination from leachate from uncontrolled waste	[See 8.8. Waste Management]
8.4 Surface Water	

Environmental /Social Aspect and Potential Impact	Mitigation Measures
8.4.1 Degradation of water quality	
Degradation of surface water quality from storm water runoff containing sediments	[EM 031] Fly camp site to be located with a 200m offset distance from sensitive environmental receptors (e.g. protected zones, water bodies, sensitive habitats like riparian zones, forests) to ensure no or minimal disturbance to flora and fauna species [EM-033] Fly camp sites will be located such that the drainage from and through the camp will not endanger any aquifer, domestic or public water supply [AM-009] Stripped soils from earthworks stored in stockpiles on the site will be contoured to minimise erosion [AM-011] Ensure that soil storage areas are protected from vehicle movements [AM-032] In proximity to water bodies maintain a perimeter ditch to intercept and settle run-off [AM-033] A shallow bund will be formed around the base of each stockpile to intercept run-off, which could contain suspended solids, and allow sediment and the water to soak away preventing any uncontrolled discharges to adjacent water courses. [AM-034] Natural drainage paths will not be blocked or filled, where possible. [AM-039] Drainage will be returned to their natural state when the seismic survey is completed. [AM-044] Any stripped soil and vegetation will be retained in the area for subsequent restoration of the land [See 8.1.1 Soil Erosion] [See 8.1.3 Soils Contamination]
Degradation of surface water quality from uncontrolled waste	[See 8.9 Waste Management]
Degradation of surface water quality from river crossings	[EM-008] River crossings by trucks and equipment will be kept to a minimum. [EM 009] River crossings will be arranged under appropriate angle not to disturb geomorphology and integrity of the banks. Otherwise, vehicles will not be permitted to cross watercourses except at officially designated crossing points [AM-036] In the absence of bridges and where crossing is unavoidable arrange temporary stream crossings so that habitat disturbance is minimal. [AM-037] Cross streams at right angles with straight approaches and gentle grades
8.5 Biodiversity	

Environmental /Social Aspect and Potential Impact	Mitigation Measures
8.5.1 Loss/disturbance of natural habitats	
Disturbance to habitats from vehicle movement resulting in dust and noise	[AM-001] Maximise the use of existing tracks and roads [AM-002] Off-road travel to be limited where practical. [AM-005] Keep vehicle movements to a minimum [AM-006] Use wide tires on vehicles where practical [AM-045] Where possible, manage high levels of dust in a close proximity to receptors using water spraying or other dust suppression techniques; [AM-046] Vehicles will be driven at allowed speed limits
Disturbance of habitats from vehicle movement resulting in physical damage	[AM-001] Maximise the use of existing tracks and roads [AM-002] Off-road travel to be limited where practical. [AM-057] A single vehicle track policy will be enforced to reduce extent of footprint;
Habitat loss and degradation due to fly camp set up	[EM-006] The cutting of trees (greater than 10 cm DBH) will be avoided. Where clearance is necessary, vegetation will be cut approximately 10 cm above the ground level to preserve rootstock and promote sprouting. [EM-029] Fly camp sites will be located on previously disturbed land wherever possible. [EM-030] Fly camp sites will be as far as practicable on level, open ground using natural or existing clearings to the maximum extent possible. [EM-034] Fly camp sites will be located so as to minimize impact on any local wildlife but also to minimize the risk of animal incursion to the camp. [EM-031] Fly camp site to be located with a 200m offset distance from sensitive environmental receptors (e.g. protected zones, water bodies, sensitive habitats like riparian zones, forests) to ensure no or minimal disturbance to flora and fauna species. [AM-048] Minimise camp footprint [AM-049] Locate base and fly camps on least valuable habitat away from sensitive features [AM 055] Minimise habitat clearance through design and planning via a forward scouting team, which should include a Biodiversity specialist [AM-056] Avoid the most sensitive habitats and features such as protected areas, Annex 1 habitats and critical habitat identified by the biodiversity specialist

Environmental /Social Aspect and Potential Impact	Mitigation Measures
	[AM-068] A Biodiversity specialist will check the vegetation for nesting birds and faunal presence in advance of clearance and propose appropriate mitigation [AM-069] Where feasible vegetation clearance will be undertaken outside of bird nesting season from March to August. However, where vegetation clearance is required in the bird nesting season, the clearance will be supported by a Biodiversity specialist [AM-070] Avoid uncontrolled fires and prohibit open fires; Fire and smoke detection devices adequately positioned and maintained throughout activities;
Disturbance of fauna due to noise, lights and presence of workers at fly camps	[AM-047] Vehicular transport permitted at night (with the exception of emergency vehicles) [AM- 050] Minimize duration of seismic survey activities at any one location [AM-051] Storage of all food and food waste securely to prevent access by species such as vultures or rats [AM-066] Avoid use of artificial light near sensitive areas; especially surface waters and sensitive bird breeding and bat areas [AM-067] Use temporary fencing around fly camps to avoid animals entering the compound, where appropriate [AM-078] Noise in fly camps to be kept to a minimum; noisy activities restricted to day time hours [AM-097] Lighting kept to a minimum and designed in a wildlife friendly manner
Habitat disturbance due to the incidental transport of seeds leading to colonization of invasive species	[AM-052] Ensure that any topsoil stored is covered to prevent erosion and growth of invasive species [AM-063] Ensure vehicles used during the project are thoroughly washed of soil before entering the area to prevent dispersion of seeds or plant fragments prior to commencing work
8.5.2 Loss/disturbance of animal/plant species of conservation concern	
Mortality of fauna caused by collisions with vehicles	[AM-001] Maximise the use of existing tracks and roads [AM-046] Vehicles will be driven at allowed speed limits
Mortality of fauna caused by increased hunting	[AM-053] Implement and enforce hunting and fishing ban for workforce.

Environmental /Social Aspect and Potential Impact	Mitigation Measures
	[AM-054] Implement strict purchasing procedures for local wildlife produce, particularly for species populations vulnerable to change
Mortality of flora and fauna due to habitat loss	(See Habitat loss and degradation due to fly camp set up)
8.5 3 Habitat degradation due to environmental contamination	
Habitat contamination and damage to species caused by spills and leakages from vehicles and camp operations	[See 8.1.3 Soils Contamination]
Habitat contamination and damage to species caused by uncontrolled waste from camp operations	[AM-051] Storage of all food and food waste securely to prevent access by species such as vultures or rats; [See 8.9 Waste Management]
8.6 Air emissions	
8.6.1 Degradation of air quality	
Increased level of dust and emissions from vehicle movement	[AM-005] Keep vehicle movements to a minimum [AM-046] Vehicles will be driven at allowed speed limits [AM-071] Where possible, manage high levels of dust in close proximity to receptors using water spraying or other dust suppression techniques [AM-081] Provide for regular servicing and maintenance of vehicles [AM-072] Best available technology (BAT) in-country to be considered including a choice of machinery, equipment, vehicles and materials that are fuel-efficient; use of low sulphur fuel [AM-073] Turn off engines and equipment when not in use
Increased level of dust from fly camp set up	[AM-005] Keep vehicle movements to a minimum

Environmental /Social Aspect and Potential Impact	Mitigation Measures
	[AM-010] Minimise top soil removal [AM-071] Avoid dust generating activities within close proximity to settlements; a distance of 350 m is recommended;;
Use of generators at fly camps	[AM-072] Best available technology (BAT) in-country to be considered including a choice of machinery, equipment, vehicles and materials that are fuel-efficient; use of low sulphur fuel
8.6.2 Climate change	
Emissions contribution to climate change	[AM-072] Best available technology (BAT) in-country to be considered including a choice of machinery, equipment, vehicles and materials that are fuel-efficient; use of low sulphur fuel [AM-073] Turn off engines and equipment when not in use [AM-081] Provide for regular servicing and maintenance of vehicles
8.6.3 Emissions due to unplanned events	
Air emissions from uncontrolled fires and explosions at fly camp and explosive	[AM-070] Avoid uncontrolled fires and prohibit open fires; Fire and smoke detection devices adequately positioned and maintained throughout activities
8.7 Noise and vibration	

Environmental /Social Aspect and Potential Impact	Mitigation Measures
Nuisance to communities from noise and vibration due to vehicle movement	[EM-027] Base, explosive magazine and fly camp sites selected to avoid, where possible, the flow of daily camp traffic passing through towns, villages or busy roads [AM-005] Keep vehicle movements to a minimum [AM-046] Vehicles will be driven at allowed speed limits [AM-073] Turn off engines and equipment when not in use. [AM-075] Provide awareness-raising sessions for communities about noise activities and their duration throughout project lifecycle [AM-076] Implement a Journey Management Plan to control traffic routing and minimize traffic movements through populated areas; use designated routes through the local area to avoid local residential roads where possible and practicable;; [AM-081] Provide for regular servicing and maintenance of vehicles; [AM-082] Refraining from unnecessary revving of vehicle engines; [AM-083] Only use vehicle horn in emergencies
Disturbance of religious ceremonies and cultural events	[AM-075] Provide awareness-raising sessions for communities about noise activities and their duration throughout project lifecycle [AM-076] Implement a Journey Management Plan to control traffic routing and minimize traffic movements through populated areas; use designated routes through the local area to avoid local residential roads where possible and practicable; [AM-114] Develop and implement a Stakeholder Engagement Plan [AM-116] Engagement with heads of the communities to ensure planned religious events are taken into account and not disturbed
Nuisance to communities from noise and vibration due to helicopters	[AM-084] Maintain sufficient altitude to reduce downdraft effects Pilots should approach or depart a helipad with external loads without flying over people, equipment, vehicles, or houses [AM-085] Locate helipad as far away from any human receptors as practicable (minimum distance of 350m) [AM-087] Plan flight routes, timing and altitude for helicopter flights over community areas to reduce disturbance [AM-088] Schedule routine take-offs to daytime only
Disturbance to sensitive receptors from camp	[EM-032] Fly camp site to be located at least 1 km offset distance from sensitive social receptors (e.g. residential zones, schools, mosques and churches, recreational areas, and cultural heritage sites) to insure no /minimal disturbance by noise, workforce and vehicles

Environmental /Social Aspect and Potential Impact	Mitigation Measures
operations	[AM-077] Limit the hours of noisy activities associated with base and fly camps near human receptors, and minimize noise generation at night
Disturbance to communities from the operation of equipment (generators and machinery)	[AM-079] If noise levels near sensitive receptors exceed the specified standards, implement when reasonably practical: screen of equipment to attenuate noise; equip noisy equipment with sound mufflers: acoustic barriers to minimize noise propagation. [AM-080] Equipment and machinery are to be adequately maintained and operated
8.8 Light emissions	
Light pollution from Base and explosives magazine	[EM-028] Siting of Base in an industrial area; where possible [AM-089] Lighting design for fly camps, base and explosives magazine will be carried out by a suitably qualified and competent professional [AM-090] Where luminaires are installed close to the application site boundaries, luminaires should be focused downwards [AM-091] Glare shall be minimised by ensuring that luminaires are specified with an inclination angle not greater than 30° [AM-092] Lighting will be positioned and directed so as not to intrude unnecessarily on adjacent buildings, land uses and to avoid unnecessary interference with local residents or passing transport users [AM-093] Light spillage towards the site boundaries will be minimised. This will be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvres and shields to direct the light to the intended area only [AM-094] Dim or switch off lights when they are not required [AM-095] Use energy efficient lighting where practicable [AM-096] Prepare and implement a suitable lighting strategy [AM-114] Develop and implement a Stakeholder Engagement Plan
Light pollution from fly camps	[EM-031] Fly Camp site to be located with a 200m offset distance from sensitive environmental receptors (e.g. protected zones, water bodies, sensitive habitats like riparian zones, forests) to ensure no or minimal disturbance to flora and fauna species [EM-032] Fly camp site to be located at least 1 km offset distance from sensitive social receptors (e.g. residential zones, schools, mosques and churches, recreational areas, and cultural heritage sites) to insure no /minimal disturbance by noise, workforce and vehicles

Environmental /Social Aspect and Potential Impact	Mitigation Measures
	[AM-066] Avoid use of artificial light near sensitive areas; especially surface waters and sensitive bird breeding and bat areas [as above for Light Pollution at Base and Explosive Magazine]
8.9 Waste Management	
8.8.1 Littering	
Environmental degradation from uncontrolled waste	[AM-100] Implement a policy for zero discharges and disciplinary action against littering [AM-101] Dedicated waste storage areas, and solid wastes will be stored in bins with covers to reduce windblown litter will be provided [AM-106] Enforce good housekeeping practices to keep the base, fly camp and survey site clean and tidy
Waste Management of Hazardous and Non-hazardous solid waste	[EM-039] Waste management areas will be installed for waste separation and storage before being collected for disposal. Portable toilets, dry latrines or a septic system will be installed if no connection to sewage system is available. [EM-041] There will be waste segregation procedures applied and there will be no mixing of hazardous waste (if generated) with non-hazardous waste. [EM-042] No waste will be disposed of on-site or in the surrounding area. All waste will be removed from the base by a licensed waste management contractor and disposed of at an appropriately licensed waste facility [EM-043] All waste will be removed from the fly camps and stored at the base until final disposal [AM-018] Provide staff spill response training [AM-019] Spill kits are to be easily accessible on site. [AM-098] Prepare and implement a Waste Management Plan and Duty of Care Procedures, which will include segregation of waste materials on the site, labelling and storage in designated containers and off-site final treatment/disposal [AM-099] Provide waste management training; including the environmental impacts of litter [AM-102] Provide sufficient waste disposal points to facilitate the collection of rubbish [AM-103] Use clear signage for solid waste, liquid waste storage areas and hazardous waste storage areas including color-coded rubbish bins to separate recyclable waste and non-recyclable waste [AM-104] Waste storage units to be compatible with contents [AM-105] Select personnel to be stewards of good site practices

Environmental /Social Aspect and Potential Impact	Mitigation Measures
	[AM-109] Use of waste transfer notes when disposing of wastes at licensed disposal facilities [AM-110] Implement waste recording procedures and regular auditing of waste documentation
Waste management of effluents	[EM-039] Waste management areas will be installed for waste separation and storage before being collected for disposal. Portable toilets, dry latrines or a septic system will be installed if no connection to sewage system is available [EM-040] The management of the camp wastewater will be guided by the national legislation and GIIP; discharge of contaminated effluents into the open environment will not be allowed. [AM-020] All discharge locations will be remediated and soils disposed of with a licensed contractor
Waste production leading to stress on existing waste infrastructures, affecting other users	[EM-044] Waste minimisation efforts will be adopted. [AM-108] Institute good operating practices, including inventory control to reduce the amount of waste resulting from materials that are out-of-date, off-specification, contaminated, damaged, or excess to needs [AM-111] Identify materials that can be recycled and implement collection and transport of recyclable wastes to a licensed recycling facility [AM-112] Consider measures that recognize opportunities to return usable materials such as containers and which prevents the over ordering of materials
8.10 Socio-Economic	
8.10.1 Land use within camp and seismic lines	
Clearance of crops or pasture from area used for establishing camps	[EM-029] Fly camp sites will be located on previously disturbed land wherever possible. [EM-030] Fly camp sites will be as far as practicable on level, open ground using natural or existing clearings to the maximum extent possible. [EM-014] Implement SUA Land Acquisition & Resettlement Framework
8.10.2 Accommodation of project workers in hotels and guest houses	
Decreased tourism in the area due to lower availability or increased cost of tourist	[AM-120] Develop a Worker Accommodation Plan for use in selecting options for worker accommodation and then managing accommodation to provide safe and comfortable accommodation and minimise impacts to local residents [AM-121] If workers are accommodated in houses or other buildings (e g schools) within villages then community engagement must take place in advance to ensure that host villages are

Environmental /Social Aspect and Potential Impact	Mitigation Measures
accommodation, caused by demand from project workforce	aware of the planned use of the village for temporary accommodation, and can provide feedback on any concerns or preferences. For temporary accommodation within local workers are accommodated in houses or other buildings (e.g. schools) within villages then community engagement must take place in advance to ensure that host villages are aware communities there must also be:: - An agreement on rental fees, either paid locally to private owners (for houses) or to the governing authority for public infrastructure such as old schools. - An agreement on the use of water, roads and any sanitation infrastructure, with appropriate fees paid for such use. - An agreement on how houses or public infrastructure that are altered for use will be passed back to the owner or community, i.e. whether restoration or retention of changes is preferred. [AM-122] Avoid excessive levels of in-community living in hotels and short-term rentals in Gjirokaster and Permet during peak tourist seasons and events. [AM-123] Prior to seismic campaign undertake an assessment of available accommodation and avoid excessive use of tourist accommodation in any single area in order to avoid competing with tourists
8.10.3 Accommodation of project workers in Base and fly camps	
Disturbance to local residents due to noise and traffic, use of local water sources to the extent that supply to residents is impacted, littering of waste, and / or unsanitary discharge of sewage in the village.	[EM-032] Fly camp site to be located at least 1 km offset distance from sensitive social receptors (e.g. residential zones, schools, mosques and churches, recreational areas, and cultural heritage sites) to insure no /minimal disturbance by noise, workforce and vehicles [AM-117] Undertake early and regular engagement with communities that are in proximity to survey activities and support facilities [AM-118] Institute a code of conduct and provide induction training on respectful interaction with local residents [AM-119] Post public notices at the base and fly camp sites to notify interested parties of the purpose of the camp and to give a point of contact for any enquiries or grievances.
8.10.4 Presence of non-local workers in or near communities	
Disruption to community well-being from non-local project workers or behaviours that are not aligned with local norms	[AM-117] Undertake early and regular engagement with communities that are in proximity to survey activities and support facilities [AM-118] Institute a code of conduct and provide induction training on respectful interaction with local residents [AM-119] Post public notices at the base and fly camp sites to notify interested parties of the purpose of the camp and to give a point of contact for any enquiries or grievances
8.10.5 Use of water for camp operations	

