

# ENVIRONMENTAL IMPACT ASSESSMENT PROJECT REPORT

FOR

**PROPOSED OIL AND GAS SEISMIC PROJECT IN BLOCK 13T: PARTS OF CENTRAL  
POKOT, LOIMA, TURKANA CENTRAL, AND TURKANA SOUTH DISTRICTS BY  
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**JULY 2011**



# PROJECT REPORT

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Signed



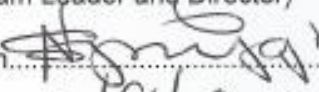
Date

1/8/2011

We the undersigned, confirm that the contents of this report are a true representation of the Environmental Impact Assessment Project Report of the proposed oil and gas seismic survey project in Block 13T: Parts of Central Pokot, Loima, Turkana Central and Turkana South Districts

Prof. Norbert Opiyo-Akech  
(Team Leader and Director)

Sign

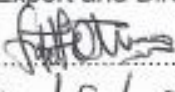


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2/8/2011

Dr. Daniel Olago  
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Date

2/8/2011

## EXECUTIVE SUMMARY

Tullow Oil, a FTSE100 company, is one of the largest independent oil and gas exploration and production companies. Tullow Kenya B.V. (TKBV) holds an Exclusive Prospecting Right (EPR) over Block 13T, which covers four districts (Central Pokot, Turkana Central, Loima and parts of Turkana South Districts) in northwest Kenya. The main objective is to study in detail the assigned area of 8,429 km<sup>2</sup>, in accordance with the contractual obligations under the Production Sharing Agreement (PSC) signed with the Kenya Government on 17<sup>th</sup> September 2008 in order to delineate potential hydrocarbon prospects. This Environmental Impact Assessment Project Report has been prepared for TKBV, in accordance with the objectives established by the Environmental Management and Coordination Act (EMCA) of 1999, and subsequent related regulations.

Seismic surveys are a primary tool utilised during the exploration of hydrocarbons in both onshore (land) and offshore (marine) areas. The project is an exploratory activity for determination of potential oil and gas resources in the assigned area (Block 13T) in Northern Kenya, and is commonly referred to, in the Oil and Gas Industry parlance, as a “seismic survey”. A seismic survey is conducted by creating an energy wave commonly referred to as a ‘seismic wave’ on the surface of the ground or in water along a predetermined line, using an energy source. This wave travels into and through the earth strata, where it is reflected and refracted by various subsurface formations, and returns to the surface where receivers called geophones are used to detect the waves and convey them to a recorder for analysis. Seismic waves can be induced by the following methods: small explosive charges, primarily dynamite, set off in shallow holes known as ‘shot holes’; large ‘Vibroseis’ trucks equipped with heavy plates that vibrate on the ground; or use of compressed point-source air pulses (commonly referred to as ‘airguns’) in water settings. By analyzing the time it takes for the seismic waves to reflect off subsurface formations and return to the surface, formations can be mapped and potential oil or gas deposits identified. Block 13T is an exclusively onshore setting.

As per the PSC requirements, 1055 km of 2D seismic data will be acquired over a projected time period of eight to twelve weeks, beginning in October 2011. The workforce that will be required to carry out the survey will be between 100 and 150 in number. Line clearance along the pre-determined and pre-surveyed transects will be done by use of mulchers and light hand-cutting tools, and where access roads are required, by bulldozers. Support vehicles such as for personnel movement, carrying of data recording equipment, etc., will be available.

The workforce will reside in a base camp that will be constructed by a professional civil and building contractor with experience in setting up such camps. Issues such as camp security, provision of basic services (e.g. accommodation, water, sanitation, lighting, and health care), waste management, materials storage areas, etc., shall be incorporated in the camp design. The camp will be sited at least 10km away from existing settlements, and its location shall be determined in consultation with the local community leaders. The health and safety of the crew and the general public at large will be ensured by the company complying both with the relevant national legislation, and its own in-house environmental health and safety (EHS) policies which embrace the international best practices for such activities. An emergency response plan will be put in place in case of any accidents. A close working relationship will be fostered with the local communities, and as far as is practicable, unskilled and semi-skilled workers shall be recruited locally.

Undertaking the seismic survey is justified by a number of factors. Following the discovery of hydrocarbons in the South Sudan rifts and, more recently, by Tullow Oil and Heritage Oil in Uganda within the western branch of the East African Rift, several oil companies have intensified exploration efforts in the related Mesozoic and Early Tertiary rift basins of Kenya



with a view to meeting the global, regional and local demand for energy. This project, if successful, would play a major role in enabling the country to reduce the cost of energy and over-reliance on hydroelectric power and crude oil imports, as well as benefit from oil and gas exportation to other countries, thus increasing the per capita income and the GDP from foreign exchange. Other possible spin-offs would include: opening up of the northern frontier districts in Kenya to development activities and trade in sectors such as mining, tourism, fishing, agriculture, and animal husbandry which are currently extremely under-exploited; job creation; and increased economic activity in the area.

The detailed field-based environmental impact assessment study, which was preceded by extensive desk top studies, was undertaken from 21<sup>st</sup> February to 4<sup>th</sup> March 2011. The biophysical studies included, amongst others, an assessment of the surface geology and geomorphology, soils, hydrogeology and water resources, climate, hydrology, terrestrial flora and fauna and their habitats. The socio-economic study covered issues such as population and economic activities, education, social amenities (healthcare and schools), cultures and traditions, infrastructure and communications. The legislative and regulatory framework has also been extensively explored in this report. The public consultations were extensive, and included formal and informal meetings with key interested and affected persons and groups (e.g. officials of governmental and non-governmental agencies, community leaders, Community Based Organisations, Women and Youth groups), public *barazas*, and open-air “market” meetings, as well as completion of questionnaires by a sample of local households. The information gathered provides detail for the current environmental and socio-economic baseline situation and is a critical component for development of the Environmental Management Plan.