Environmental /Social Aspect and Potential Impact	Mitigation Measures
Project use of local water sources could reduce the availability of that water to other users and / or increase the cost of water supply to users.	[AM-124] A Water Management Plan must be developed to help reduce water consumption and minimise any impact to the water supply to other users. [AM-125] Induction training for all workers will contain training on the importance of water conservation and direction that local water sources (e.g. springs) should not be used without authorization
8.10.6 Movement of project equipment and vehicles	
Movement of project vehicles could result in increased risk of road accidents for other vehicles, pedestrians and livestock, as well as increased risk of traffic delays, damage to road-side structures and degradation of the roads.	[EM-011] Road conditioning will be minimized by using portable drilling equipment, especially in mountainous areas [EM-027] Base, explosive magazine and fly camp sites selected to avoid, where possible, the flow of daily camp traffic passing through towns, villages or busy roads [AM-115] Develop and implement a Traffic Management Plan [AM-017] Prepare and Implement a Land Transport Safety Plan to avoid road accidents resulting in spillages of hazardous wastes and substances [AM-129] Undertake pre-survey road improvements where necessary to prevent deterioration of the existing road network by project vehicles Post-survey restoration of the affected roads or alternative compensation will established in consultation with local authorities
8.10.7 Introduction or spread of communicable disease within communities	
Introduction or spread of communicable diseases within local communities from the presence of non-local workers and / or unsanitary accommodation and proximity to cattle.	[EM-034] Fly camp sites will be located so as to minimize impact on any local wildlife but also to minimize the risk of animal incursion to the camp [EM-037] The base will include medical facilities, to provide first aid care and treat emergency patients. The Project will have access to a helibase as close as possible to the base, and this may be used for emergency transport to hospitals. Project to provide adequate medical (nurse and doctor) availability and monitor referrals to and use of local medical facilities [AM-113] If workers are accommodated in houses or other buildings (e.g. schools) within villages adequate sanitation systems must be present or be installed or upgraded [AM-126] Project to provide adequate medical (nurse and doctor) availability and monitor referrals to and use of local medical facilities

Environmental /Social Aspect and Potential Impact	Mitigation Measures
	[See 8.9 Waste Management]
8.10.8 Provision of security	
Any inappropriate behaviour or excessive use of force by project security personnel would impact community safety and wellbeing.	[AM-127] Security personnel must be trained and must be directed on the appropriate use of force [AM-128] Security incidents and any grievances related to security must be investigated to verify that use of force was appropriate
8.10.9 Employment	
Creation of employment opportunities (positive impact)	[EM-016] Seismic Contractor will employ locally available work force as suitable and practicable to the skill requirements.s required [AM-134] Communication of Contractor job opportunities and hiring methods to local communities during pre-survey engagement with the villages in proximity to the seismic lines
8.11 Cultural heritage	
8.11.1 Damage to cultural heritage, cultural monuments and archeological sites	
Potential damage or destruction of known cultural heritage sites	[EM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition. [EM-002] A 200m buffer zones for cultural heritage monument where no explosive or vibroseis activities are to be undertaken. [EM-003] A 50 m buffer zone where no explosive or vibroseis activities are to be taken will be adopted for natural monuments with the exception of Zheij and Zagori. [EM-005] Prior to data acquisition, the site conditions will be assessed (pre-testing) to determine the geological conditions and appropriate setbacks for structures; buffer zones will be extended, if necessary [EM-035] Fly camp sites will be located outside of areas of archaeological significance

Environmental /Social Aspect and Potential Impact	Mitigation Measures
	[AM-135] Undertake an inventory of existing cultural sites located within and near the seismic lines prior to field operations [AM-136] All coordinates of known cultural heritage will be shared with the seismic contractor [AM-137] Demarcate known cultural heritage sites/cemeteries around the camps and seismic lines to avoid any destruction or disturbance Remove flags or tapping around cultural heritage sites/cemeteries once restoration is complete [AM-138] Determine offsets for seismic source operations in the field and redesign the seismic lines for avoidance of known cultural heritage where possible and to ensure maintenance of a 200m buffer around cultural heritage Evaluation should be undertaken during the Pre-acquisition phase and final design discussed with affected parties and key stakeholders [AM-140] A suitable offset from the known extent of a cemetery should be agreed with community leaders, religious representatives and key stakeholders [AM-141] An appropriately qualified and experienced cultural heritage and archeology specialist should be available on call-off basis to provide guidance [AM-142] Evaluation of the integrity of the structures should be undertaken during the Pre-acquisition phase and final design discussed with affected parties and key stakeholders
Potential damage to as yet unknown archaeological sites during Base and Fly camp set up	[EM-035] Fly camp sites will be located outside of areas of archaeological significance [EM-004] Implement a Chance find procedure to ensure that any archaeological artefacts encountered are properly recorded and left in situ. A stop work policy will be implemented [AM-143] The chance find procedure will be shared as part of the seismic contractor inductions to ensure any discovery of previously undiscovered cultural heritage sites are encountered
8.11.2 Disturbance to intangible cultural heritage	
Traffic noise disturbance of religious ceremonies	[EM-032] Fly camp site to be located at least 1 km offset distance from sensitive social receptors (e.g. residential zones, schools, mosques and churches, recreational areas, and cultural heritage sites) to insure no /minimal disturbance by noise, workforce and vehicles [AM-075] Provide awareness-raising sessions for communities about noise activities and their duration throughout project lifecycle; [AM-139] Liaise with Municipalities, the Ministry of Tourism and Cultural Heritage authorities with regard to festival dates in order to minimize disruption that may be caused by project operations [AM-135] Undertake an inventory of existing cultural sites located within and near the seismic lines prior to field operations
8.12 Landscape and Visual Amenity	

Environmental /Social Aspect and Potential Impact	Mitigation Measures
8.12.1 Deterioration of roads and unpaved tracks	
Vehicle movement	[AM-001] Maximise the use of existing tracks and roads [AM-004] Minimise seismic track width wherever practical [AM-005] Keep vehicle movements to a minimum [AM-129] Undertake pre-survey road improvements where necessary to prevent deterioration of the existing road network by project vehicles Post-survey restoration of the affected roads or alternative compensation will established in consultation with local authorities
8.12.2 Vegetation clearance	
Alteration to visual landscape due to the clearance of vegetation	[EM-006] The cutting of trees (greater than 10 cm DBH) will be avoided. Where clearance is necessary, vegetation will be cut approximately 10 cm above the ground level to preserve rootstock and promote sprouting [EM-013] Maintain a community feedback mechanism, including a Grievance Mechanism, to receive and resolve community complaint [EM-029] Fly camp sites will be located on previously disturbed land wherever possible. [EM-036] Fly camps will be sited to reduce visual impact as much as practicable [AM-001] Maximise the use of existing tracks and roads [AM-008] Avoid tree removal and minimise vegetation clearance areas; especially in sensitive and forested areas [AM-044] Any stripped soil and vegetation will be retained in the area for subsequent restoration of the land;
8.12.3 Presence of camps, vehicles, machinery and equipment	
Alteration of visual amenity due to presence of seismic crew, facilities and equipment	[EM-006] The cutting of trees (greater than 10 cm DBH) will be avoided. Where clearance is necessary, vegetation will be cut about 10 cm above the ground level to preserve rootstock and promote sprouting [EM-013] Maintain a community feedback mechanism, including a Grievance Mechanism, to receive and resolve community complaint [EM-029] Fly camp sites will be located on previously disturbed land wherever possible [EM-036] Fly camps will be sited to reduce visual impact as much as practicable

Environmental /Social Aspect and Potential Impact	Mitigation Measures
	[AM-008] Avoid tree removal and minimise vegetation clearance areas; especially in sensitive and forested areas [AM-044] Any stripped soil and vegetation will be retained in the area for subsequent restoration of the land
8.12.4 Littering	
Uncontrolled waste	[AM-100] Implement a policy for zero discharges and disciplinary action against littering
8.12.5 Light emissions	
Disturbance from lighting	[see Light Emissions]

Table 8-2 Management Plan Matrix for the Seismic survey phase

Environmental /Social Aspect and Potential Impact	Mitigation and Management
8.1Soils	8.1Soils
8.1.1 Soil erosion	8.1.1 Soil erosion
Soil erosion from vehicle movement	[AM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition [AM-002] Off-road travel to be limited where practical. [AM-003] Vehicle access limited to seismic tracks and access roads [AM-005] Keep vehicle movements to a minimum [AM-006] Use wide tires on vehicles where practical
8.1.2 Soil Compaction	
Soil compaction from vehicle movement	[AM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition [AM-002] Off-road travel to be limited where practical [AM-003] Vehicle access limited to seismic tracks and access roads [AM-005] Keep vehicle movements to a minimum [AM-006] Use wide tires on vehicles where practical
8.1.3 Soils Contamination	
Soil contamination from fuels and chemical spills and leakages	[AM-015] During seismic operations, mobile machinery should sit on a purposely provided drip tray during refueling and maintenance [AM-016] A spill control procedure will be implemented in the event of accidents. In the event of leakages or spillages of fuel or oil, a Spill Prevention and Response Plan will be implemented to contain any spillages and prevent adverse impacts on soils which could infiltrate into the groundwater or migrate to surface water [AM-018] Provide staff spill response training [AM-019] Spill kits are to be easily accessible on site [AM-021] Depending on the nature and extent of the spill, contaminated soil must be excavated and removed for appropriate disposal using approved waste handlers

Environmental /Social Aspect and Potential Impact	Mitigation and Management
	[AM-022] Excavation of contaminated soil will involve careful removal of soil using appropriate tools/machinery to storage containers [AM-024] Materials used for the remediation of spills must be used according to product specifications and guidance for use [AM-025] Contaminated remediation materials must be carefully removed from the area of the spill so as to prevent further release of petrochemicals to the environment, and stored in adequate containers until appropriately disposed of
Contamination of soil by drill cuttings	[EM-022] No chemicals or specialised muds will be used for drilling. [EM-025] All misfired charges will be abandoned in the well boring and left to decompose, while any casing will be removed from the ground. [AM-042] Contain drilling fluids during shot hole drilling; use fit for purpose containment to receive drilling cuttings; no unlined pits will be used [AM-043] Backfill all cuttings after drilling shot-holes
8.2 Geology	
8.2.1 Damage to Geological Monuments and Features	
Damage to geological monuments and features from seismic data acquisition activities	[EM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition [EM-002] A 200m buffer zones for cultural heritage monument where no explosive or vibroseis activities are to be undertaken. [EM-019] The location of the energy source points and geophones may be offset in the field to avoid a sensitive receptor [EM-024] Before recording activities commence along each seismic line, the surveyors will determine the minimum safe offset distance for the area of operations to prevent impacts to the existing infrastructure or protected areas [AM-029] Scout the area to identify and avoid unique and possibly fragile geological features of the landscape [AM-030] Seismic survey activities within the natural monuments of Zheij, and Zagori Natural Park will be in compliance with NAPA guidance [AM-031] Place vibration sensors on fragile geological features, natural monuments and designated/undesignated cultural heritage structures, during the Pre-shooting testing to determine site conditions prior to seismic data acquisition
8.2.1 Karst collapse	
Karst collapse from shot hole drilling and seismic shooting	[EM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition

Environmental /Social Aspect and Potential Impact	Mitigation and Management
	[EM-019] The location of the energy source points and geophones may be offset in the field to avoid a sensitive receptor [AM-027] Undertake a desktop study to identify the extent of the subterranean geology (i.e. extent and depth of cave systems) at Shepella e Magazorat; undertake a site visit to understand topography and geological beds and thus avoid areas of increased risk of cave systems [AM-028] Where possible, use vibroseis as an energy source so as to preclude drilling into a cave ceiling (shot hole method) [AM-029] Scout the area to identify and avoid unique and possibly fragile geological features of the landscape [AM-031] Place vibration sensors on fragile geological features, natural monuments and designated/undesignated cultural heritage structures, during the Pre-shooting testing to determine site conditions prior to seismic data acquisition.
8.3 Groundwater	
8.3.1 Degradation of groundwater quality	
Potential groundwater contamination due to explosives residues	[EM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition [EM-019] The location of the energy source points and geophones may be offset in the field to avoid a sensitive receptor [EM-020] No shot holes will be drilled near water lines and shot holes that result in flow of ground water to the surface (e.g. artesian) will be plugged immediately and the shot hole location relocated [EM-023] Project will use of non-toxic degradable explosives [EM-025] All misfired charges will be abandoned in the well boring and left to decompose, while any casing will be removed from the ground
Water contamination by fuels and chemicals from plant leakages from vehicles and equipment	[See 8.1 Soils Contamination]
8.4 Surface Water	
8.4.1 Degradation of water quality	

Environmental /Social Aspect and Potential Impact	Mitigation and Management
Run-off from drilling cuttings and fluids polluting water courses	[EM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition [EM-019] The location of the energy source points and geophones may be offset in the field to avoid a sensitive receptor [EM-022] No chemicals or specialised muds will be used for drilling [AM-042] Contain drilling fluids during shot hole drilling; use fit for purpose containment to receive drilling cuttings; no unlined pits will be used [AM-043] Backfill all cuttings after drilling shot-holes
Water contamination by fuels and chemicals from plant leakages	[EM-038] All fuels and chemicals will be stored in contained bunded areas and refuelling will be carried out in dedicated areas with hard standing/ impermeable layer. Lubricants will also be stored in bunded areas to contain potential spills or leaks. [AM-015] During seismic operations, mobile machinery should sit on a purposely provided drip tray during refuelling and maintenance; [AM-016] A spill control procedure will be implemented in the event of accidents. In the event of leakages or spillages of fuel or oil, a Spill Prevention and Response Plan will be implemented to contain any spillages and prevent adverse impacts on soils which could infiltrate into the groundwater or migrate to surface water [AM-017] Prepare and Implement a Land Transport Safety Plan to avoid road accidents resulting in spillages of hazardous wastes and substances [AM-018] Provide staff spill response training [AM-019] Spill kits are to be easily accessible on site
Degradation of water quality from crossing of streams	[EM-009] Vehicles will cross rivers and streams along suitable alignment to protect geomorphology and integrity of the banks. In case this is practically not achievable, vehicles will only cross at officially designated crossing points. [EM-008] River crossings by trucks and equipment will be kept to a minimum. [AM-037] Cross streams at right angles with straight approaches and gentle grades
8.4.2 Alterations in stream bank geomorphology and integrity	
Alterations in stream bank geomorphology and integrity resulting from river crossings or seismic data acquisition	[EM-008] River crossings by trucks and equipment will be kept to a minimum [EM-009] Vehicles will cross rivers and streams along suitable alignment to protect geomorphology and integrity of the banks. In case this is practically not achievable, vehicles will only cross at officially designated crossing points.

Environmental /Social Aspect and Potential Impact	Mitigation and Management
	[EM-010] Temporary bridges or other support structures will be removed prior to line abandonment unless it is determined these structures will benefit local communities. [AM-035] Keep vehicle routes to and from the seismic corridors away from water bodies, if practical, except at crossings [AM-037] Cross streams at right angles with straight approaches and gentle grades [AM-038] Temporary bridges will be designed to prevent alterations in stream bank morphology. [AM -041] Any seismic data acquisition activity that has the potential to destabilize river or irrigation canal banks will not be undertaken within 50m of the watercourse
8.5 Biodiversity	
8.5.1 Loss/disturbance of natural habitats	
Habitat loss and degradation due to vegetation clearance	[EM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition. [EM-019] The location of the energy source points and geophones may be offset in the field to avoid a sensitive receptor. [EM-006] The cutting of trees (greater than 10 cm DBH) will be avoided. Where clearance is necessary, vegetation will be cut approximately 10 cm above the ground level to preserve rootstock and promote sprouting. [AM-009] Avoid vegetation clearance in sensitive and forested areas [AM-055] Minimise habitat clearance through design and planning via a forward scouting team, which should include a Biodiversity specialist [AM-056] Avoid the most sensitive habitats and features such as protected areas, Annex 1 habitats and critical habitat identified by the biodiversity specialist. [AM-059] Natural breaks in vegetation will be used as preferred routes [AM-060] A Biodiversity specialist will accompany the line clearance crew and ensure that the SUA standards as outlined in the Line Clearance and Restoration Guidelines (to be developed) are maintained for the clearance process to ensure that habitat degradation is minimised [AM-061] The Biodiversity specialist will also report on the progress of clearance [AM-062] Seismic field crews will be provided with environmental awareness training Crews will not deviate from approved clearance lines [AM-063] To avoid clearance of vegetation lines will be off-set and/or wavy line technique will be used [AM-064] Cut scrub and vegetation will be put back on to the lines to promote natural re seeding and growth [AM-065] Demarcate area that should be avoided when laying receiver lines of during data acquisition

Environmental /Social Aspect and Potential Impact	Mitigation and Management
	[AM-068] A Biodiversity specialist will check the vegetation for nesting birds and faunal presence in advance of clearance and propose appropriate mitigation [AM-069] Where feasible, vegetation clearance will be undertaken outside of bird nesting season from March to August. However, where vegetation clearance is required in the bird nesting season, the clearance will be supported by a Biodiversity specialist
Degradation of terrestrial habitat due to tramping	[AM-004] Minimise seismic track width wherever practical [AM-006] Use wide tires on vehicles where practical [AM-056] Avoid the most sensitive habitats and features such as protected areas, Annex 1 habitats and critical habitat identified by the biodiversity specialist [AM-057] A single vehicle track policy will be enforced to reduce extent of footprint [AM-061] Where required lines will deviate lines and/or equipment will be laid by hand through vegetation stands [AM-062] Seismic field crews will be provided with environmental awareness training; crews will not deviate from approved clearance lines
Degradation of riparian and aquatic habitats	[AM-040] Avoid placement of seismic lines within wetlands and watercourses; a 100 metre off-set is recommended [AM-041] Any seismic data acquisition activity that has the potential to destabilize river or irrigation canal banks will not be undertaken within 50m of the watercourse [AM-056] Avoid the most sensitive habitats and features such as protected areas, Annex 1 habitats and critical habitat identified by the biodiversity specialist
Degradation of habitat due to fragmentation	[EM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition [EM-006] The cutting of trees (greater than 10 cm DBH) will be avoided. Where clearance is necessary, vegetation will be cut approximately 10 cm above the ground level to preserve rootstock and promote sprouting [AM-008] Avoid tree removal and minimise vegetation clearance areas; especially in sensitive and forested areas [AM-009] Avoid vegetation clearance in sensitive and forested areas [AM-055] Minimise habitat clearance through design and planning via a forward scouting team, which should include a Biodiversity specialist [AM-056] Avoid the most sensitive habitats and features such as protected areas, Annex 1 habitats and critical habitat identified by the biodiversity specialist [AM-057] A single vehicle track policy will be enforced to reduce extent of footprint

Environmental /Social Aspect and Potential Impact	Mitigation and Management
	[AM-058] To avoid clearance of vegetation lines will be off-set and/or wavy line technique will be used [AM-059] Natural breaks in vegetation will be used as preferred routes [AM-060] A Biodiversity specialist will accompany the line clearance crew and ensure that the SUA standards as outlined in the Line Clearance and Restoration Guidelines (to be developed) are maintained for the clearance process to ensure that habitat degradation is minimised [AM-061] The Biodiversity specialist will also report on the progress of clearance [AM-062] Seismic field crews will be provided with environmental awareness training; crews will not deviate from approved clearance lines. [AM-065] Demarcate area that should be avoided when laying receiver lines of during data acquisition [AM-068] A Biodiversity specialist will check the vegetation for nesting birds and faunal presence in advance of clearance and propose appropriate mitigation [AM-069] Where feasible vegetation clearance will be undertaken outside of bird nesting season from March to August. However, where vegetation clearance is required in the bird nesting season, the clearance will be supported by a Biodiversity specialist
Habitat disturbance caused by contamination of water sources due to spills and leakages from survey vehicles	[AM-015] During seismic operations, mobile machinery should sit on a purposely provided drip tray during refuelling and maintenance [AM-016] A spill control procedure will be implemented in the event of accidents. In the event of leakages or spillages of fuel or oil, a Spill Prevention and Response Plan will be implemented to contain any spillages and prevent adverse impacts on soils which could infiltrate into the groundwater or migrate to surface water [AM-065] Demarcate area that should be avoided when laying receiver lines of during data acquisition
Disturbance of fauna due to noise and presence of workers	[AM-065] Demarcate area that should be avoided when laying receiver lines of during data acquisition [AM-050] Minimise duration of seismic survey activities
Habitat disturbance due to the colonisation of invasive species	[AM-010] Minimise top soil removal [AM-063] Ensure vehicles used during the project are thoroughly washed of soil before entering the area to prevent dispersion of seeds or plant fragments prior to commencing work
8.5.2 Loss/disturbance of animal/plant species of conservation concern	
Loss/disturbance of animal/plant species of conservation concern	[see Habitat loss and degradation due to vegetation clearance above]

Environmental /Social Aspect and Potential Impact	Mitigation and Management
Mortality of fauna caused by collisions with vehicles	[AM-001] Maximise the use of existing tracks and roads [AM-046] Vehicles will be driven at allowed speed limits
Mortality of fauna caused by increased hunting	[AM-053] Implement and enforce hunting and fishing ban for workforce. [AM-054] Implement strict purchasing procedures for local wildlife produce, particularly for species populations vulnerable to change.
8. 6 Air emissions	
8.6.1 Degradation of air quality	
Vehicle movements resulting emissions and dust generation	[AM-005] Keep vehicle movements to a minimum [AM-046] Vehicles will be driven at allowed speed limits [AM-076] Implement a Journey Management Plan to control traffic routing and minimize traffic movements through populated areas; use designated routes through the local area to avoid local residential roads where possible and practicable; [AM-081] Provide for regular servicing and maintenance of vehicles [AM-073] Turn off engines and equipment when not in use
Increased level of dust from helicopters	[AM-085] Locate helipad as far away from any human receptors as practicable (minimum distance of 350m). [AM-074] Landing areas must be kept clean and clear of all obstructions. If landing pads cannot be hard paved, vegetation cover should be maintained as well as damping down of the ground; where appropriate [AM-086] Seek to reduce amount of time helicopters take to shut down once landed
8.7 Noise	
Nuisance to communities from	[AM-005] Keep vehicle movements to a minimum

Environmental /Social Aspect and Potential Impact	Mitigation and Management
vibration and noise from vehicle movements	[AM-046] Vehicles will be driven at allowed speed limits [AM-047] No vehicular transport permitted at night (with the exception of emergency vehicles) [AM-073] Turn off engines and equipment when not in use [AM-075] Provide awareness-raising sessions for communities about noise activities and their duration throughout project lifecycle [AM-076] Implement a Journey Management Plan to control traffic routing and minimize traffic movements through populated areas; use designated routes through the local area to avoid local residential roads where possible and practicable; [AM-080] Equipment and machinery are to be adequately maintained and operated [AM-081] Provide for regular servicing and maintenance of vehicles [AM-082] Refraining from unnecessary revving of vehicle engines
Nuisance to communities from vibration and noise from helicopter movements	[AM-087] Plan flight routes, timing and altitude for helicopter flights over community areas to reduce disturbance
Disturbance of religious ceremonies and cultural events	[EM-019] The location of the energy source points and geophones may be offset in the field to avoid a sensitive receptor (i.e. cultural heritage and sacred sites such as cemeteries) [AM-114] Develop and implement a Stakeholder Engagement Plan (to ensure planned religious events are taken into account) [AM-116] Engage with heads of the communities to ensure planned religious events are taken into account and not disturbed [AM-131] CLOs will engage with villages in advance of the survey phase and will provide the schedule for survey activity
8.8 Light emissions	

Environmental /Social Aspect and Potential Impact	Mitigation and Management
No night works	
8.9 Waste Management	
8.8.1 Littering	
Uncontrolled waste management	[AM-107] Enforce good housekeeping practices in the field during survey works; collect all litter and marker point flags.
Socio-Economic	
8.10.4. Presence of Non local project workers in or near communities	
Disruption to community well-being from non-local project workers and associated increased noise and traffic or behaviours that are not aligned with local norms	[AM-116] Engage with heads of the communities to ensure planned religious events are taken into account and not disturbed [AM-119] Post public notices at the base and fly camp sites to notify interested parties of the purpose of the camp and to give a point of contact for any enquiries or grievances. [AM-131] CLOs will engage with villages in advance of the survey phase and will provide the schedule for survey activity.
8.10.5 Use of water for drilling	
Project use of local water sources could reduce the availability of that water to other users and / or increase the cost of water supply to users.	[AM-124] Water Management Plan must be developed to help reduce water consumption and minimise any impact to the water supply to other users [AM-125] Induction training for all workers will contain training on the importance of water conservation and direction that local water sources (e.g. springs) should not be used without authorization.
8.10.6 Movement of project equipment and vehicles	
Movement of project vehicles could result in increased risk of road	[EM-011] Road conditioning will be minimized by using portable drilling equipment, especially in mountainous areas [AM-129] Undertake pre-survey road improvements where necessary to prevent deterioration of the existing road network by project vehicles Post-survey restoration of the affected roads

Environmental /Social Aspect and Potential Impact	Mitigation and Management
accidents for other vehicles, pedestrians and livestock, as well as increased risk of traffic delays, damage to road-side structures and degradation of the roads.	or alternative compensation will established in consultation with local authorities [EM-027] Base, explosive magazine and fly camp sites selected to avoid, where possible, the flow of daily camp traffic passing through towns, villages or busy roads [AM-017] Prepare and Implement a Land Transport Safety Plan to avoid road accidents resulting in spillages of hazardous wastes and substances [AM-115] Develop and implement a Traffic Management Plan
8.10.8 Provision of security	
Any inappropriate behaviour or excessive use of force by project security personnel would impact community safety and wellbeing.	[AM-127] Security personnel must be trained and must be directed on the appropriate use of force [AM-128] Security incidents and any grievances related to security must be investigated to verify that use of force was appropriate
8.10.9 Employment	
Creation of employment opportunities (positive impact)	[EM-016] Seismic Contractor will employ locally available work force as suitable and practicable to the skill requirements. [AM-134] Communication of Contractor job opportunities and hiring methods to local communities during pre-survey engagement with the villages in proximity to the seismic lines
8.10.10 Clearance of seismic lines	
Clearance of crops or pasture from seismic lines and access routes.	[EM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition. [EM-019] The location of the energy source points and geophones may be offset in the field to avoid a sensitive receptor [EM-006] The cutting of trees (greater than 10 cm DBH) will be avoided. Where clearance is necessary, vegetation will be cut approximately 10 cm above the ground level to preserve rootstock and promote sprouting. [EM-014] Implement SUA Land Acquisition & Resettlement Framework [EM-015] Implement SUA Community Feedback and Compensation Procedure [EM-017] The permit crew will visit the landowner after the line survey and after completion of works to document any damage to crops/property, agree compensation, if any, and address

Environmental /Social Aspect and Potential Impact	Mitigation and Management
	any complaints [AM-131] CLOs will engage with villages in advance of the survey phase and will provide the schedule for survey activity. [AM-133] Signage will be provided to advise residents of drilling activity and to mark the exclusion area around shot-holes during acquisition.
8.10.11 Access restriction to land and agricultural areas during seismic acquisition activity	
Access restriction to agricultural areas during seismic acquisition activity	[EM-014] Implement SUA Land Acquisition & Resettlement Framework [AM-130] Field crews will identify access points (gates, roads) that may be required by local farmers and avoid placement of equipment and vehicles in these areas. [AM-131] CLOs will engage with villages in advance of the survey phase and will provide the schedule for survey activity. [AM-133] Signage will be provided to advise residents of drilling activity and to mark the exclusion area around shot-holes during acquisition.
8.10.12 Disturbance to livestock from seismic survey activity	
Disturbance to livestock, potentially affecting behaviour.	[EM-012] Engage Community Liaison Officer (CLO) to inform and consult with local communities [EM-018] In places where there are sensitive receptors potentially susceptible to environmental, social or health impacts, the cables and geophones will be hand carried into position by the front crew [AM-131] CLOs will engage with villages in advance of the survey phase and will provide the schedule for survey activity [AM-132] If livestock are present in close proximity to the planned acquisition activity then contact will be made with livestock keeper to arrange movement of the livestock [AM-133] Signage will be provided to advise residents of drilling activity and to mark the exclusion area around shot-holes during acquisition
8.10.13 Damage from vibration to structures, including buildings, shed, fences, wells and septic tanks	
Damage from vibration to structures, including buildings, sheds, fences, wells and septic	[EM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition [EM-015] Implement SUA Community Feedback and Compensation Procedure [EM-017] The permit crew will visit the landowner after the line survey and after completion of works to document any damage to crops/property, agree compensation, if any, and address

Environmental /Social Aspect and Potential Impact	Mitigation and Management
tanks	any complaints [EM-019] The location of the energy source points and geophones may be offset in the field to avoid a sensitive receptor [EM-020] No shot holes will be drilled near water lines and shot holes that result in flow of ground water to the surface (i.e. artesian) will be plugged immediately and the shot hole location relocated. [EM-021] No shot holes will be drilled in a buffer zone of up to 200m of water supply source; during permitting and site reconnaissance local wells will be identified for avoidance [EM-024] Before recording activities commence along each seismic line, the surveyors will determine the minimum safe offset distance for the area of operations to prevent impacts to the existing infrastructure or protected areas [AM-130] Field crews will identify access points (gates, roads) that may be required by local farmers and avoid placement of equipment and vehicles in these areas [AM-144] Compensation Plan to include a rapid process for investigating and compensation for any damage to assets that could impact vulnerable people, including the elderly [AM-133] Signage will be provided to advise residents of drilling activity and to mark the exclusion area around shot-holes during acquisition [AM-142] Evaluation of the integrity of the structures should be undertaken during the Pre-acquisition phase and final design discussed with affected parties and key stakeholders
8.10.14 Decreased tourist appeal of the area due to noise and disturbance (e.g. traffic or visual disruption)	
Decreased tourist appeal of the area due to noise and disturbance created by the project and visual impact (impact on landscape)	[EM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition [EM-005] Prior to data acquisition, the site conditions will be assessed (pre-testing) to determine the geological conditions and appropriate setbacks for structures; buffer zones will be extended, if necessary [EM-006] The cutting of trees (greater than 10 cm DBH) will be avoided. Where clearance is necessary, vegetation will be cut approximately 10 cm above the ground level to preserve rootstock and promote sprouting [AM-026] Implement a post survey cleanup (green team) to confirm the site has been restored to pre-survey conditions [See 8.12 Landscape and Visual Amenity]
8.10.15 Disturbance to local community by equipment and vehicles by noise and vibration	
Noise and vibration disturbance to local residents from helicopter	[AM-084] Maintain sufficient altitude to reduce downdraft effects. Pilots should approach or depart a helipad with external loads without flying over people, equipment, vehicles, or houses

Environmental /Social Aspect and Potential Impact	Mitigation and Management
movements	[AM-085] Locate helipad as far away from any human receptors as practicable (minimum distance of 350m) [AM-086] Seek to reduce amount of time helicopters take to shut down once landed [AM-087] Plan flight routes, timing and altitude for helicopter flights over community areas to reduce disturbance.
Noise and vibration disturbance to local residents	[EM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition. [EM-019] The location of the energy source points and geophones may be offset in the field to avoid a sensitive receptor [AM-050] Minimise duration of seismic survey activities at any one location. [see 8.7 Noise and Vibration]
4.10.16 Poor handling, transportation, storage and use of explosives	
Poor handling, transportation, storage and use of explosives could result in accidents (e.g. fires, explosions) and injury of workers and members of the public.	[EM-025] All misfired charges will be abandoned in the well boring and left to decompose, while any casing will be removed from the ground. [EM-026] The wire leads to the charges must be cut below the surface to a minimum of 50 cm. [AM-017] Prepare and Implement a Land Transport Safety Plan to avoid road accidents resulting in spillages of hazardous wastes and substances [AM-133] Signage will be provided to advise residents of drilling activity and to mark the exclusion area around shot-holes during acquisition [AM-151] Security shall be provided to minimize any tampering and vandalism of shot holes and geophones.
8.10.8 Provision of security	
Any inappropriate behaviour or excessive use of force by project security personnel would impact community safety and wellbeing.	[AM-127] Security personnel must be trained and must be directed on the appropriate use of force. [AM-128] Security incidents and any grievances related to security must be investigated to verify that use of force was appropriate.
8.11 Cultural heritage	

Environmental /Social Aspect and Potential Impact	Mitigation and Management
8.11.1 Damage to cultural monuments and archeological sites	
Potential damage or destruction of cultural sites during line clearance and vehicle circulation and seismic data acquisition	[EM-001] Seismic survey activities will be limited to within the 500m corridor along the line length to provide flexibility to avoid sensitive receptors whilst allowing for reliable data acquisition. [EM-019] The location of the energy source points and geophones may be offset in the field to avoid a sensitive receptor. [EM-005] Prior to data acquisition, the site conditions will be assessed (pre-testing) to determine the geological conditions and appropriate setbacks for structures; buffer zones will be extended, if necessary [EM-018] In places where there are sensitive receptors potentially susceptible to environmental, social or health impacts, the cables and geophones will be hand carried into position by the front crew. [EM-024] Before recording activities commence along each seismic line, the surveyors will determine the minimum safe offset distance for the area of operations to prevent impacts to the existing infrastructure or protected areas. [AM-003] Vehicle access limited to seismic tracks and access roads [AM-004] Minimise seismic track width wherever practical [AM-137] Demarcate known cultural heritage sites/cemeteries around the camps and seismic lines to avoid any destruction or disturbance. Remove flags or tapping around cultural heritage sites/cemeteries once restoration is complete [AM-140] A suitable offset from the known extent of a cemetery should be agreed with community leaders, religious representatives and key stakeholders. [AM-141] An appropriately qualified and experienced cultural heritage and archeology specialist should be available on call-off basis to provide guidance [AM-142] Evaluation of the integrity of the structures should be undertaken during the Pre-acquisition phase and final design discussed with affected parties and key stakeholders