The potential environmental and social impacts, and for which clear, achievable, and effective mitigation measures have been suggested in this report, include:

- Noise and vibrations from Vibroseis machines, and dynamite charges;
- Disturbance to terrestrial and aquatic (riverine) habitats, flora and fauna along survey line transects;
- Dust generation and exhaust emissions by vehicles and equipment;
- Waste generation at camp sites and other work areas;
- Disturbance to livelihood activities during data acquisition along survey lines; and
- Interference with sensitive cultural and natural heritage sites.

Both the field survey and documentation reveal the following existing pressures on the environment and social fabric: soil compaction by grazing animals; active wind erosion and water erosion; more frequently recurring droughts; dust generated by moderate to strong winds and enhanced by low vegetation cover; pollution of rivers, water pans and shallow groundwater in luggas from humans and livestock; high demand for potable groundwater sources; and land degradation due to overgrazing and charcoal burning. The communities lack adequate provision of basic services such as education, health and security. In addition, while the communities are fairly stable, their security is compromised by sporadic but often deadly cattle rustling.

From an environmental point of view, it can be concluded that the project is viable and will not adversely affect the environment if the EMP outlined in this document is strictly adhered to. Some of the key recommendations are summarized here-below:

- To reduce the expected transient impacts on wildlife, noise levels will need to be minimized to the extent possible, correct strength of dynamite charging and Vibroseis use applied to achieve the survey objectives, and human contact with wildlife should also be minimized in line with the Environmental Management and Coordination

(Noise and Excessive Vibration Pollution Control) Regulations, and the Wildlife Conservation and Management Act;

- Liaise with the Kenya Wildlife Service (KWS) to ensure that wildlife disturbance and danger to the seismic team is mitigated in and around the National Reserves in the south. Any planned lines that are considered to be a threat will be relocated;
- Minimize vegetation and grassland clearance as much as possible when cutting the survey line transects;
- Trees with trunk diameter greater than 20cm should not be cut;
- Use of modern line cutting technology, preferably *mulchers* for clearing of the geophysical survey transects will ensure that minimal vegetation is removed, hence ensuring that re-vegetation will occur in a much shorter period since the seeds and branches will be left along the traverses and this will promote faster re-growth;
- Use existing access roads to the extent possible, limit traffic speed, and restrict movement of vehicles as is reasonable to minimize dust generation;
- Rivers/luggas should be crossed at road crossings, where such crossings exist, or in areas where the bank heights are less than 1m – banks at the lugga crossings should be mechanically restored;
- Access routes and cut lines will be selected to provide sufficient offset to known cultural sites to avoid disturbing them: these offsets shall be determined in consultation with area leaders;
- Seismic survey activities to be undertaken during daylight hours only;
- A waste management plan documenting the waste strategy, storage (including facilities and locations), handling procedures and means of disposal should be developed and should include a clear waste-tracking mechanism to track waste consignments from the originating location to the final waste treatment and disposal location in compliance with the Environmental Management and Coordination (Waste Management) Regulations;
- The company should consider drilling its own water supply borehole for the camp to avoid water resource conflicts with the communities;
- Employees should be provided with and use personal protective equipment at all times;
- Employ Community Liaison Officers to keep communities informed prior to project mobilisation and on an ongoing, continual basis to ensure sensitization of the community and stakeholders *vis a vis* the project objectives, activities and scheduling, potential impacts;
- Liaise with local community leaders during the recruitment process;
- All operations will be conducted in compliance with Tullow's EHS policy, international best practices and Kenya Government requirements (as set out in the Occupational Health and Safety Act and the Public Health Act); and
- The company should liaise with the Provincial Administration, the Kenya Police, KWS, Kenya Police Reservists and other agencies to provide adequate security during the seismic survey operation.

Due to the nature, scale and short time duration of the proposed seismic survey, the impacts would by and large be considered to be low, temporary and/or transient, rather than long-term and/or permanent. A number of seismic surveys have already been conducted in the region and other areas of Kenya, and no adverse or long-lasting impacts have been reported from these activities. The measures proposed to mitigate these environmental and social impacts detailed in the Environmental Management Plan within this report are considered adequate and effective in safeguarding the environmental and social fabric of the area, and should be strictly adhered to.

The community members and leaders who attended the various public meetings and participated in the questionnaire survey welcomed the proposed project, but appealed for adherence to environmental safeguards and labour legislation. TKBV (as outlined in its EHS

[Environmental, Health and Safety] and CSR [Corporate Social Responsibility] Policies) is committed to environmental protection at the highest level, continual engagement of local stakeholders throughout the duration of the project, and to being sensitive to local culture and customs, and would want to be seen as a valued part of the communities in the project area.

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## CHAPTER 1:

### INTRODUCTION

#### 1.1 INTRODUCTION

This environmental impact assessment (EIA) project report presents baseline biophysical and socio-economic information, project mitigation measures, and an environmental management and monitoring plan for a proposed land seismic data acquisition programme for identification of potential oil and gas deposits in the National Oil Corporation of Kenya (NOCK, 1987) exploration Block 13T, which straddles four administrative districts, namely, Central Pokot, Turkana Central, Loima and parts of Turkana South Districts (latitudes ca. 1.3° to 3°N and longitudes ca. 35° to 35.7°E) (Figure 1.1). This is carried out in accordance with the requirements of Kenya's Environmental Management and Coordination Act of 1999 and subsidiary legislation, and in fulfilment of the more general requirement that projects maintain a clean, sustained and healthy environment. The project proponent is Tullow Kenya B.V. (TKBV). This EIA project report has been prepared by Earthview Geoconsultants for TKBV, and has aimed at establishing and mitigating the potential impacts of the proposed seismic survey operations in the project area.

#### 1.2 DEVELOPER IDENTIFICATION

This EIA is carried out for TKBV (Pin P051340553U), a subsidiary company of Tullow Oil PLC, with respect to the proposed seismic survey in Block 13T.

Offices In Kenya:	Contact:
Ground Floor Acacia House Westlands Office Park Waiyaki Way Nairobi	Mr. Martin Mbogo General Manager Tullow Kenya B.V. P.O. Box 63298-00619 Nairobi Kenya

TKBV will engage an internationally experienced seismic acquisition geophysical company that will use suitable state-of-the-art technology to execute the seismic program in Block 13T.

#### 1.3 ACTIVITIES OF TULLOW OIL PLC: AN OVERVIEW

Tullow Oil PLC is one of the largest independent oil and gas exploration companies, and is a FTSE100 company. The Group has over 80 licences in more than 20 countries, with operations in Africa, Europe, South Asia and South America.

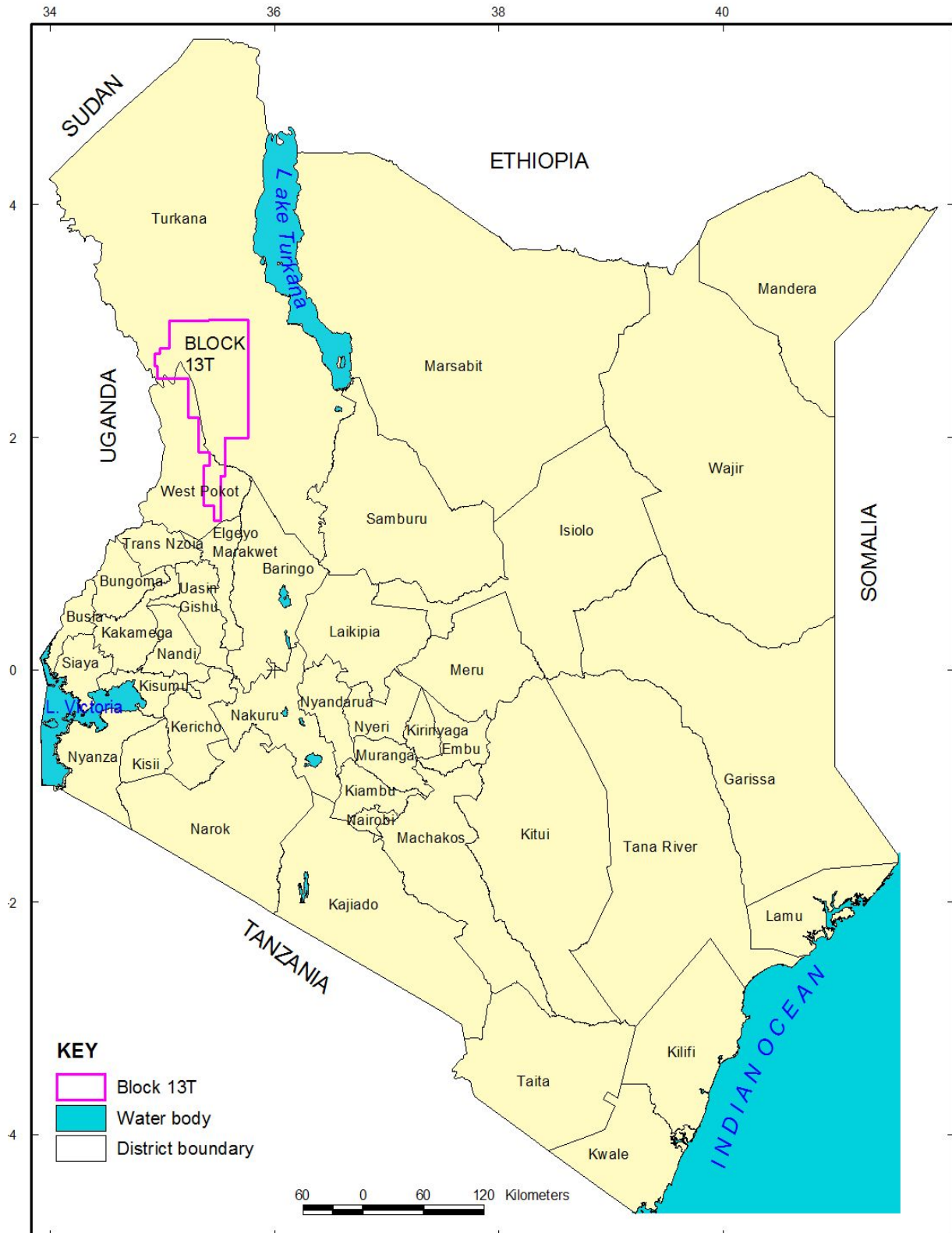


Figure 11.1: Location of the project area.

#### 1.4 BRIEF REGIONAL DESCRIPTION

Block 13T is located in Northern Kenya. The block straddles four administrative districts, namely, Central Pokot, Turkana Central, Loima and parts of Turkana South Districts as shown in Figure 1.1.