Environmental /Social Aspect and Potential Impact	Mitigation and Management
Potential damage to as yet unknown archaeological sites	[EM-004] Implement a Chance find procedure to ensure that any archaeological artefacts encountered are properly recorded and left in situ. A stop work policy will be implemented [AM-003] Vehicle access limited to seismic tracks and access roads [AM-004] Minimise seismic track width wherever practical [AM-139] Liaise with Municipalities, the Ministry of Tourism and Cultural Heritage authorities with regard to festival dates in order to minimize disruption that may be caused by project operations [AM-141] An appropriately qualified and experienced cultural heritage and archeology specialist should be available on call-off basis to provide guidance [AM-143] The chance find procedure will be shared as part of the seismic contractor inductions to ensure any discovery of previously undiscovered cultural heritage sites are encountered
8.11.2 Disturbance to intangible cultural heritage	
Seismic operation noise disturbance of religious ceremonies	[AM-138] Determine offsets for seismic source operations in the field and redesign the seismic lines for avoidance of known cultural heritage where possible and to ensure maintenance of a 200m buffer around cultural heritage Evaluation should be undertaken during the Pre-acquisition phase and final design discussed with affected parties and key stakeholders [AM-075] Provide awareness-raising sessions for communities about noise activities and their duration throughout project lifecycle; [AM-114] Develop and implement a Stakeholder Engagement Plan (to ensure planned religious events or cultural ceremonies are taken into account) [AM-139] Liaise with Municipalities, the Ministry of Tourism and Cultural Heritage authorities with regard to festival dates in order to minimize disruption that may be caused by project operations [AM-140] A suitable offset from the known extent of a cemetery should be agreed with community leaders, religious representatives and key stakeholders.
8.12 Landscape and Visual Amenity	
8.12.1 Deterioration of roads and unpaved tracks	
Vehicle movement	[AM-001] Maximise the use of existing tracks and roads [AM-129] Undertake pre-survey road improvements where necessary to prevent deterioration of the existing road network by project vehicles Post-survey restoration of the affected roads

Environmental /Social Aspect and Potential Impact	Mitigation and Management
	or alternative compensation will established in consultation with local authorities
8.12.2 Vegetation clearance	
Alteration to visual landscape due to the clearance of vegetation	[EM-006] The cutting of trees (greater than 10 cm DBH) will be avoided. Where clearance is necessary, vegetation will be cut approximately 10 cm above the ground level to preserve rootstock and promote sprouting. [AM-044] Any stripped soil and vegetation will be retained in the area for subsequent restoration of the land.
8.12.4 Littering	
Uncontrolled waste	[AM-100] Policy for zero discharges and disciplinary action against littering

9. Environmental Monitoring Plan

Environmental monitoring is the key element of the environmental management plan ensuring the measures and procedures to manage and mitigate the physical, biological and social environmental risks during all phases of the seismic survey are implemented and are effective.

The mitigation and management actions to eliminate, offset or reduce potential significant negative impacts identified have been summarized in **Chapter 8, Mitigation Measures**. The environmental monitoring plan describes:

- The objectives of the monitoring plan;
- The approach to environmental monitoring;
- The role of environmental monitors; and
- the specific monitoring activities to be undertaken during the seismic survey.

Table 8-1 and Table 8-2 summarize the monitoring requirements to be utilized throughout the project lifecycle, the reporting requirements documenting the implementation and efficacy of the mitigation measures and the responsible party for undertaking the monitoring. The plan will be incorporated into the overall environmental management and monitoring plan (EMMP) for the project and will act as a 'live' document to track progress through to completion of the seismic program. The overall environmental and management and monitoring plan is provided in **Chapter 10 Environmental Management and Monitoring Plan**.

9.1 Objectives of the environmental monitoring plan

The EMP covers all phases of the project from mobilization to demobilization and addresses the monitoring needs of significant environmental issues or impacts identified by ESHIA process. The main objectives of the environmental monitoring during the seismic survey will be to:

6. provide a mechanism to monitor the seismic contractor's compliance by activity;
7. monitor the effectiveness of the mitigation measures ;
8. ensure that controls and mitigations are effective and where revision is required;
9. verify the implementation of corrective actions in areas where the activity specific EMP did not meet the expectations or outcomes;
10. document the project impacts on physical and biological resources and socioeconomic receptors; and
11. provide data for preparing the monitoring reports.

9.2 Environmental Monitoring Approach

The environmental monitoring approach provides the mechanisms to achieve the objectives of the environmental monitoring plan. The monitoring approach incorporates:

- Self-assurance by the seismic contractor during the project and at completion, to verify and document compliance with the EMP. The documentation will also cover any remedial or corrective actions that have been implemented;
- guidance and monitoring by biodiversity and cultural heritage specialists;
- Performance monitoring by SUA to verify and document compliance or non-compliance with the EMP during and at the completion of the project. This includes verification and documentation of the implementation of corrective actions or remedial work plans required to address non-compliance issues; and
- An independent environmental monitor to document the implementation and efficacy of the mitigation measures in accordance with the conditions of the Environmental Declaration.

It is expected that all non-compliances with the implementation of mitigation measures or monitoring requirements will be reported on a daily basis so that appropriate corrective actions can be initiated, as necessary. Ongoing evaluation to identify any gaps or weaknesses in the EMP will be undertaken through communication between SUA, the seismic contractor and stakeholders. The biodiversity and cultural heritage specialists will support this effort. All findings will be reviewed by the relevant project teams and, where corrective actions are deemed necessary, specific actions (with designated responsibility and timing) will be developed, aimed at achieving continuous improvement in performance.

Following demobilization of the seismic camp and completion of the field activities, a joint inspection will be conducted by the Seismic contractor's HSSE Lead and the SUA Seismic Lead. The primary objectives of this phase of the monitoring will be to evaluate the effectiveness of the environmental control measures and to identify and initiate mitigation measures that might still be needed. The seismic contractor will prepare a Final Inspection Report to be submitted to SUA for approval. This report will provide the results and findings of the monitoring and the final inspection discussed above, and will include the action plan for any further mitigation measures, which might be needed. As a part of the final report, suggested improvements or modifications in the environmental control measures and the monitoring process will also be provided for any future work by the seismic contractor for SUA or for their next assignment.

In the longer term, once seismic surveys have been completed, a short program of monitoring will be conducted to determine the success of the mitigation and remediation works and a compliance report submitted to NEA. This will include a survey approximately twelve months post completion (to allow natural plant regrowth) examining the recovery of impacted habitats. This should allow the success of the habitat remediation works to be assessed. Any significant residual impacts should be addressed after this survey.

9.3 Environmental Monitoring

Environmental monitoring will be undertaken primarily by the seismic contractors HSSE Field Supervisors however during execution of the Project they will be supported by:

- A Biodiversity specialist; and
- A Cultural heritage and archeology specialist (available on call-off basis)

The biodiversity and cultural heritage specialists will provide guidance to the seismic crew within their areas of expertise and monitor the implementation of the mitigation measures through inspections of all work areas, verify the efficacy of mitigation measures and document compliance with the mitigation measures. The roles and responsibilities of the environmental monitors are further described in **Chapter 10 Environmental Management and Monitoring Plan**.

9.4 Environmental Monitoring Plan

The environmental monitoring plan summarizes the monitoring and reporting requirements for the mitigation and management actions. Table 9-1 summarizes the monitoring and reporting or mobilization, support facilities set up and operation (e.g. base, fly camps, accommodations, heliport and explosives magazine) and demobilization and Table 9-2 specifically address the seismic survey aspects of the project.

Table 9-1 Summary of monitoring and reporting for mobilization, support facilities set up and operations, demobilization and restoration activities

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
9.1 Soils			
9.1.1 Soil erosion 9.1.2 Soil Compaction 9.1.3 Soils Contamination	Maintain a register of community feedback and complaints Monitor heavily traveled routes on a daily basis, particularly from base and accommodations for signs of erosion Maintenance work to be documented Monitor camp set up activities for areas prone to erosion Daily inspection of work areas for signs of soils contamination Maintain a log of soil contamination incidents Inspect fly camp and areas of vehicle and equipment storage after demobilization for effectiveness of restoration for soils erosion, compaction and contamination Document site restoration activities	Report areas of erosion, compaction or contamination for possible restoration on a weekly basis Prepare a spill report to document: location, material, amount and remedial actions taken. Report all site restoration activities on a weekly basis Provide monitoring records and in the monthly report	Seismic contractor SUA HSSE Seismic Lead
9.2 Geology			
9.2.1 Damage to Geological Monuments and Features	Document guidance provided to the seismic crew on avoidance of geological monument and features Monitoring avoidance of geological monuments and features Maintain a log of accidental damage	Report incidents of accidental damage to geological monuments and features to SUA on a daily basis Provide monitoring records and logs in the monthly report	Seismic contractor SUA HSSE Seismic Lead
9.3 Groundwater			
9.3.1 Degradation of groundwater quality	Maintain a register of community feedback and complaints Document site restoration activities	Prepare a spill report to document: location, material, amount and remedial actions taken Report site restoration activities on a weekly basis Report complaints to the SUA CLO on a weekly basis Provide monitoring records and reports in	Seismic contractor SUA HSSE Seismic Lead

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
		the monthly report	
9.4 Surface water			
9.4.1 Degradation of surface water quality	Maintain a register of community feedback and complaints Monitor base and fly camp sites for areas prone to erosion and runoff, particularly after rain events Inspect fly camp after demobilization for effectiveness of restoration Visually monitor stream crossing locations for stream bank or water quality deterioration on a daily basis Visually monitor natural drainage paths for blockages or erosion after rain events Maintain a log of surface water contamination incidents. Document site restoration activities on a weekly basis	Report signs of degraded water quality and sites for possible restoration on a weekly basis. Report stream crossing and natural drainage path locations for possible restoration on a weekly basis. Provide monitoring record, logs and reports in the monthly report	Seismic contractor SUA HSSE Seismic Lead
9.5 Biodiversity			
9.5.1 Loss/disturbance of natural habitats 9.5.2 Loss/disturbance of animal/plant species of conservation concern 9.5.3 Habitat degradation due to environmental contamination	Visually monitor heavily travel routes on a daily basis, particularly from base and accommodations for signs of habitat degradation Biodiversity specialist to document guidance provided to the seismic crew and loss/disturbance of protected species (i.e. no cutting or removal of protected vegetation including trees and plants) and loss/disturbance of sensitive habitats (i.e. Annex 1 and critical habitats). Document sensitive areas to be avoided; including the presence of animal nests Document vehicle and equipment washing prior to and after vehicles and equipment are deployed to the field to prevent the introduction of alien invasive species. Maintain a log of incidents of rodent activity Monitor nighttime noise generation and light near fly camps Maintain a log and inform Biodiversity specialist of encounters with fauna Maintain a log of incidents of unauthorized hunting activity or purchase of local wildlife. Biodiversity specialist to visually inspect restored sites to ensure sites is restored to pre-survey conditions.	Report incidents and encounters with wildlife on a weekly basis Provide monitoring records and logs in monthly report	Seismic contractor Biodiversity specialist SUA HSSE Seismic Lead

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
	Maintain a log of areas to be inspected after survey to ensure no residual impacts are evident.		
9.6 Air quality			
9.6.1 Degradation of air quality	Maintain a register of community feedback and complaints	Inform SUA CLO of complaints on a weekly basis.	Seismic contractor
9.6.2 Climate change	Maintain of vehicle maintenance log	Provide monitoring records and logs in monthly report	SUA HSSE Seismic Lead
9.6.3 Emissions due to unplanned events	Monitor heavily traveled routes on a daily basis, particularly from base and accommodations for signs of areas prone to dust generation. Maintain a log of maintenance of generators Monitor compliance with no open fire policy		
9.7 Noise and vibration			
9.7 Noise and vibration	Maintain a log of maintenance of vehicle Maintain a log of equipment maintenance Maintain a register of community feedback and complaints	Inform SUA CLO of complaints on a weekly basis. Provide monitoring logs in monthly report	Seismic contractor SUA HSSE Seismic Lead
9.8 Light emissions			
9.8 Light emissions	Maintain a register of community feedback and complaints	Report on a weekly basis complaints to SUA CLO	Seismic contractor SUA CLO
9.9 Waste Management			
9.9 Waste Management	Ensure monitoring requirements prescribed in the Waste Management Plan and the Duty of Care Procedures (to be developed jointly by SUA and the Seismic Contractor) are implemented	As per Waste Management Plan and Duty of Care Procedures	Seismic contractor
9.10 Social			
9.10.1 Land use during establishment of camps	Maintain a register of community feedback and complaints	Report on a weekly basis complaints to SUA CLO	Seismic contractor
9.10.2 Accommodation of project workers in hotels and guest houses	Document the locations of land used/crossed temporarily which does not require land permitting and monitor for damages	Report Land permitting and accommodation agreements on a weekly	SUA CLO SUA Permitting Lead
9.10.3 Accommodation of project workers in			

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
Base and fly camps 9.10.4 Presence of non-local workers in or near communities	Document land permitting and accommodation agreements Document all compensation activities Maintain a register of accommodations and occupants	basis Report compensation activities on a weekly basis. Provide registers and logs in the monthly report.	
9.10.5 Use of water for camp operations	Maintain records of water supplied to camps from local providers Maintain a register of community feedback and complaints	Inform SUA CLO of feedback and complaints on a weekly basis. Report records of water supplies in the monthly report.	Seismic contractor SUA HSSE Seismic Lead
9.10.6 Movement of project equipment and vehicles	Visually inspect heavily travel routes on a daily basis, particularly from Base and accommodations for signs of damage to roads. Maintenance work to be documented Maintain a log of all seismic contractor road accident incidents Maintain a register of community feedback and complaints	Inform SUA CLO of feedback and complaints on a weekly basis. Report all road incidents on a daily basis. Provide monitoring reports of road conditions, vehicle maintenance records and incidents in the monthly report	Seismic contractor SUA CLO
9.10.7 Introduction or spread of communicable disease within communities	All seismic crew will be screened prior to their induction in to the project to ensure that they are not carrying any communicable disease. Maintain a log of seismic crew illnesses and referrals to local medical facilities Monitor local medical facilities for increased incidence of health concerns on a monthly basis	Crew screening records at the time of their induction Provide monitoring reports of seismic crew illness, particularly of communicable diseases and usage of local facilities in the monthly report Report on increased incidence of health concerns at local medical facilities on a monthly basis Inform SUA CLO of feedback and complaints on a weekly basis Provide registers, monitoring records and logs in the monthly report.	Seismic contractor SUA CLO

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
9.10.8 Provision of security	Maintain records of security incidents Maintain a register of community feedback and complaints	Inform SUA CLO of feedback and complaints on a weekly basis. Report all security incidents on a daily basis and include in the monthly report	Seismic contractor SUA CLO
9.10.9 Employment	Maintain records (i.e. requests for employment, new hires, local or expatriate etc.) on local employment Maintain a register of community feedback and complaints	Report all employment records on a weekly basis Inform SUA CLO of complaints on a weekly basis. Provide registers and records in the monthly report.	Seismic contractor SUA CLO
9.11 Cultural heritage and archeology			
9.11.1 Damage to cultural monuments and archeological sites 9.11.2 Disturbance to intangible cultural heritage	Cultural heritage & archeology specialist to maintain records of cultural heritage sites demarcated Cultural heritage & archeology specialist to document visual inspection of cultural monuments Maintain records of chance finds and inform the Cultural Heritage specialist Maintain a register of community feedback and complaints	Provide records of cultural heritage sites demarcated and inspection reports in the monthly report Provide notifications of chance finds to SUA on a daily basis Inform SUA CLO of feedback and complaints on a weekly basis Provide registers and records in the monthly report	Seismic Contractor SUA HSSE Seismic Lead SUA CLO Cultural heritage/archeologist specialist
9.12 Landscape and visual amenity			
9.12.1 Deterioration of roads and unpaved tracks 9.12.2 Vegetation clearance 9.12.3 Presence of camps, machinery and equipment 9.12.4 Littering	Maintain a register of community feedback and complaints Monitor effectiveness of restoration efforts and natural vegetation regrowth after 1 year by a biodiversity specialist. Monitor and maintain a log of road conditions requiring repair and restoration road conditions and undertake restoration efforts, where necessary. Maintain a log of road repair and restoration efforts completed	Inform SUA CLO of complaints on a weekly basis Report signs of road deterioration and sites for possible restoration on a weekly basis. Document all restoration efforts in monthly report Provide monitoring records in monthly	Seismic Contractor SUA HSSE Seismic Lead SUA CLO Biodiversity Specialist Seismic Contractor

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
	Monitor work areas by visual inspection of work areas for litter on a daily basis.	report	SUA HSSE Seismic Lead

Table 9-2 Summary of monitoring and reporting for seismic survey activities

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
9.1 Soils			
9.1.1 Soil erosion 9.1.2 Soil Compaction 9.1.3 Soils Contamination	Maintain a register of community feedback and complaints Monitor heavily traveled routes and tracks along the seismic corridors on a daily basis for signs of erosion Maintenance work completed in the field to be documented Daily inspection of work areas for signs of soils contamination Maintain a log of soil contamination incidents Inspect work areas for effectiveness of restoration for soils erosion, compaction and contamination Document site restoration activities	Report areas of erosion, compaction or contamination for possible restoration on a weekly basis Prepare a spill report to document: location, material, amount and remedial actions taken. Report all site restoration activities on a weekly basis Provide monitoring records and in the monthly report	Seismic contractor SUA HSSE Seismic Lead
9.2 Geology			
9.2.1 Damage to Geological Monuments and Features 9.2.1 Damage to Geological Monuments and Features	Document guidance provided to the seismic crew on avoidance of geological monument and features Visually inspect geological monuments and features for signs of damage Record avoidance distances (offsets observed) Document vibration monitoring	Report incidents of accidental damage to geological monuments and features to SUA daily Provide monitoring and inspection records in the monthly report	Seismic contractor SUA HSSE Seismic Lead
9.2.1 Karst collapse	Visually inspect geological karst features for signs of damage. Record avoidance distances (offsets observed)	Report incidents of accidental damage to karst features Provide monitoring records and inspection reports in the monthly report	Seismic contractor SUA HSSE Seismic Lead
9.3 Groundwater			
9.3.1 Degradation of groundwater quality	Prepare a spill report to document: location, material, amount and remedial actions taken Document site restoration activities Maintain a log of surface water contamination incidents	Document site restoration activities on a weekly basis Prepare a spill report to document: location, material, amount and	Seismic contractor SUA HSSE Seismic

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
	Maintain a register of community feedback and complaints	remedial actions taken Inform SUA CLO of feedback and complaints on a weekly basis. Provide monitoring records and logs in the monthly report	Lead
9.4 Surface water			
9.4.1 Degradation of surface water quality	Prepare a spill report to document: location, material, amount and remedial actions taken Maintain a log of surface water contamination incidents Maintain a log of surface water contamination incidents Visually inspect water quality at stream crossing locations on a daily basis Document site restoration activities. Maintain a register of community feedback and complaints	Inform SUA CLO of feedback and complaints on a weekly basis. Report signs of degraded water quality and sites for possible restoration on a weekly basis. Provide monitoring records and logs in the monthly report	Seismic contractor SUA HSSE Seismic Lead
9.4.2 Alterations in stream bank geomorphology and integrity	Visually inspect stream banks for signs of deterioration at stream crossing locations on a daily basis Maintain a register of community feedback and complaints	Inform SUA CLO of feedback and complaints on a weekly basis. Report signs of stream bank damage and sites for possible restoration on a weekly basis. Provide monitoring records in monthly report	Seismic contractor SUA HSSE Seismic Lead
9.5 Biodiversity			
9.5.1 Loss/disturbance of natural habitats	Visually monitor heavily travel routes on a daily basis, particularly from base and accommodations for signs of habitat degradation	Inform SUA CLO of feedback and complaints on a weekly basis.	Seismic contractor
9.5.2 Loss/disturbance of animal/plant species of conservation concern	Biodiversity specialist to document guidance provided to the seismic crew and loss/disturbance of protected species (i.e. no cutting or removal of protected vegetation including trees and plants) and loss/disturbance of sensitive habitats (i.e. Annex 1 and critical habitats).	Report incidents and encounters with wildlife on a weekly basis Provide monitoring records and logs in monthly report	Biodiversity Specialist
9.5.3 Habitat degradation due to environmental	Document sensitive areas to be avoided; including the presence of animal nests Document vehicle and equipment washing prior to and after vehicles and equipment are deployed		

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
contamination	to the field to prevent the introduction of alien invasive species. Maintain a log and inform Biodiversity specialist of encounters with fauna Maintain a log of incidents of unauthorized hunting activity or purchase of local wildlife. Biodiversity specialist to visually inspect restored sites to ensure sites are restored to pre-survey conditions. Maintain a log of areas to be inspected after survey to ensure no residual impacts are evident.		
9.6 Air quality			
9.6.1 Degradation of air quality	Maintain of vehicle maintenance log Monitor heavily traveled routes on a daily basis along tracks for signs of areas prone to dust generation. Maintain a register of community feedback and complaints	Inform SUA CLO of feedback and complaints on a weekly basis. Provide monitoring records and logs in the monthly report	Seismic contractor SUA CLO
9.6.2 Climate change	Maintain a log of maintenance of vehicle and report on a weekly basis.	Maintain a log of maintenance of vehicle and report on a weekly basis	Seismic contractor SUA HSSE Seismic Lead
9.7 Noise and vibration			
9.7 Noise and vibration	Maintain a log of maintenance of vehicle Maintain a register of community feedback and complaints Record details of local cultural heritage and religious events during initial community engagement and incorporate necessary precautions within planning and implement at execution	Inform SUA CLO of feedback and complaints on a weekly basis. Provide monitoring records in monthly report	Seismic contractor SUA HSSE Seismic Lead
9.8 Light emissions			
9.8 Light emissions	No night works	N/A	N/A
9.9 Waste Management			
9.9.1 Littering	Visual inspection of work areas on a daily basis. Document non-compliances and report on a weekly basis. Maintain a register of community feedback and complaints	Report on a weekly basis any non-compliance Provide monitoring records in monthly report	Seismic contractor SUA HSSE Seismic Lead

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
9.10 Social			
9.10.4. Presence of Non local project workers in or near communities	Maintain a register of community feedback and complaints	Inform SUA CLO of feedback and complaints on a weekly basis	Seismic contractor SUA CLO
9.10.5 Use of water for drilling	Maintain records of water supplied to drill rigs from local providers Maintain a register of community feedback and complaints	Inform SUA CLO of feedback and complaints on a weekly basis. Report records of water supplies in the monthly report	Seismic contractor SUA CLO
9.10.6 Movement of project equipment and vehicles	Monitor heavily travel routes on a daily basis, particularly from Base and accommodations for signs of damage to roads. Maintenance work to be documented Maintain a log of all road accident incidents Maintain a register of community feedback and complaints	Inform SUA CLO of feedback and complaints on a weekly basis. Report all road incidents on a daily basis. Provide monitoring reports of road conditions, incidents and vehicle maintenance records in the monthly report	Seismic contractor SUA CLO
9.10.8 Provision of security	Maintain a log of security incidents Maintain a register of community feedback and complaints.	Inform SUA CLO of feedback and complaints on a weekly basis Report all security incidents on a daily basis Provide reports of security incidents in the monthly report	Seismic contractor SUA CLO
9.10.10 Clearance of seismic lines	Monitor for damages or incidents on a daily basis. Maintain a register of community feedback and complaints Document all restoration and compensation activities.	Report property damages or incidents on a daily basis. Inform SUA CLO of complaints on a weekly basis Report restoration activities and compensation on a weekly basis.	Seismic contractor SUA HSSE Seismic Lead

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
	Document Land Permitting agreements	Report Land Permitting agreements on a weekly basis and include in monthly report	
9.10.11 Access restriction to land and agricultural areas during seismic acquisition activity	Maintain a register of community feedback and complaints. Document Land Permitting agreements Document all restoration and compensation activities	Report property damages or incidents on a daily basis. Inform SUA CLO of feedback and complaints on a weekly basis Report restoration on a weekly basis. Report Land Permitting agreements and compensation on a weekly basis and include in monthly report	Seismic contractor SUA HSSE Seismic Lead
9.10.12 Disturbance to livestock from seismic survey activity	Maintain a register of community feedback and complaints Document Land Permitting agreements Document all restoration and compensation activities.	Report property damages or incidents on a daily basis. Inform SUA CLO of feedback and complaints on a weekly basis Report restoration on a weekly basis. Report Land Permitting agreements and compensation on a weekly basis and include in monthly report	Seismic contractor SUA HSSE Seismic Lead
9.10.13 Damage from vibration to structures, including buildings, shed, fences, wells and septic tanks	Document, by inventory, the features of natural and built environment Inspect and document the condition of all structures before and after survey. Maintain a register of community feedback and complaints SUA CLO Document all restoration and compensation activities	Report property damages or incidents on a daily basis. Inform SUA CLO of feedback and complaints on a weekly basis Report restoration activities and compensation on a weekly basis. Report Land Permitting agreements on a weekly basis and include in monthly report	Seismic contractor SUA HSSE Seismic Lead

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
9.10.14 Decreased tourist appeal of the area due to noise and disturbance (e.g. traffic or visual disruption)	Maintain a register of community feedback and complaints and inform SUA CLO on a weekly basis. Document all notifications of authorities on a weekly basis	Inform SUA CLO of feedback and complaints on a weekly basis Report records of notifications to authorities in the monthly report	Seismic contractor SUA HSSE Seismic Lead
9.10.15 Disturbance to local community by equipment and vehicles by noise and vibration	Maintain a log of all flight routes and report on a weekly basis Document all notifications of authorities on a weekly basis Maintain a register of community feedback and complaints	SUA CLO of complaints on a weekly basis. Report all road incidents on a daily basis. Provide monitoring reports and logs in the monthly report	Seismic contractor SUA CLO
4.10.16 Poor handling, transportation, storage and use of explosives	Document all misfires on a daily basis Record the location of signage notifying landowners of the used of explosives in the vicinity Document all incidents of accidents and report on a daily basis Maintain a register of community feedback and complaints	Inform SUA CLO of feedback and complaints on a weekly basis Report all incidents of accidents on a daily basis. Provide summary of misfires , accidents and logs in the monthly report	Seismic contractor SUA HSSE Seismic Lead
9.10.8 Provision of security	Maintain records of security incidents and report on a daily basis Maintain a register of community feedback and complaints	Inform SUA CLO of feedback and complaints on a weekly basis Report all security incidents on a daily basis and include in the monthly report	Seismic contractor SUA CLO
9.11 Cultural heritage and archeology			
9.11.1 Damage to cultural monuments and archaeological sites	Cultural Heritage specialist to maintain records of cultural heritage sites demarcated Cultural Heritage specialist to document visual inspection of cultural monuments before and after seismic survey	Provide records of cultural heritage sites demarcated and inspection reports in the monthly report	Seismic Contractor Cultural heritage/archeologist specialist
9.11.2 Disturbance to intangible cultural heritage	Maintain records of chance finds and inform the Cultural Heritage specialist	Provide notifications of chance finds to SUA on a daily basis	

Environmental /Social Aspect and Potential Impact	Monitoring	Reporting	Responsible Party
	Maintain a register of community feedback and complaints	Inform SUA CLO of feedback and complaints on a weekly basis Provide registers and records in the monthly report	
9.12 Landscape and visual amenity			
9.12.1 Deterioration of roads and unpaved tracks 9.12.2 Vegetation clearance 9.12.4 Littering	Maintain a register of community feedback and complaints Monitor effectiveness of restoration efforts and natural vegetation regrowth after 1 year by a biodiversity specialist Monitor and maintain a log of road conditions requiring repair and restoration road conditions and undertake restoration efforts, where necessary. Maintain a log of road repair and restoration efforts completed Monitor work areas by visual inspection of work areas for litter on a daily basis.	Inform SUA CLO of complaints on a weekly basis Report signs of road deterioration and sites for possible restoration on a weekly basis. Document all restoration efforts in monthly report Provide monitoring records in the monthly report	Seismic Contractor SUA HSSE Seismic Lead SUA CLO Biodiversity Specialist

10. Environmental Management and Monitoring Plan

The Environmental Management and Monitoring Plan (EMMP) is the overarching management framework which SUA will implement to ensure mitigation measures are implemented and there is adequate monitoring of the environmental and social performance by the seismic contractor and SUA during the execution of the seismic survey. The environmental monitoring plan (EMP) is a sub-set of the EMMP which focuses on specific actions (e.g. implementation of mitigation measures) by the seismic contractor, SUA and specialists to mitigate potential adverse impacts or enhance the positive impacts.

The provision of an EMMP is a legal requirement of the Environmental Impact Assessment Report (according to the Appendix II of the DCM 686/29.07.2015). According to Appendix II of the DCM, the plan should ESHIA detail:

- The responsible entities and relevant roles for the EMP implementation (**Section 10.1**);
- Environmental Monitoring Plan costs (**Section 10.2**); and
- Stakeholder Engagement Plan (**Section 10.3**).

According to IFC Performance Standard PS1 (IFC, 2012), project proponents should establish and maintain a Social and Environmental Management System appropriate to the nature and scale of the project and commensurate with the level of social and environmental risks and impacts. This environmental management and monitoring plan is considered to be part of SUA's overall social and environmental management system for operations within Albania, including Block 4.

The impact assessment (see **Chapter 5 Negative Impacts**) described certain activities or aspects of the project which would, if unmitigated, have the potential to adversely impact on a range of environmental resources and social receptors within the project area of influence. The mitigation and management actions to eliminate, offset or reduce of potential significant negative impacts identified have been summarized in **Chapter 8, Mitigation Measures**. Environmental monitoring is the key element of the environmental management framework ensuring the measures and procedures for managing and mitigation risks to the physical, biological and social environment during all phases of the seismic survey are implemented and effective. The environmental monitoring plan provided in **Chapter 9, Environmental Monitoring Plan**.

The EMMP presented in this chapter is designed to facilitate the implementation of the Environmental Monitoring Plan (see **Chapter 9**). The plan is integral to the overall environmental management of the project and will act as a 'live' document to track progress through to completion of the seismic program. The EMMP represents SUA's commitment to address and manage potential impacts that could occur during seismic survey. Implementing the EMMP and the associated EMP is the responsibility of SUA and the selected seismic contractor.

10.1 Objectives

The EMMP covers all phases of the project from mobilisation to demobilization. Its main objectives are to:

- Ensure the project is compliant with applicable national environmental and social legal requirements (see **Chapter 1, Introduction**)
- Provide a framework to implement the mitigation measures identified in **Chapter 8 Mitigation Measures**
- Outline roles and responsibilities of SUA and the seismic contractor for the implementation of this EMMP;
- Identify dedicated subject specific management plans (i.e. plans for stakeholder engagement, waste management, water management, emergency response, spill prevention and response) which will be required to be developed by SUA and the seismic contractor prior to the start of the activities for the full implementation of proposed mitigation measures to reduce negative impacts and enhance positive ones;

- Provide monitoring requirements in order to ensure effective implementation of the mitigation measures and a mechanism for taking timely action in the face of unanticipated environmental situations;
- Identify training and competency requirements;
- Describe project communication protocols;
- Identify documentation and reporting requirements;
- Summarise the types and frequency of audits and reviews and identify the parties responsible for audit supervision and conducting of audits;
- Describe the requirements for change management, the processes in place to handle unforeseen or unexpected conditions or situations, and any review and potential modifications to the EMMP.

10.1.1 Environmental Management Framework

The environmental management of the project will be conducted within a comprehensive framework comprising:

- Shell HSSE & SP Policy
- Seismic Contractor's EHS Policy;
- Dedicated personnel to implement mitigation measures and to provide oversight and support of the seismic survey contractor's activities;
- EMMP(this Chapter);
- Training Programs;
- Specific Project Management Plans; and
- Monitoring Program

The framework also includes mechanisms to engage with the communities.

A typical management process is structured around six steps: 'policy, organize, plan, implement, monitor and review', to ensure continuous improvement in performance' as depicted in

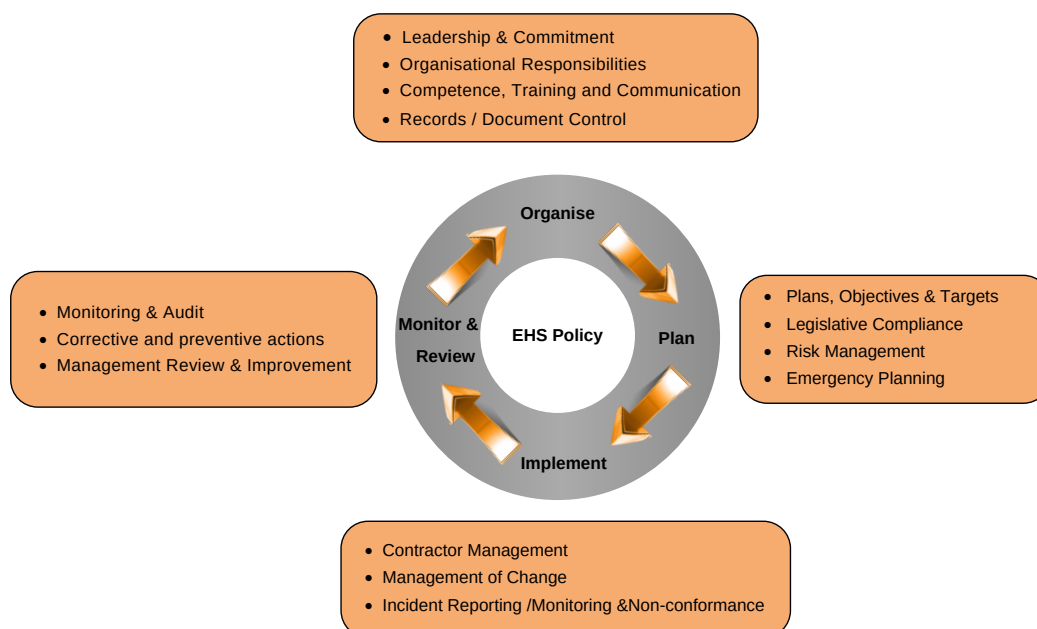


Figure 10-1 EHS Management System Framework (adapted from management systems principles of ISO14001 and OSHAS18001)

The EMMP is developed on this basis and will be implemented throughout the project planning, mobilization, operational and demobilization activities. EMMP implementation will be the responsibility of SUA and its seismic contractor. The EMP is essential and integral to the overall environmental management of the Project. The monitoring plan is provided in **Chapter 9, Environmental Monitoring**.