Geologically, the project area can be divided into three parts (southern, central and northern), moving latitudinally from south to north. The thin southern strip (1.3° to 2°N) is dominated by: metamorphosed sediments of the Basement System; Tertiary rocks represented by plugs and dykes of nephelinites or alkali basalt and; Quaternary rocks that consist of soils, alluvium, scree and ironstone cappings (McCall, 1964). In the central section (2° to 2°30'N), there are mainly superficial deposits of Pleistocene to Recent age that occupy the Turkwel plain, while to the west occur a metamorphic and igneous complex of Pre-Cambrian rocks containing recrystallised sediments and volcanics (Walsh, 1966). The rocks in the northern part (2°30' to 3°N) are folded gneisses, schists, granulites and limestones of the basement system that are cut by acid pegmatites and basic intrusions (Fairburn and Matheson, 1970). In the northwest, the basement system rocks are covered by a thick series of basalt, andesites and rhyolitic ignimbrites. The main river is the Turkwel, and its important tributaries within the project area are the Wei Wei River in the south, Kateruk River in the central part and Nakaton River in the north.

The area, which is arid to semi-arid, receives an average annual rainfall of between 200 and 400mm and temperatures range from 24 to 38°C (Republic of Kenya, 2002). The long rains occur between April and August, while the short rains occur in October and November. The annual rainfall amount ranges between 200 and 400mm (Nicholson, 1980), but is erratic and unreliable (Republic of Kenya, 2002). The area belongs to the Somali-Masai floristic zone (White, 1983). It comprises of semi-arid grassland and thorny shrubland in the lowlands, grading into wooded grassland and bushland as altitude increases, and also towards the south. Along the rivers are riverine forests that are dominated by *Acacia tortillis*, *Balanites aegyptiaca*, *Salvadora persica*, and *Hyphaene compressa*. *Calotropis procera* and *Prosopis juliflora* are common in disturbed areas.

While the population growth in Kenya is estimated to be 3.3% as per the 1999 census (Republic of Kenya, 2002), the project area is however sparsely populated with higher population in the urban centres, which attract higher settlement due to better communication services and availability of schools, health centres, and water. Pastoralism is the predominant economic activity in the lowlands, and agriculture in the highlands. Animals reared are cattle, goats, sheep, donkeys and poultry. In Loima District, crop irrigation is done along River Turkwel, and includes cultivation of sorghum, maize, cowpeas, and green grams. The low and erratic rainfall, high temperatures, prolonged droughts, and El Niño-related floods in the project area have, however, contributed to the high poverty levels through: crop and livestock diseases, collapse of irrigation schemes and harvest failures, as well as livestock deaths (Republic of Kenya, 2002).

The earth roads comprise mainly of a sandy substrate, and are best traversed using four-wheel drive vehicles. Five light aircraft airstrips serve the area and are located at Lokichar, Lorugumu, Kaputir, Katilu and Kalemyang. The area is covered by both mobile and land line telephone services.

## **1.5 PROJECT BACKGROUND, OVERVIEW, JUSTIFICATION AND OBJECTIVES**

### **1.5.1 Project Background**

A Production Sharing Contract (PSC) for the Exclusive Prospecting Right (EPR) for Block 13T was signed with the Government of Kenya on 17<sup>th</sup> September 2008.

TKBV's main aim and objective over the years will be to explore in detail the assigned area of 8,429 km<sup>2</sup> (Block 13T), in accordance with its contractual obligations under the PSC, in order to: (a) delineate potential hydrocarbon prospects, (b) carry out exploratory drilling within the identified potential prospect areas, (c) carry out well appraisal and production of oil

and/or gas if the prospects prove to be economically viable. TKBV is committed to ensuring that the activities that will be carried out to achieve the stated objectives performed in a manner that will not be detrimental to the natural environment or the local communities in the area.

This EIA covers the seismic program only.

### **1.5.2 Overview of the Project**

The project is an exploratory activity for determination of potential oil and gas resources in the assigned area (Block 13T) in Northern Kenya, and is commonly referred to, in the Oil and Gas Industry parlance, as a “seismic survey”. A seismic survey is conducted by creating an acoustic energy wave (commonly referred to as a ‘seismic wave’) using an energy source placed on or close to the surface of the ground along a predetermined line (seismic survey line, or transect). This wave travels into and through the earth strata, where it is reflected and refracted by various subsurface formations, and returns to the surface where receivers called geophones are used to detect the waves and convey them to a recorder for analysis. By analyzing the time it takes for the seismic waves to reflect off subsurface formations and return to the surface, formations can be mapped and potential oil or gas deposits identified. The seismic waves can be induced using two types of energy sources: (i) dynamite charges that are set off in shallow (5 to 20m deep) holes (known as ‘shot holes’); and (ii) ‘Vibroseis’ trucks that are equipped with heavy plates that vibrate on the ground.

As per the PSC requirements, 1055 km of 2D seismic data will be acquired over a projected time period of eight to twelve weeks, beginning in October 2011. The workforce that will be required to carry out the survey will be between 100 and 150 in number. Line clearance along the pre-determined and pre-surveyed transects will be done by use of mulchers and light hand-cutting tools, and where access roads are required, by bulldozers. Support vehicles such as for personnel movement, carrying of data recording equipment, etc., will be available.

The workforce will reside in a base camp that will be constructed by the seismic contractor who will have many years of experience in setting up such camps- and will comply with IAGC standards (International Association of Geophysical Contractors). Issues such as camp security, provision of basic services (e.g. accommodation, water, sanitation, lighting, and health care), waste management, materials storage areas, etc., shall be incorporated in the camp design. The camp will be sited at least 10-15km away from existing settlements, and its location shall be determined in consultation with all key stakeholders and the local community leaders in order for them to give their consent. The health and safety of the crew and the general public at large will be ensured by the company complying both with the relevant national legislation, and its own in-house environmental health and safety (EHS) policies which embrace the international best practices for such activities. An emergency response plan will be put in place in case of any accidents. A close working relationship will be fostered with the local communities, and as far as is practicable, unskilled and semi-skilled workers shall be recruited locally.

### **1.5.3 Project Justification**

Following the discovery of hydrocarbons in the Muglad and Melut basins of the South Sudan rifts and, more recently, by Tullow Oil and Heritage Oil in Uganda within the western branch of the East African Rift, several oil companies have intensified exploration efforts in the related Mesozoic and Early Tertiary rift basins of Kenya with a view to meeting the global, regional and local demand for energy.

Energy is an important factor in socio-economic development (GVEP Kenya, 2006). The international community is today confronted with the daunting task of reducing poverty and achieving sustained economic growth and development for the benefit of all. The provision of adequate, quality, and affordable energy services can play a decisive role in poverty reduction (GVEP Kenya, 2006). To improve on the sustainability of energy supply in Kenya, industries have had to invest in stand-by generators, which run on expensively imported diesel, thus pushing the cost of production even higher. The industry sector has thus been faced with costly energy supply, which has contributed to high industrial production costs. Thus, the availability of fossil fuels locally would significantly reduce the energy cost as well as production cost of industries.

This project, if successful would play a major role in enabling the country to reduce the cost of energy and over-reliance on hydroelectric power and crude oil imports, as well as benefit from oil and gas exportation to other countries, thus increasing the per capita income and the GDP from foreign exchange. Other possible spin-offs would include: opening up of the northern frontier districts in Kenya to development activities and trade in sectors such as mining, tourism, fishing, agriculture, and animal husbandry which are currently extremely under-exploited; job creation; and increased economic activity in the area. The project is in line with the objectives of the national Energy Policy (improving access to affordable energy services, enhancing security of supply, promoting development of indigenous energy resources; promoting energy efficiency and conservation; and promoting prudent environmental, health and safety practices), the Economic Recovery for Wealth and Employment Creation Strategy (expanding and improving infrastructures, developing arid and semi-arid lands, and safeguarding environment and natural resources), and Kenya Vision 2030 (enhanced equity and wealth creation for the poor in semi-arid and arid districts, and; must generate more energy at a lower cost and increase efficiency in energy consumption).

## **1.6 PURPOSE OF THE EIA**

In Kenya, the primary authority that regulates the environment with respect to oil and gas exploration activities is the National Environment Management Authority (NEMA). Other key national players and regulators in the oil and gas industry are: the Ministry of Environment and Mineral Resources, the Ministry of Energy, and the National Oil Corporation of Kenya. The country is also a signatory to a number of international treaties and conventions related to environmental protection and conservation.

### **1.6.1 The Mandate of NEMA**

The National Environment Management Authority (NEMA) is the institution that has been established under the Environment Management and Coordination Act (EMCA) of 1999 in order to deal with matters pertaining to the environment, with the object and purpose of exercising general supervision and co-ordination over all matters relating to the environment and to the principal instrument of government in the implementation of all policies relating to the environment. Some of its mandates that are relevant to EIAs are to:

- Co-ordinate the various environmental management activities being undertaken by the lead agencies and promote the integration of environmental considerations into development policies, plans, programmes and projects with a view to ensuring the proper management and rational utilisation of environmental resources on a sustainable yield basis for the improvement of the quality of human life in Kenya;
- Carry out surveys which will assist in the proper management and conservation of the environment;

- Undertake and co-ordinate research, investigation and surveys in the field of environment and collect, collate and disseminate information about the findings of such research investigation or survey;
- Identify projects and programmes or types of projects and programmes, plans and policies for which environmental audit or environmental monitoring must be conducted under the Act;
- Monitor and assess activities, including activities being carried out by relevant lead agencies, in order to ensure that the environment is not degraded by such activities, environmental management objectives are adhered to and adequate early warning on impending environmental emergencies is given;
- Undertake, in co-operation with relevant lead agencies programmes intended to enhance environmental education and public awareness about the need for sound environmental management as well as for enlisting public support and encouraging the effort made by other entities in that regard;
- Publish and disseminate manuals, codes or guidelines relating to environmental management and preventing or abatement of environmental degradation;
- Render advice and technical support, where possible, to entities engaged in natural resources management and environmental protection so as to enable them carry out their responsibility satisfactorily.

### **1.6.2 Requirements and Scope of Work for the EIA**

A project report is defined, in the preliminary section of the EMCA (1999) and the interpretation section of the Environmental (Impact and Audit) Regulations (2003), as a summarized statement of the likely environmental effects of a proposed development referred to in section 58 of the Environmental Management and Co-ordination Act, 1999. Section 58 requires that a proponent intending to carry out any undertaking listed in the Second Schedule to the Act must submit a project report to the National Environmental Management Authority ('the Authority') in the prescribed form accompanied by the prescribed fee. The seismic survey project falls under Schedule 2, at 6(j) "exploration for the production of petroleum in any form" of EMCA 1999.