The EMP includes:

- social and environmental management plans (e.g. Stakeholder Engagement and Waste Management Plans);
- plans for community interactions and employment (e.g. Community Feedback mechanism); and
- monitoring of the implementation of the mitigation measures and reporting requirements.

These plans will summarise the specific actions, procedures or mitigation measures that will be implemented to reduce the potential impacts. The plans will also identify the personnel responsible for implementing the required procedures or mitigation actions and monitoring, reporting and documentation requirements and the key indicator(s) of compliance with the mitigation measures.

10.1.2 Roles and responsibilities

This section describes the roles and responsibilities of SUA and the seismic contractor in relation to the management actions defined in the EMMP.

Protection of the environment and of social rights is the responsibility of all project personnel. The SUA senior management plays an important role in demonstrating leadership and commitment in the EMMP implementation. The roles and responsibilities of SUA personnel are detailed in Table 10-1.

The seismic contractor is responsible for implementing the environmental monitoring and management plans and procedures in line with applicable national standards, as well as SUA procedures and guidelines. SUA is responsible for management of the performance of the seismic contractor through site inspections, monitoring, and auditing. The roles and responsibilities of seismic contractor's personnel are detailed in Table 10-2.

Environmental monitoring will be undertaken primarily by the seismic contractor however they will be supported by:

- A Biodiversity specialist ;
- Cultural heritage and archeology specialist; and
- An independent environmental monitor;

The biodiversity and cultural heritage specialists will provide guidance to the seismic crew within their areas of expertise and monitor the implementation of the mitigation measures through inspections of all work areas, verify the efficacy of mitigation measures and provide documentation and records of compliance with the mitigation measures. The independent environmental monitor will document the implementation and efficacy of the mitigation measures and prepare a compliance report to be submitted to NEA in accordance with the conditions of the Environmental Declaration. The roles and responsibilities of environmental monitors are shown in Table 10-3.

10.1.2.1 SUA

SUA is accountable and responsible for the EHS management of the proposed seismic survey. Roles and responsibilities for SUA personnel to support the seismic survey are provided in Table 10-1

Table 10-1 Roles and responsibilities for SUA personnel

Role	Responsibilities
Seismic Survey Lead	• Ensure that the seismic data acquisition program is conducted in accordance with the provisions and requirements of this EMMP and project specific EMP • Ensure that incidents, hazards or other environmental related deficiencies are reported, analyzed and rectified. • Verify/endorse Final Inspection Report prepared by the seismic contractor
Health, Safety, Security and Environment (HSSE) Lead	• Review the site specific environmental, social and health management plan (EMP) • Provides support to the seismic contractor on the development of training materials • Provide advice and feedback to the contractors on HSSE

	• matters. • Ensure and audit the seismic contractor for compliance with all aspects of the EMP and implementation of corrective actions
Land and Permitting Lead	• Support the seismic contractor in developing a Land Permitting Plan and Compensation Plan aligned with SUA's Land Acquisition Framework • Assess the Land Permitting and Compensation Plans prepared by the seismic contractor
External Relations Lead	• Support the seismic contractor in developing a job request response protocol • Provide support to the seismic contractor in preparing and implementation of plans with respect to community interactions such as, the Stakeholders Management, Hiring Plan and Accommodation Plan. • Assist in the development of community awareness initiatives related to project activities. • Ensure that system to register, monitor, and report and track job requests and employment of local staff is maintained by the seismic contractor • Ensure that the system to register, monitor, and report and track community feedback and grievances is maintained by the seismic contractor • Ensure that all compensation is paid. • Maintains all external communications with Stakeholders, as necessary.
Community Liaison Officer	• Implement the Stakeholder Engagement Plan • Provide day to day support to the seismic contractor's Permitting Lead and Officer. • Inform local communities on the role of the CLO and access to the community feedback process and grievance mechanism. • Maintain a system to register, monitor, and report and track job requests and employment of local staff

SUA will allocate a dedicated seismic survey HSSE Lead to monitor the contractor's performance and provide advice on environmental, health and safety issues during project planning and implementation. The HSSE Lead will be responsible for monitoring the implementation of SUA HSSE Policies and the EMMP, and will have the authority to stop work in case of non-compliance, and impose remedial action. The HSSE Lead will be SUA's EHS representative for the seismic crew.

SUA will implement the Stakeholder Engagement Plan. The Plan identifies relevant stakeholders and specifies engagement activities that should be undertaken during the execution of the Project. SUA's Community Liaison Officer (CLO) will be responsible for implementing the community feedback mechanism to maintain open lines of communication with the community representatives and to address any grievances that may arise throughout the project lifecycle.

SUA will contract an external independent monitor to assess restoration compliance and produce a Final Compliance Report for submission to NEA, if required as a condition of the Environmental Declaration.

10.1.2.2 Seismic Survey Contractor

The seismic survey contractor who will carry out field activities for the acquisition of seismic data has obligations under Albanian law, and under the contract with SUA, to fulfill the environmental and social commitments specified in this EMMP. It is expected that the seismic contractor will:

- Appoint an HSSE Lead within its project team who will facilitate the implementation of this EMMP and other project specific plans;
- Obtain additional operational permits, where necessary, from the local and regional authorities (i.e. wastewater discharge, etc.);
- Develop a Permitting Plan aligned with the SUA Land Acquisition Framework before project mobilization to obtain permission from the stakeholders concerned to carry out work on their property, identify sensitive elements and determine the compensation which may need to be paid.

- Prepares specific management and control plans and ensure that operational controls and procedures are fully consistent with the level of environmental, social, health, archaeological and cultural heritage safeguards set out in the ESHIA and EMP;
- Provide project personnel and workers with appropriate training to implement the EMP and comply with SUA's EHS guidelines and standards as well as any conditions specified by the Albanian authorities;
- Provide SUA with weekly EHS reports on project performance;
- Report incidents, including near-misses, irrespective of their scale;
- Take appropriate steps to contain and minimise damage in the event of a non-routine event;
- Identify in advance the additional elements or events which are likely to pose environmental and social risks, and inform SUA on risk management strategies.

As the seismic contractor has not been appointed yet therefore indicative roles and responsibilities of the seismic contractor's personnel to support the seismic survey are provided in Table 10-2.

Table 10-2 Indicative roles and responsibilities for the seismic survey contractor

Role	Responsibilities
Party Manager	• Manage the seismic crews including Health, Safety and Environmental (HSSE) Lead and Community Liaison and Land Permitting Lead. • Liaising with Seismic Survey Lead and or the SUA Geophysical Operations Project Lead • Monitors the implementation of the of this EMMP • Provides appropriate resources, staffing and training in support of the implementation of the EMP • Guarantee that roles, responsibilities and authorities have been defined, documented and communicated
Health, Safety , Security and Environment (HSSE) Lead	• Understands the requirements of the EMMP and the conditions of any permits and consents. • Supervise, manage and ensure the implementation of the EMP and all plans referenced within as well as SUA and contractor's HSSE policies • Provide recommendations to SUA on revision of the EMP and any specialist procedures. • Update or revise the EMP as necessary and submit to SUA for approval • Prepares all training materials in coordination with SUA, as necessary. • Ensure the delivery and documentation of training, including site inductions • Coordinate initial site briefings, toolbox talks, EHS and operational meetings and emergency drills. • Confirm that the appropriate control measures are being implemented effectively by appropriately trained staff. • Maintain records of environmental monitoring as described in the EMP and perform internal audits as required by the EMMP. • Confirm that all issues/non-compliances/incidents identified are responded to in an efficient and effective manner. • Notify SUA of all near misses and incidents • Keeps the Party Manager informed about all environmental and social performance issues, implementation issues and compliance/noncompliance with the EMMP or EMP. • Prepares a Contractor Weekly Monitoring, Monthly and Final Inspection Report for submission to SUA.
Health, Safety , Security and Environment (HSSE) Field Supervisors	• Support the Health, Safety, Security and Environment (HSSE) Lead as necessary • Supervise the implementation of mitigation measures and controls and document compliance with the EMP • Supports seismic survey crews in the field on HSSE matters.
Permitting Lead	• Provide direction and support to the Permitting Officer • Develop Land Permitting Plan and Compensation Plan in coordination with SUA. • Maintain documentation of community awareness initiatives related to project activities • Maintains a system to register, monitor, and report and track job requests and employment of local staff
Permitting Officer	• Implements the Land Permitting Plan

-
- Registers job requests
 - Registers community feedback and grievances.
-

Table 10-3 Roles and responsibilities of monitors and specialists

Role	Responsibilities
Independent monitor	The independent site monitor will provide nonbiased oversight of the seismic contractor's compliance with all mitigation measures. The monitor will: • Verify compliance with conditions of the Environmental Declaration • Review environmental monitoring reports and undertake a site survey to confirm mitigation measures have been implemented and effective. • Complete an Independent Monitoring Report for submission to NEA in accordance with the conditions of the Environmental Declaration.
Biodiversity specialist	The Biodiversity specialist will support the seismic survey crew in all aspects related to the protection of habitats and species, in particular: • Provide guidance on the locations of sensitive habitats and species behaviors • Maintain a list of species of conservation concern encountered • Ensure site restoration efforts are implemented and no residual impacts remain.
Cultural heritage and archeology specialist	The Cultural heritage specialist will support the seismic survey crew in all aspects related to the protection cultural heritage, in particular: • Provide guidance on the boundaries of cultural monuments and fragility • Document that no damage to cultural monuments has occurred • Notify SUA of any damage to cultural monuments

10.1.3 EMMP Implementation

The EMMP is a management framework to be adopted by both SUA and the seismic contractor as per their roles. SUA will support the seismic contractor to ensure that the appropriate levels of environmental safeguards are in place throughout the duration of seismic survey. The seismic survey contractor will be contractually required to adopt and implement the mitigation measures proposed in the ESHIA (see **Chapter 8, Mitigations Measures** and **Chapter 9 Environmental Monitoring Plan**). The general procedure to ensure that the seismic survey contractor appropriately address the issues will be as follows:

- SUA's HSSE Lead or an appointed delegate will supervise and confirm the seismic survey contractor's conformance with the requirements of the EMP and will review and approve the reports prepared by the seismic survey contractor and specialists;
- The seismic survey contractor will be responsible for EMP implementation and for carrying out self-monitoring to verify compliance with the requirements.

The EMMP may be reviewed, revised and updated during the life of the seismic survey contractor's contract to address efficacy of EHSIA mitigation implementation or to address changes that might occur as a result of changed conditions or project activities.

10.1.4 Training

SUA will ensure that all staff receives sufficient training and assessment to satisfactorily meet their responsibilities and achieve the competencies required for their position. SUA will also ensure that the contractor provides sufficient training to its employees to meet the same objectives. Although the seismic contractor is primarily responsible for providing the appropriate training to the seismic survey staff and field personnel, SUA will provide training and or support as necessary, to the seismic contractor who will then in turn provide training to the relevant staff. Training of the seismic crew will be implemented by the seismic contractor's HSSE Lead and Permitting Lead with support from the SUA CLO, the SUA HSSE and External Relations Leads and specialists, as appropriate, before the commencement of field activities.

Training of the seismic survey crew will include:

- Site induction;
- Code of conduct;
- Cultural heritage awareness; and
- Environmental awareness.

10.1.4.1 Site Induction

The seismic contractor is responsible for conducting the staff inductions and ensuring that all members of staff have received the environmental induction. An induction register will be kept up to date with details of staff inductions. The SUA Community Liaison Officer and the seismic survey contractor will inform that all seismic survey crew of current issues such as recent social and environmental incidents. All training material should be prepared in appropriate languages.

An indicative seismic contractor training program is shown in Table 10-4 which will be finalized before commencement of the project.

Table 10-4 Indicative Seismic Contractor Training Program

Seismic Contractor Staff	Training Topics
HSSE Lead	• Community feedback process and grievance management plan • Local employment response protocol • Community engagement protocols • Community Interactions • Code of conduct • Environmental awareness • Cultural heritage awareness • First Aid
HSSE Field Supervisors	
Community Liaison and Permitting Lead	
Drivers	• Safe Driving • Security • Road safety and access restrictions • Vehicle movement restrictions • Refuelling operations • Spill response and control • Waste management • Code of conduct • Environmental awareness • Cultural heritage awareness • First Aid
Survey Crew	• Vehicle movement restrictions • Communications and reporting • Waste management • Community Interactions • Code of conduct • Environmental awareness • Cultural heritage awareness • First Aid

Seismic Contractor Staff

Training Topics

Drilling Personnel	• Refuelling operations • Road access restrictions • Vehicle movement restrictions • Communications and reporting • Waste management • Community Interactions • Code of conduct • Environmental awareness • Cultural heritage awareness • First Aid
Recording and Loading Crew	• Road access restrictions • Vehicle movement restrictions • Communications and reporting • Waste management • Community Interactions • Code of conduct • Environmental awareness • Cultural heritage awareness • First Aid
Mechanics and Vehicle Repair Personnel	• Environmental controls for vehicles and equipment • Spill response and control • Hazardous substances • Waste management
Base, Explosives storage magazine and Fly Camp Personnel	• Facility Rules • Security • Spill response and control • Hazardous substances • Waste management • Code of conduct
Restoration Teams	• Site restoration requirements • Waste Management • Code of conduct • Environmental awareness • Cultural heritage awareness • First Aid

Site induction training will include reviews of the management control plans such as traffic management plan and waste management plans and, in particular, the mitigation measures and monitoring plan provided in the ESHIA (**Chapter 8, Mitigation Measures** and **Chapter 9, Environmental Monitoring Plan**).

10.1.4.2 Code of Conduct

The main objective of the code of conduct training is to raise awareness of the sensitivities of the communities within which the seismic crew will be operating. The crew will be introduced to the social context of the project area, including the rural lifestyles and the fact that many of the residents of the rural areas are elderly and potentially vulnerable to project impacts.

Code of conduct training will address:

- Set standards of behavior;
- Use of prohibited substances (i.e. alcohol);
- Respect for community members and their property;
- Respect cultural heritage including cultural events and religious practices and ceremonies; and
- Reporting process (i.e. when to report, to whom to report, how to report and disciplinary measures for not reporting)

All personnel will be provided with a copy of the code of conduct, who should acknowledge in writing having received a copy.

10.1.4.3 Cultural Heritage Awareness

Training in cultural awareness and sensitive issues is an important component of the EMP. The SUA CLO will provide support to the seismic contractor, as needed. The Cultural Heritage specialist will provide support as needed.

The scope of the cultural heritage awareness training program should include, at a minimum, the following components:

- Local norms and practices (e.g. religious and secular practices);
- Procedures for archaeological finds (including prohibition of removal of any artefacts or materials);
- Measures that are to be implemented as part of the seismic survey to avoid or minimize adverse impacts to local communities and archaeological finds;
- Reference materials available for field use (i.e. maps or specific information about a particular site); and
- Reporting procedures for community interactions or archaeological finds.

SUA will provide guidance on potential and known cultural heritage sites within the seismic survey area to the seismic contractor. A training register will be kept up to date with details of staff training.

10.1.4.4 Environmental Awareness

The main objective of the environmental awareness training program will be to ensure that all seismic personnel are aware of the EMP requirements with regards to individual responsibilities. Specific training components for the environmental awareness training will focus on natural monument and species awareness and sensitivities.

The seismic contractor is primarily responsible for providing the appropriate training to the seismic crew. The SUA CLO will provide support to the seismic contractor, as needed. The Biodiversity specialist) will provide training and or support on some topics.

The scope of the environmental awareness training program should include, at a minimum, the following components for natural monuments and species of concern:

- Description natural monuments;
- Description of representative species (including behavior);
- Habitats (i.e. Annex 1 habitats and sensitive habitats) that are used by each species within or immediately adjacent to the project site that are or have been used by each species;
- Measures that are to be implemented as part of the seismic survey to avoid or minimize adverse impacts to natural monuments and habitats including the need to observe the buffer zones;
- Reference materials available for field use (i.e. maps, habitats and species descriptions etc.); and
- Reporting procedures if any of the species are observed.

10.1.5 Management Plans

Management plans will be developed to ensure that the project environmental and social commitments and obligations are met and mitigation measures are effectively implemented during all project phases. The seismic contractor will develop the management plans identified in the environmental monitoring plan in cooperation with SUA. The seismic contractor is responsible for the implementation of the management plans with the exception of the Stakeholder Engagement Plan. Implementation of the SEP will be the responsibility of SUA; however, the seismic contractor will support SUA in updating the plan as necessary.

The management plans will be regularly revised in light of project progress and performance. The management plans include:

- Land Permitting Plan;
- Local Hiring Plan;
- Compensation Plan;
- Worker Accommodation Plan;
- Journey Management Plan;
- Traffic Management Plan;

- Land Transport Safety Plan
- Water Management Plan;
- Waste Management Plan;
- Emergency Response Plan (ERP), including Spill Prevention and Response Plan;
- Site Restoration Plan; and
- Stakeholder Engagement Plan (see **Section 10.3**)

These plans will be finalised prior to the start of activities. Additional plans will be developed as and when there is a need in coordination with SUA. An overview of the key elements of the plans is provided below and should be adopted by the seismic contractor, as practicable.