Regulation 7 of the Environmental (Impact and Audit) Regulations, 2003 lays down the specific issues that the project report must address, which in summary are: the nature, location, activities, and design of the project; the materials that are to be used; the potential environmental, economic and socio-cultural impacts and mitigation measures; plans for the prevention and management of accidents and for ensuring the health and safety of workers and neighbouring communities; and the project budget. These issues are to further address, as outlined in the Second Schedule of the Environmental (Impact and Audit) Regulations (2003): ecological considerations; sustainable use; ecosystem maintenance; social considerations; landscape and land uses; and water. Within this framework, the collection of relevant baseline data, and consultations with stakeholders and the public are important, and ought also to be included in the report.

### **1.6.3 The EIA Review and Approval Process**

Where the Authority finds that the project report conforms to the requirements of Regulation 7 (1), it must within seven days of receiving the report, submit a copy to each of the relevant lead agencies, the relevant District Environment Committee, and where it involves more than one district, to the relevant Provincial Environment Committee. Each of these lead agencies and Committees must then submit their written comments to the Authority within twenty-one days from the date on which they received the project report from the Authority or within any other period that the Authority may prescribe (Regulation 9). Once the Authority comes to a decision, it must communicate that decision, together with the reasons for it, to the



proponent within forty-five days from the date on which the project report was submitted to it (Regulation 10(1)). Where the Authority is satisfied that the project will have no significant impact on the environment, or that the project report discloses sufficient mitigation measures, it may issue a licence (Regulation 10(2)). If, however, it finds that the project will have a significant impact on the environment, and the project report discloses no sufficient mitigation measures, the Authority will require that the proponent undertake an environmental impact assessment study in accordance with the Regulations.

## 1.7 THE EIA TEAM

Earthview Geoconsultants (K) Ltd. was appointed by TKBV on 7<sup>th</sup> February 2011 to undertake the EIA for the seismic survey in Block 13T. Earthview is a well-established consultancy firm based in Nairobi with good capacity in, e.g., environmental and social impact assessments and audits, geological and hydrogeological studies, geographic information systems, natural resource surveys, and project planning, implementation and management. Earthview is officially registered with the National Environment Management Authority as an Environmental Consultancy Firm. The firm comprises of individuals with many years' experience and knowledge in these and other areas. The firm is conversant with national legislation and regulations that relate to the sectors in which it carries out its activities, including NEMA requirements for environmental and social impact assessments and audits, as well as applicable international best practices and standards.

**Table 1.1: The EIA team composition**

Name	Role	Qualifications	Experience (years)
Prof. Norbert Opiyo-Aketch	Overall coordination/Geological issues	PhD	30
Dr. Daniel Olago	Coordination/Biophysical and Socio-economic issues	D.Phil.	20
Mr. Joseph Nganga	Soil and Waste Management	BSc	20
Mr. Adams Gakuo	Aquatic Ecology	MSc	4
Mr. Francis Aketch	Terrestrial and Wildlife Ecology	MSc	4
Mr. John Obunga	Geology, Hydrogeology, Water Resources	BSc	5
Mr. James Ndunda	Socio-economist	BSc	5
Ms. Evelyn Sindani	Health and Socio-cultural issues	BSc	3
Mr. Peter Kibe	GIS Expert	MSc	20
Mr. Nicholas Aketch	Logistics/Administration	BSc	8
Ms. Emily Atieno	Policy/Legislation/Regulations	LLB	25

## 1.8 OBJECTIVES OF THE EIA PROJECT REPORT

In carrying out the project, and considering the national legislative and regulatory requirements for EIA's, TKBV shall seek to:

- Identify, evaluate and propose suggested mitigation measures for potential environmental impacts of the proposed project on the various biophysical and socio-economic structures of the area.
- Assess and analyse the environmental costs and benefits associated with the proposed project.
- Outline environmental management plans and monitoring mechanisms during the project execution phase
- Ensure that concerns and aspirations of the local community are addressed in all stages of the project cycle.
- Ensure that the project activities do not in any way interfere with the environmental sustainability of the area. This is ensured by giving due consideration to:

- Ecosystem in general;
  - Land resources and national heritage sites in and around the project area;
  - Local communities and land tenure systems, and;
  - Sensitive historical, archaeological and cultural sites.
- f) Put in place mitigation and monitoring measures that will ensure that any potential negative impacts arising from activities of the project are eliminated or reduced at the earliest opportunity to obviate any harmful effect to the environment.
- g) Boost the economy by providing jobs and trading opportunities to the local community in the region.

## 1.9 TERMS OF REFERENCE (TOR)

The following are the Terms of Reference (TOR) for the EIA:

- To hold meetings with the project proponent to establish the procedures, define requirements, responsibilities and a time frame for the proposed project.
- To carry out a systematic environmental and social impact assessment of the proposed seismic survey project within the project area, following the National Environment Management Authority legislative and regulatory requirements and best international practice for an activity of this nature.
- To provide a description of the proposed activities throughout the entire implementation process of the proposed project with special focus on potential impacts to the surrounding environment and the socio-economic fabric of the local communities.
- To produce an Environmental Impact Assessment Project Report that contains the details of potential negative impacts, together with recommendations for their mitigation and/or prevention, as well as positive impacts and recommendations for enhancing and/or encouraging them.
- To develop an Environmental Management and Monitoring Plan

## 1.10 STRUCTURE OF THE REPORT

The structure of the report is based on that proposed in the NEMA EIA Guidelines (2002), and is indicated in Table 1.1 below.

**Table 1.2 Structure of the EIA Project Report.**

Chapter	Title	Contents
1	Introduction	Introduction to the project area; identification and activities of the project proponent in other regions; project background, objectives and justification; purpose of the EIA and objectives of the report; the EIA team; TORs for the report.
2	Project Description	The technology and processes to be used in the implementation of the project; workforce requirements; the materials to be used in the construction and implementation of the project, and; the products, by products and waste generated by the project.
3	Methodology	Methods used in carrying out the assessment; identification of gaps in knowledge and uncertainties that were encountered in compiling the information.
4	Legal and Regulatory Framework	A concise description of the national environmental, legislative and regulatory framework, international best practices, and Tullow Oil plc policies.
5	Baseline Environmental Parameters of the Project Area	Description of the potentially affected environment within the framework of the proposed EIA; assessment of existing (pre-project) impacts and potential project and residual impacts.
6	Analysis of Project	Alternative technologies and processes available and reasons for

	Alternatives	preferring the chosen technology and processes.
7	Environmental Impact Assessment	Environmental effects of the project including the social, economic and cultural effects and the direct, indirect, cumulative irreversible, short-term and long-term effects anticipated.
8	Environmental Management Plan	Environmental management plan proposing the measures for eliminating, minimizing or mitigating adverse impacts on the environment; including the cost, time frame and responsibility to implement the measures; provision of an action plan for the prevention and management of foreseeable accidents and hazardous activities in the course of carrying out activities; measures to prevent health hazards and to ensure security in the working environment for the employees and for the management of emergencies.
9	Conclusions and Recommendations	Summary of the conclusions and key recommendations from the EIA.
References	References	List of references and websites referred to in the text.
Appendices	1. Provisional 2011 seismic program	Provisional seismic survey lines: may be revised in context of data needs and EIA recommendations.
	2. Minutes of meetings	Minutes of meetings held with communities, community leaders and other stakeholders in the project area.
	3. Copies of laboratory results	Laboratory results for samples collected in the field (water quality, soil chemistry, phytoplankton, zooplankton, lake sediments).
	4. Certificates	Certificates of the consultants and the company doing the EIA project report.
	5. Pin Number and VAT certificates	Pin number and VAT certificates of the proponent.

## **CHAPTER 2:**

### **PROJECT DESCRIPTION**

#### **2.1 INTRODUCTION**

TKBV is proposing to undertake seismic surveys in order to delineate potential hydrocarbon prospects in Block 13T (which covers an area of 8429.33 km<sup>2</sup>) in the northern Kenya Rift (see Figure 1.1). The project area has poor physical infrastructure and lacks tarmacked roads. There is a low density network of generally poorly maintained Murram or earth roads, many of which are impassable during rains because they are criss-crossed by luggas or traverse through river/lugga floodplains. The communications infrastructure is still poor, although telecommunications coverage and reliability has increased in recent years due to nation-wide expansion programmes that have been launched by the major mobile service companies in Kenya.

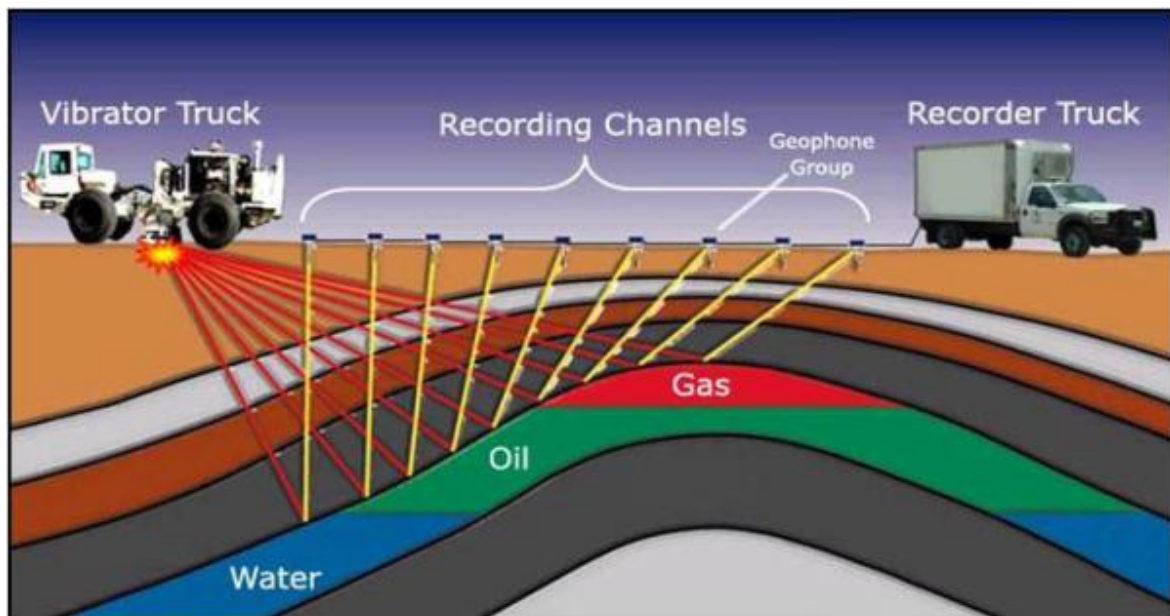
#### **2.2 PROJECT LOCATION**

The project area lies in parts of Central Pokot, Turkana South, Loima and Turkana Central districts (Figure 1.1). It is bounded by latitudes ca.1.3°N and 3°N and longitudes ca.35°E and 35.7°E and covers an area of 8429.33 km<sup>2</sup>. The area is located in two counties - Turkana County and Pokot County.