10.1.5.1 Land Permitting Plan

The Land Permitting Plan will align with the SUA Land Acquisition Framework before project mobilization. The Land Permitting Plan defines the process for gaining consent for land access and arranging for compensation if necessary. This will apply for all project components, including land required for the base, heliport and fly camps as well as the access and clearance required for the survey lines. The Land Permitting process will recognize the land ownership rights of people who cannot provide written documentation. Written documentation to prove land ownership should not be required in all cases. Verification of land ownership rights should include input from village heads. The Land Permitting process must plan for situations where land owners are absent and cannot be reached to provide consent for land access. Consent will not be assumed when land owners cannot be identified or contacted.

The Land Permitting process must include:

- identifying and informing the plots' owners and occupiers information about the project and negotiation of the right to access and impact land;
- Prepare an inventory of the cultivated or culturally or ecologically sensitive areas directly impacted by activities along the seismic line or may fall within the setback distances within the seismic corridor to inform the compensation plan;
- Crosscheck with information on sensitive areas provided by SUA and the specialists (e.g. cultural heritage and natural monuments);
- make a record of dwellings and other assets which may be affected by the project;
- develop agreements with the owners of any assets (cultivated areas, dwellings, other assets) for access;
- where possible within schedule, provide opportunity for any impacted crops to be harvested by the owner before clearance; and
- post-project follow-up inspection to assess the actual damage or detriment caused by the project activities.

10.1.5.2 Local Hiring Plan

A local hiring plan will be developed which will outline the strategy and steps to be taken to provide employment opportunities with respect to the seismic survey operations. Key elements of the Hiring Plan include:

- Identification of skill sets required;
- Development of job descriptions and selection criteria;
- The mechanism to advertise job opportunities; and
- Establishment of pay scales and methods of payment.

10.1.5.3 Compensation Plan

A Compensation Plan will be developed to define the process for investigating unplanned damage caused by the project and the basis on which compensation will be paid. For damage to any asset on which the impacted party is reliant for subsistence, income or shelter the Compensation Plan must include a process that is specifically designed for the timely repair, restoration, replacement or cash compensation. This applies particularly to any damage to water sources, the structural integrity of a residence, or any damage that could impact the income or health of an elderly or other vulnerable person.

;. The compensation rates will be developed by SUA and provided to the seismic contractor. In case of loss in cultivated land or damage of infrastructure, compensation should be provided and the project must make up for losses and damage caused. Compensation rates specific to agriculture and livestock will consider:

- damage to crops rates based on market value (as verified by the Commune, Municipality (Agriculture Department) or District
- In the event of livestock injury or death, financial compensation based on the market price of the animal killed and transport costs associated with the replacement animal.
- In the event of an orphaned calf or for a breeding animal compensation will allow for calf milk replacement and labour costs rearing a calf.

A standard rate of valuation of assets for structures (e.g. fences, roads etc.) will be developed in consultation with municipality and village administrators for equitable compensation to all affected parties:

According to the process developed by SUA in previous surveys:

- If the circumvention or avoidance of a sensitive site (such as crops) is not technically feasible, the project proponent is obliged to compensate the concerned parties for the losses caused by the project after mutual agreement and development of a written agreement signed by both parties and countersigned by an official of the concerned municipality. Standardization of the compensation must be carried out before the survey or activity takes place;
- Compensation negotiations are managed by the seismic contractor under the supervision/monitoring of a SUA representative. Negotiations will be in the Albanian language. All negotiations will be in the presence of a representative of the local authority.

Minutes should be drawn up and signed by the person in charge of the contractor, a representative of SUA and the person/entity concerned and should be countersigned by a duly appointed administrator of the municipality or village. Compensation shall be paid according to the actual damage recorded.

The Compensation Plan will make provisions for:

- Finalizing agreements with the owners of any assets (cultivated areas, dwellings, other assets) for compensation amounts for any damage or detriment caused by the activities of the project;
- For damage to any asset on which the impacted party is reliant for subsistence, income or shelter the Compensation Plan must include a process that is specifically designed for the timely repair, restoration, replacement or cash compensation. This applies particularly to any damage to water sources, the structural integrity of a residence, or any damage that could impact the income or health of an elderly or other vulnerable person.
- Crops that are used for household use must be valued to fully reflect the costs of buying replacement food for those in rural areas. This valuation must include recognition of the travel and time costs of travel to the closest market / shop to buy replacement food.

10.1.5.4 Worker Accommodation Plan

The Worker Accommodation Plan for use in selecting options for worker accommodation and then managing accommodation to provide safe and comfortable accommodation and minimise impacts to local residents. The Worker Accommodation plan will include the following measures:

- Alternative analysis for choosing the preferred balance between in-community living (in hotels or short-term rental accommodation) versus accommodation in Base and fly camps, and the location of Base and fly camps. The alternatives analysis must include the criterion to avoid excessive use of accommodation that would otherwise be used by tourists, particularly at peak tourist seasons and during major events as given in the baseline section.
- Consultation with potentially impacted stakeholders must be undertaken before decisions on local accommodations and fly camp locations are made. This consultation must include the local village, sub-municipality and Municipality authorities.
- Waste management must be conducted to avoid littering and pollution of local areas and to avoid creating burden on local waste management systems. Sewage must only be discharged under the terms of prior agreement with the local authorities.
- SUA will inspect proposed accommodations and approve before use.

- Emergency response plans for the accommodations must be defined, consulted with stakeholders who may be involved in emergency responses (e.g. local medical services), and then implemented with worker training and drills as required.

If workers are accommodated in houses or other buildings (e.g. schools) within villages then the Contractor must consult with community representatives. This will ensure that host villages are aware of the planned use of the village for temporary accommodation and give consent for siting within their village. These consultations should address:

- Consent for use as accommodations will be obtained from the building owner.
- The method of payment of rental fees, either paid locally to private owners (for houses) or to the governing authority for public infrastructure such as old schools.
- Payment of fees for the use of water, roads and any sanitation infrastructure
- The possible need for houses or public infrastructure to be altered for use and the conditions return to the owner or community, i.e. whether restoration or retention of changes is preferred.
- If workers are accommodated in houses or other buildings (e.g. schools) within villages and if adequate sanitation systems are not present or cannot be installed or upgraded then all sewage must be taken offsite. All waste must be transferred off site.

10.1.5.5 Journey Management Plan

To prevent potential traffic accidents that could lead to the loss of human life and local fauna, a project specific Journey Management Plan will be prepared. This will contain actions for, amongst others, improving driver and vehicle safety, enforcement of speed limits at all times. The Journey Management Plan will be aligned with SUA's processes and procedures.

10.1.5.6 Traffic Management Plan

The Traffic Management Plan is designed to promote safe driving and reduce the risk of accidents, damage to roads and disruption to local residents. The Traffic Management Plan will be aligned with GIIP and include the following:

- Designated traffic routes should be defined to ensure optimal vehicle use on shortest routes while avoiding roads that are identified to be sensitive due to their poor conditions or potential hazards (e.g. landslides). Designated traffic routes should avoid local residential roads where possible and practicable. When travel through villages is required the best routes should be defined with consideration of road conditions and potential disruption to residents.
- Specification of speed limits based on road and weather conditions and requires all project workers adhere to them. Speed limits on low quality unpaved access roads and through villages should be further reduced to minimise the risk of traffic accidents;
- Specification of nighttime driving restrictions.
- Requirement for all drivers to conduct dynamic risk assessments of potentially hazardous routes, particularly when weather conditions change or there is deterioration of road quality. Drivers must report observed hazards and access challenges so that designated traffic routes can be updated.
- In areas of high sensitivity signage may be required to advise project drivers of designated routes, speed limits and specific hazards. Signage and signaling will also be applied when required to advise other road users, particularly in areas of high project traffic at the Base and explosive storage magazine;
- Emphasis on safe driving culture through toolbox talks, training for drivers, and as part of induction training for all site workers;
- Definition and implementation of limits for trip duration, total driving time per day, and arranging driver rosters to avoid overtiredness;
- As part of induction training drivers must be informed of the potential for livestock to be present on all roads. When livestock are encountered drivers must proceed with high caution, allowing adequate time for the livestock keepers to clear the road.

- Minimum specifications for project vehicles and requirements for inspection and maintenance must be defined and adhered to.

10.1.5.7 Land Transport Safety Plan

The Land Transport Safety Plan is make reference to the provisions of the traffic management plan as they are closely related in scope.

Transportation of hazardous materials should comply with applicable national legislation and best industry practice; in particular, the standard mitigation and control procedures for transportation of hazardous materials should include:

- Labelling of containers, including identification and quantity of the contents, hazards, and seismic operator contact information;
- Ensuring that the volume, nature, integrity and protection of packaging and containers used for transport are appropriate for the type and quantity of hazardous material and modes of transport involved;
- Ensuring vehicle specifications correspond to the nature of hazardous waste being transported;
- Project specific measures for transportation of hazardous materials include:
 - Training employees involved in handling, packaging and transportation of hazardous materials;
 - Using labelling and placarding (external signs on transport vehicles), as required;
 - Providing the necessary means for emergency response on call 24 hours/day; and
 - Providing waste transfer notes (WTN) that describe contents of the load and its associated hazards in addition to the labelling of the containers. The WTN should establish a chain-of-custody using multiple signed copies to show that the waste was properly transported and received by licensed recycling or treatment/disposal facilities.

10.1.5.8 Water Management Plan

A Water Management Plan will aim to ensure the sustainable use of water resources and minimise any impact to the water supply of other users. The plan should promote conservation of water in all project activities.

The Water Management Plan will:

- Specify the sources of water that will be used and outline how the use of local water sources will be managed to avoid noticeable impacts on water supply to other users.
- Specify the agreements obtained / to be obtained from the municipalities or other authorities.
- Define how water consumption will be monitored throughout the project lifecycle to ensure it aligns with planned and approved water use from municipality and other local sources;
- Define the engagement that will be undertaken to seek feedback on any impacts of the project's water use on the supply to other users. If an impact is reported then the Water Management Plan will be updated to mitigate this impact.

In the event of reduced water availability as a result of project water requirements, SUA would identify an alternative source of water supply for the project.

10.1.5.9 Waste Management Plan (and Duty of Care Procedures)

In order to ensure best practice with respect to waste management, a Waste Management Plan (WMP) including duty of care procedures will be developed and implemented and will include regular qualitative and quantitative monitoring of all waste streams. All project wastes will be managed in accordance with Albanian legislation and good industry practices.

The purpose of the WMP is to organize waste management from its point of production up to final disposal, in order to reduce potential environmental impact and harm to human health. SUA's corporate EHS Policy commits to environmentally responsible performance throughout its activities. In order to achieve these aims it is essential that the following objectives are met through WMP development and implementation:

- Compliance with all applicable legislation;
- Waste streams originating as a result of seismic and associated activities must be defined and disposed of correctly;
- All reasonably practicable steps must be taken to minimise these waste streams and by careful selection of materials turn hazardous waste streams into less hazardous or non-hazardous alternatives;
- Responsibilities for minimising waste (particularly hazardous waste) and for ensuring that all waste is handled in a specific manner must be clearly allocated;
- Environmentally sound methods of handling, storing, transporting and disposing of the waste streams must be specified;
- Arrangements must be put in place to check compliance with the stipulated requirements for handling, storing, transporting and disposing of wastes.

The Waste Management Plan will be based on international best industry practice such as IAGC Environmental Manual for Worldwide Geophysical Operations²⁷⁸ and the IAGC Land Geophysical Safety Manual²⁷⁹, OGP Guidelines for waste management on areas with limited infrastructure²⁸⁰ and general international guidance such as the IFC EHS guidelines on waste management²⁸¹ and Onshore Oil and Gas Development²⁸².

10.1.5.10 Emergency Response Plan

A project specific Emergency Response Plan (ERP) will detail measures to be taken by project personnel in the event of emergency and accidents. It will assess the risks to environment, personnel and assets. Safety training, Spill Prevention and Response Plan, Medical Emergency Response Plan, Crisis Management Plan, Fire Response Plan and Evacuation Plans will all be included in the ERP.

The Emergency Response Plan will:

- Summarise emergency response procedures for spills, fires, uncontrolled explosions, road accidents etc.
- Describe the role of the Client, Contractor and Subcontractor in an emergency.
- Describe reporting procedures and interface process with authorities in the event of an emergency.
- Describe the emergency services that are available in the event of an emergency e.g. medevac; hospitals; evacuation; fire-fighting. Set out the call out procedures.
- Contact details (telephone; email; radio etc.) for all relevant project personnel, third parties and emergency services

The ERP will define among other things:

- Who is the Emergency Response Coordinator?
- How will the Emergency Response Plan be documented and displayed?
- What emergency response drills and competencies are needed?
- What equipment is required and where should it be located?
- What are the responsibilities of individual crew members?
- Who needs to be contacted, by whom and when.

²⁷⁸ IAGC, 2013 Environmental Manual for Worldwide Geophysical Operations
https://www.iagc.org/uploads/4/5/0/7/45074397/environmental_compliance_manual.pdf

²⁷⁹ IAGC 2012 Land Geophysical Safety Manual

http://www.iagc.org/uploads/4/5/0/7/45074397/iagc_landsafetymanualonlineversion_2012_12_19.pdf

²⁸⁰ OGP 2009 Guidelines for waste management with special focus on areas with limited infrastructure <http://inswa.or.id/wp-content/uploads/2012/07/Guidelines-for-waste-management-with-special-focus-on-areas-with-limited-infrastructure.pdf>

²⁸¹ IFC 2007 EHS Guidelines for Environmental Waste Management

<https://www.ifc.org/wps/wcm/connect/6e4e348048865839b4cef66a6515bb18/1-6%2BWaste%2BManagement.pdf?MOD=AJPERES>

²⁸² IFC 2007 EHS Guidelines for Onshore Oil and Gas Development,

<https://www.ifc.org/wps/wcm/connect/4504dd0048855253ab44fb6a6515bb18/Final+-+Onshore+Oil+and+Gas+Development.pdf?MOD=AJPERES&id=1323153172270>

Relevant emergency response equipment will be located at working points and in vehicles in line with SUA requirements. Safety measures from the IAGC Land Geophysical Safety Manual and the IAGC Environmental Manual for Worldwide Geophysical Operations will be incorporated in the ERP.

10.1.5.11 Spill Prevention and Response Plan

The Spill Prevention and Response Plan (SPRP) can be included as part of the ERP which will be agreed between SUA and the seismic contractor. The SPRP will include a procedure for inspecting and testing pollution prevention equipment and systems. Testing and inspection of the fluid handling equipment and systems at the base camp will be conducted by the Field HSSE Lead on a periodic basis commensurate with the complexity, condition and circumstances of the facility. Safety measures from the IAGC Land Geophysical Safety Manual and IAGC Environmental Manual for Worldwide Geophysical Operation as well as SUA's internal emergency procedures will be incorporated.

10.1.5.12 Site Restoration Plan

To prevent a lasting impact on the environment as a result of the project camps, a site restoration plan will detail the works required, and procedure for returning the sites of the base camp and fly camps back to their original condition (prior to camp installation). For example, if levelling was required during construction, organic-rich topsoil will be removed and stockpiled in appropriate locations for later use in the restoration of affected areas. Similarly any stripped vegetation will be retained in the area for subsequent restoration of the land. The site restoration plan and works will be in accordance with GIIP.

10.1.6 Monitoring Plan

Environmental monitoring is an essential component of the environmental management framework ensuring the measures and procedures for managing and mitigation risks the physical, biological and social environment during all phases of the seismic survey. The EMP is provided in **Chapter 9 Environmental Monitoring Plan**.

10.1.7 Project Communication

10.1.7.1 Communications and consultations

Communications and consultations are the integral part of EMMP for the project. This involves communications aimed at keeping SUA project management, the seismic contractor, governmental agencies and other key stakeholders and potential external parties informed about the progress of the work and monitoring activities. All communications regarding implementation of the EMMP will be coordinated through the designated focal point as designated by SUA in coordination with seismic contractor.

10.1.7.2 Internal communication

The key internal communications, relevant to environmental management will be between the seismic contractor's Party Manager and SUA's Seismic Survey Lead.

Internal communications shall include appropriate social environmental issues including:

- Any new items of applicable legislation;
- Any learning from social and environmental incidents; and
- Performance against objectives of the EMP.

Communication will use the agreed communication tool (e.g. written documentation). All records should be retained by seismic contractor and SUA as appropriate. Meetings should include safety, environmental and cultural heritage awareness and social issues as a mandatory agenda item may include:

- Toolbox meetings (e.g. daily briefings before the start of work)
- Operations meetings
- Monitoring progress meetings
- Management meetings

10.1.7.3 External communications

External communications with regulatory authorities will be maintained by SUA. External communications with the stakeholders will be maintained by the SUA CLO or delegate throughout the seismic study. This will include:

- Consultations regarding land acquisition and compensation
- Consultations regarding grievances and employment
- Additional consultations may also be required to address
 - Security
 - Stakeholder engagement
 - Interactions with local communities
 - Management of archaeological, cultural or heritage properties
 - Capacity building
 - Emergency Response

10.1.7.4 Meetings

Regular coordination meetings ensure communication between all parties and serve as a mechanism to highlight key EMMP and EMP implementation issues in a timely manner. The following are some examples:

- **Kick-off meeting:** The purpose of the meeting will be to present the EMMP and EMP to the senior staff of the SUA seismic survey team and seismic survey contractor's team. The implementation of the plan will be discussed during the meeting. The SUA CLO and the seismic survey contractor's senior management, field management, supervisors and biodiversity and cultural heritage specialists will attend the meeting.
- **Tool box meetings:** The daily toolbox talks are attended by all seismic crews. Toolbox talks will be provided on a daily basis to reinforce the culture of HSSE protection as part of work ethic and will include any materials referenced within the environmental control plans or method statements, including e.g.: terrestrial ecology, archaeological artefacts, noise, air and water pollution, waste management spillage containment, community interactions, sensitive receptors and other HSSE issues specific to the work activity.
- **Daily operations meetings:** The daily operations meetings are attended by senior managers and supervisors. The purpose of the daily meetings will be to discuss progress of the seismic survey as well as any HSSE issues. HSSE issues to be addressed include inspections and audits, recent noteworthy environmental, socioeconomic and health incidents, findings and recommendations of the monitoring teams, to identify and discuss any areas of concern including any changes to the EMP as a result of changes in activity or unforeseen circumstances, and to finalize the daily environmental reports.
- **Weekly health safety and environment meetings:** The weekly HSSE meetings are held with both junior and senior staff. Any relevant environmental issues, progress of the monitoring teams, and areas of concern will be discussed during these meetings. The weekly environmental reports will also be discussed during these meeting.

10.1.8 Documentation

Accurate documentation is essential for tracking and evaluating the implementation and effectiveness of the EMMP and EMP. Each environmental management plan and community engagement plan will identify the specific reporting and documentation requirements. Processes shall be in place for controlling documentation and to ensure that it is available at all time, valid and current. All documentation becomes a part of the

environmental site history file. The seismic contractor will maintain records and track performance. The following documents that are to be kept onsite include, but are not limited to:

- Amendments to the EMMP
- All plans, procedures, list and reports or documents required by the EMP
- Permits and authorizations issued by SUA and Albanian authorities
- List of chemicals stored on site including Material Safety Data Sheets
- Copies of monitoring, audit or inspection records and reports
- Non-compliance, corrective action and incident reports
- Medical records
- HSSE training records
- Complaints and incident register (i.e., community feedback mechanism)
- Audit and inspection reports
- Monitoring and inspection checklists
- Weekly and monthly environmental reports
- Waste disposal transfer notes

10.1.9 Reporting

The purpose of reporting is to detail the monitoring and auditing activities undertaken in accordance with this EMMP and EMP. All documentation will be filed separately and a log sheet will be attached to the front of each file to identify the date of documentation last inserted in order to facilitate tracking. The reports that will be produced during the survey are described in the following sections.

The monitoring reports will incorporate timely and relevant documentation of implementation of all aspects of the EMP. At a minimum, the following reports will be prepared:

- **Weekly Monitoring Report** – A weekly monitoring report will be prepared the seismic survey contractor. The report will document the daily toolbox talks, inspections, audits, issues or activities of potential concern as it relates to the implementation of the EMP. This report will provide a summary of the week's work and include any outstanding issues that remain to be closed out.
- **Monthly Monitoring Report** – A monthly monitoring report will be prepared the seismic contractor will provide a summary of the month's work, recommendations for ongoing activities and status of outstanding issues remaining to be closed out. Of primary concern is the effectiveness of the implementation of the EMP to mitigate impacts. Recommendations, schedule and responsibility for improvement and or modification to the EMP should be addressed in this report. The seismic contractor's monthly environmental report will be submitted to SUA.

The respective SUA, seismic contractor's representatives will specifically report monthly on HSSE and social performance to include, but not limited to the following issues:

- Number of complaints / grievances received and closed out
- Number of daily site inspections and audits completed for the week
- Number of non-conformances and corrective action requests raised
- Sightings of special status species
- Unrecorded or potential cultural heritage sites encountered and actions taken
- Number of HSSE incidents
- Latest revision of the EMMP and EMP and amendments
- Number of staff inducted
- Number of toolbox talks held
- Monthly waste register
- Upcoming works that may encounter environmental, socioeconomic and health issues

- Any new legislation
- Medical and accident cases
- **Final Monitoring Report** – A final monitoring report will be prepared by the seismic contractor to be reviewed by SUA upon demobilization and the completion of field activities. This report will provide a summary of the final status of the project from an environmental, socioeconomic and health perspective. The final inspection report will include the action plan for any further mitigation measures which might be needed. As a part of the final report, suggested improvements or modifications in the environmental control measures and the monitoring process will also be provided for any future work by the seismic contractor for SUA or for the seismic contractor's next assignment. The seismic contractor will prepare the Final Inspection Report to be submitted to SUA for approval.
- **Compliance Report to NEA** - This is a practice and condition to the Environmental Declaration. This report will demonstrate how SUA has fulfilled the environmental conditions at the declaration and achieved the environmental compliance during the project. The report is prepared by an independent party (i.e. Environmental monitor). The environmental monitoring and compliance report is submitted every 3 months to NEA or one full report at the end of operations depending upon the conditions of the Environmental Declaration.

Incident Reporting

All environmental, cultural heritage and community incidents will be appropriately documented and reported. Reporting will follow established procedures. Reports may be internal and/or external to regulatory agencies or other parties, depending on the nature of an incident.

Reports for project spills, environmental compliance incidents, reportable quantity releases, fines, enforcement proceedings, and regulatory non-compliance situations must contain certain information. This information includes:

- Date, time, location (GPS) and description of events;
- Location of the incident;
- Description of the incident;
- Immediate actions taken;
- Volumes for spills and releases;
- Notification and reports completed (where applicable);
- Root causes from investigations; and
- Corrective actions developed and implemented.

The SUA Seismic HSSE Lead will assist in incident response, classification, and reporting as appropriate.

10.1.10 Supervision and Review

Environmental supervision and reviews are conducted to verify the implementation and effectiveness of the EMMP and EMP. The scope of the Environmental supervision Program includes:

- Internal supervision and reviews are conducted by the seismic contractor's HSSE Advisor and SUA's Seismic HSSE Lead or delegate.
- External supervision is conducted by environmental specialists.

The proposed frequency of supervision activities, reviews and reporting along with the responsible party is given in

Table 10-5 and is indicative. However nature and frequency of supervision and review will be finalised on the basis of regulatory approval and after the conclusion of the ESHIA process.

Table 10-5 Internal and external supervision

Category	Type of Activity	Frequency	Responsibility	Reporting
Internal Supervision	Review of the Seismic Contractor Field HSSE Supervisors and Permitting Officer's weekly environmental reports and the monthly environmental report	Monthly	Seismic Contractor's HSSE Lead and SUA Seismic HSSE Lead	Seismic Contractor's Monthly Environmental Report
External Supervision	Prepare a report of compliance with the requirements of the EMP and guidance and support activities	End of the project	Biodiversity and Cultural Heritage Specialist	Environmental Monitor's monthly report

10.1.11 Change Management

During the seismic survey, change may be required to address unforeseen or unexpected conditions or situations. A change management process will be applied to ensure environmental and social issues are addressed as part of any significant changes to project procedures, processes or activities. For example, change management would be required should the mitigation measures fall short of providing the level of protection to the environment (i.e. natural monuments, protected habitats and species) or cultural heritage. Stakeholder grievances that could negatively affect community relations, the seismic project, future SUA projects and reputation may necessitate change management to adequately address the grievances.

The seismic contractor will develop a change management plan to include:

- Identification of the item potentially requiring change
- Preparation of Change Document outlining nature of change, impacts of change and environmental concerns
- Review of change for compatibility with environmental standards and guidelines
- Seek approval from the SUA project management for any changes to the activity specific EMP recommended
- Documentation of the approval or rejection of change
- Implementation of approved change
- Summary of project change to be included in monthly reports

The change management process will be the responsibility of the Seismic Contractor Party Manager.

10.1.12 Management Review

The seismic contractor's HSSE Lead will periodically review, update and re-issue the project specific EMMP document to incorporate any new legislative requirements or changing site conditions/ site activities as the seismic survey progresses. This review should occur at least once during the course of the project (or more frequently should process or management change dictate). Following any document review and prior to issue, comments and approval should be sought from SUA project management.

In the case of major changes to the seismic study, the EMMP review should be undertaken by SUA's Social Performance and Environmental Leads. The purpose of the review is to critically examine the effectiveness of the

EMP and its implementation and to decide on potential modifications to the EMP as necessary including new proposed environmental control plans.

This process of review is in keeping with the principle of continual improvement. Records of the review will be retained by the seismic contractor. Input to the management reviews will include:

- Results of internal and external audits and evaluations of compliance with legal requirements and other requirements
- Communication(s) from external interested parties including complaints;
- Environmental and social performance;
- The extent to which objectives and targets are met (if applicable);
- Status of corrective and preventative actions;
- Follow-up actions from previous management reviews;
- Changing circumstances, including changes in legislation and changes in seismic survey operations or activities; and
- Recommendations for improvement.

10.2 Environmental Monitoring Plan Costs

The primary responsibility for the implementation of the environmental monitoring plan is the seismic contractor; as such, much of the cost will be covered within the seismic contractors' scope of work. In some cases, the cost may be shared or reimbursed to the contractor for expenses incurred. However, the overall responsibility of the implementation of the environment monitoring plan and its associated costs remains with SUA. A summary of the estimated costs association with the environmental management plans is provided in Table 10-6. The costs presented are only indicative over the life of the project.

Table 10-6 Summary of environmental monitoring costs

Activity	Description	Rational	Cost
Biodiversity Specialist	Additional surveys prior to seismic survey	Annex 1 and other sensitive habitats may be coincident with the seismic survey corridors and should be demarcated to allow the avoidance. This a full time short duration (10-15 days) to survey areas of the seismic corridors within the footprint where the survey operations will take place.	• 2 biologists and logistics and management costs • 20,000 Euro - total
	Operational biodiversity surveillance , guidance and monitoring during seismic survey activities	Critical and sensitive habitats and protected species are within the survey corridors. A biologist familiar the biodiversity of the area will advise on mitigation measures to be adopted and confirm that no permeant damage is caused by survey operations. This is a full time position during survey operations including demobilization.	• 1 biologist and logistics and management costs • 15,000 Euro - total
Culture Heritage Specialist	A cultural heritage and archeology specialist monitoring	There are protected cultural monuments within proximity to the seismic corridor. The specialist will be available to	• 1 specialist and logistics and management costs • 15,000 Euro - total

Activity	Description	Rational	Cost
		the permitting teams as the final seismic line and support facility locations are determined within the seismic corridor. Also, the specialist will be available in case of a chance find. This is a full time position during survey operations.	
Waste Management	Waste transportation	Waste transport to a collection site (Base) or secure SUA facility.	1 subcontracted transportation provider 10,000 Euro - total
	Transport and disposal of sewage	In the event that fly camps are used, sewage will need to be collected and appropriately disposed.	1 subcontracted transportation provider 60,000 Euro - total
	Transport and disposal of waste for final treatment	There are no hazardous waste facilities in Albania; waste may need to be shipped abroad to licensed facilities	- One consolidated shipment 150,000 Euro- total
Environmental sampling	Sample Shipment and Analysis	In event there is a spill of fuels or lubricants, the soils or water collected for disposal will require testing to determine if they classify as hazardous waste. Once the area is remediated, the soil or water will need to be analyzed by an accredited laboratory to confirm that there is no residual contamination.	- Typical costs per sample for analysis that may be required are: - Benzene, toluene, ethyl benzenes, xylenes - 35 Euro - Total petroleum hydrocarbons – 75 Euro - Polyaromatic hydrocarbons – 170 Euro - Ether oxygenates- 200 Euro - Shipment – 500 Euro
			•
Site Restoration	The site is to be restored to pre-survey conditions.	Local works maybe employed to do the final restoration and to identify any areas where restoration efforts that may be ineffective or insufficient and which may require additional restoration efforts. This is a full time position during survey operations including demobilization.	2 workers 15,000 Euro
Compliance Reporting	Environmental monitoring report compilation	NEA may require and Environmental Monitoring and Compliance Report as a condition of the Environmental Declaration. The compliance is to be achieved by implementation of EMP	1 Report 15,000 to 20,000 Euro

10.3 Stakeholder Engagement Plan

The stakeholder engagement plan (SEP) focuses on maintaining open lines of communication between SUA and the communities to manage social risks. It specifies procedures and guidelines for these interactions.. Stakeholder engagement will continue throughout the duration of the seismic survey. SUA will implement a stakeholder engagement plan and maintain a community feedback mechanism.

10.3.1 Stakeholder Engagement Requirements

Chapter 7 of the SEP (Annex 2.1) outlines the key engagement activities that will be undertaken post-ESHIA, prior to and during the execution phase of the Project. The seismic survey Contractor will develop Chapter 7 of the SEP into a full execution phase SEP that they will use to implement the engagement activities outlined in Chapter 7, as well as the mitigation outlined in this section. The SEP will also be prepared in line with the IFC Performance Standard 1 and SUA's policies and standards.

The key measures that will be incorporated into the engagement programme undertaken prior to and during the seismic survey

- Engage with potentially impacted residents to provide awareness of the project, to keep them updated with planned activity (particularly the schedule for land access, clearance and acquisition activities), and to provide access to CLOs and the Community Feedback Mechanism. Engagement and communications must include:
 - Prior consultation with communities that are in proximity to the Base and fly camps. This consultation must be used to elicit feedback on preferred siting and identification of potential impacts.
 - Post public notices at the base and fly camp sites to notify interested parties of the purpose of the camp and to give a point of contact for any enquiries or grievances.
 - Site restoration plans to be developed for base camp and fly camps must be developed in consultation with the local authorities.
 - Engagement with village heads and residents in advance of the survey phase to provide the schedule for survey activity.
 - Awareness-raising sessions to inform surrounding communities about the potential temporary noise and vibration impacts during the construction phase.
 - Maintain an open communication channel with community leaders and religious representatives to avoid operations occurring during traditional, religious or cultural ceremonies.
 - Engagement with village heads and residents in advance of the survey phase to provide the schedule for survey activity.
 - Inform the contractor personnel of the existence of sensitive areas and sacred sites (i.e. cemeteries), and on the key importance to respect these cultural and heritage sites in order to ensure smooth project implementation.
 - Ensure the presence of the SUA Community Liaison Officer (CLO) prior to field work and during all the working periods.
 - During the survey phases if livestock are present in close proximity to the planned acquisition activity then contact will be made with livestock keeper to arrange movement of the livestock.
- For any survey activity within the Greek Minority areas (including in Dropulli and Libohova, and particularly Pogoni and Dropulli I Poshtem administrative units), the CLO must verify with village heads whether there are any impacted households with whom Greek should be used as the language for communication by the Land Permitting team.
 - For any households for which this is a requirement a translator should be used and any written documentation (particularly land access and compensation agreements) must be written in Greek.
 - Within the Greek Minority areas, the CLO must confirm with the village heads whether any project signage that is installed in the village will need to be given in both Albanian and Greek.

It will also propose the correct procedures to be taken by the workforce in case of accidental discovery of a cultural asset during fly camp construction and vegetation clearance activities (Chance Find procedure).

SUA will conduct periodic reporting to the affected communities to describe progress with implementation of the project on key sensitive issues that involve on-going risk to, or impacts on, affected communities. The frequency of these reports will be proportionate to the concerns of affected communities but not less than weekly.

10.3.2 Community Feedback Mechanism

SUA will also establish a procedure to receive Community Feedback Mechanism which will facilitate resolution of affected communities' concerns and grievances about its environmental and social performance. The Community Feedback Mechanism will seek to resolve concerns promptly, using an understandable and transparent consultative process that is culturally appropriate and readily accessible, and at no cost and without retribution to the party that originated the issue or concern.

The feedback process for external communication should include, as a minimum, methods to:

- Receive and register external communication from the public;
- Screen and assess the issues raised and determine how to address them;
- Provide, track, and document responses, if any; and
- Adjust the management program, as appropriate.

SUA will inform the affected communities of the procedure and requirements of the feedback process prior to the start of activities, as part of the stakeholder engagement process.

Grievances will be received by the CLO or seismic contractor permitting team will be acknowledged and be entered into a complaints register. The language used will be Albanian. People will also have the option of making their initial complaint either through village heads or other local structures. The CLO will be responsible for entering complaints in the register, and grievances received by other employees will also be forwarded to the CLO. The comment or complaint will then be entered into a database set up for this purpose.

Information about the steps that will be undertaken to resolve the grievance and the expected time for its resolution will be provided to the complainant as soon as possible. Where appropriate this feedback will be provided in the local language to ensure all interested parties understand the response.

Where required, SUA will conduct an internal investigation to determine the underlying cause of the grievance and make any changes as required to prevent recurrence of a similar grievance.

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Annex 1 Non-Technical Summary



ESHIA for 2D Seismic Survey Block 4 with
extension into Blocks 2 and 3

Project number: 60568938

annex to be provided in the Final ESHIA



Annex 2: Stakeholder engagement process

annex to be provided in the Final ESHIA

Annex 3 Biodiversity Conservation status of flora and fauna

annex to be provided in the Final ESHIA

Annex 4: Additional Mapping

annex to be provided in the Final ESHIA

Annex 5: Baseline data collection methodologies and field result

annex to be provided in the Final ESHIA

Annex 6: References

annex to be provided in the Final ESHIA

Annex 7:Company License of EMA Consultancy

annex to be provided in the Final ESHIA