#### **2.3 OVERVIEW OF ONSHORE SEISMIC SURVEYS AND DESIGN**

##### **2.3.1 Principles of Onshore Seismic Survey**

Seismic surveys are a primary tool utilized during the exploration of hydrocarbons on land. A seismic survey is conducted by creating an energy wave commonly referred to as a 'seismic wave' on the surface of the ground along a predetermined line, using an energy source. This wave travels into and through the earth strata, where it is reflected and refracted by various subsurface formations, and returns to the surface where receivers called geophones are used to detect the waves and convey them to a recorder for analysis. Seismic waves can be induced by the following methods: small explosive charges, primarily dynamite, set off in shallow holes known as 'shot holes'; or by large 'Vibroseis' trucks equipped with heavy plates that vibrate on the ground. By analyzing the time it takes for the seismic waves to reflect off subsurface formations and return to the surface (Figure 2.1), formations can be mapped and potential oil or gas deposits identified.



**Figure 2.1: Onshore Seismology Using a Vibrator Truck as a Seismic Energy Source**  
 (Source: Adapted from <http://www.cougarlandservices.net/landowner>)

Onshore 2D seismic surveys are conducted along ground transects where sequential “receiver cables” of 6 to 12 kilometres in length are laid out on the ground. A group of evenly spaced geophones that are sensitive to small sound waves and vibration are placed on the ground and connected to the cable. A truck-mounted recording system connected at one end of the receiver cable records the sound waves picked up by the geophones electronically. At carefully calculated points along the receiver line, an impulse is sent into the earth. This “shot” may be caused by a specially-built vibrator truck shaking the surface (Vibroseis) or by a small detonation at the bottom of a five to twenty metre deep, narrow-diameter hole drilled into the ground. On completion of recording, a section at one end of the cable is unplugged and moved, together with its geophones, to the front of the cable where the process is repeated. In this way, the recording moves along the pre-determined seismic line, as a continuous process.

### 2.3.2 Seismic Survey Data

#### (a) 2D Surveys

Computer analyses of the recorded seismic waves provide a profile of the underlying rock strata and offer the basis for identifying potential hydrocarbon traps. The analysis creates a two-dimensional picture (Figure 2.2) that shows the subsurface geology of the earth’s strata along the line of the cable.

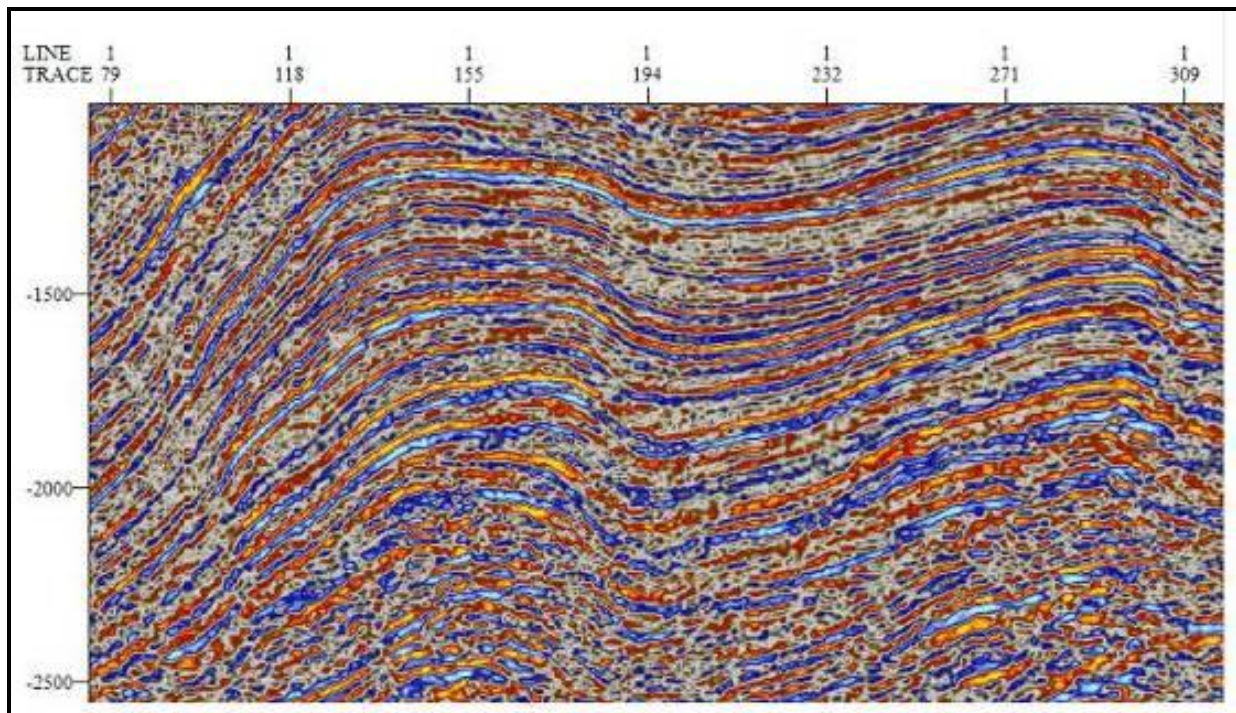


Figure 2.2: 2D Seismic section (after McFarland, 2009)

## 2.4 THE PROPOSED SEISMIC SURVEY

### 2.4.1 Seismic Survey Objectives

The objective of the proposed seismic survey is to identify and delineate potential prospects, if any, in sufficient detail to be able to, at a later and different stage, test one or more by drilling.

### 2.4.2 Seismic Survey Scale and Extent

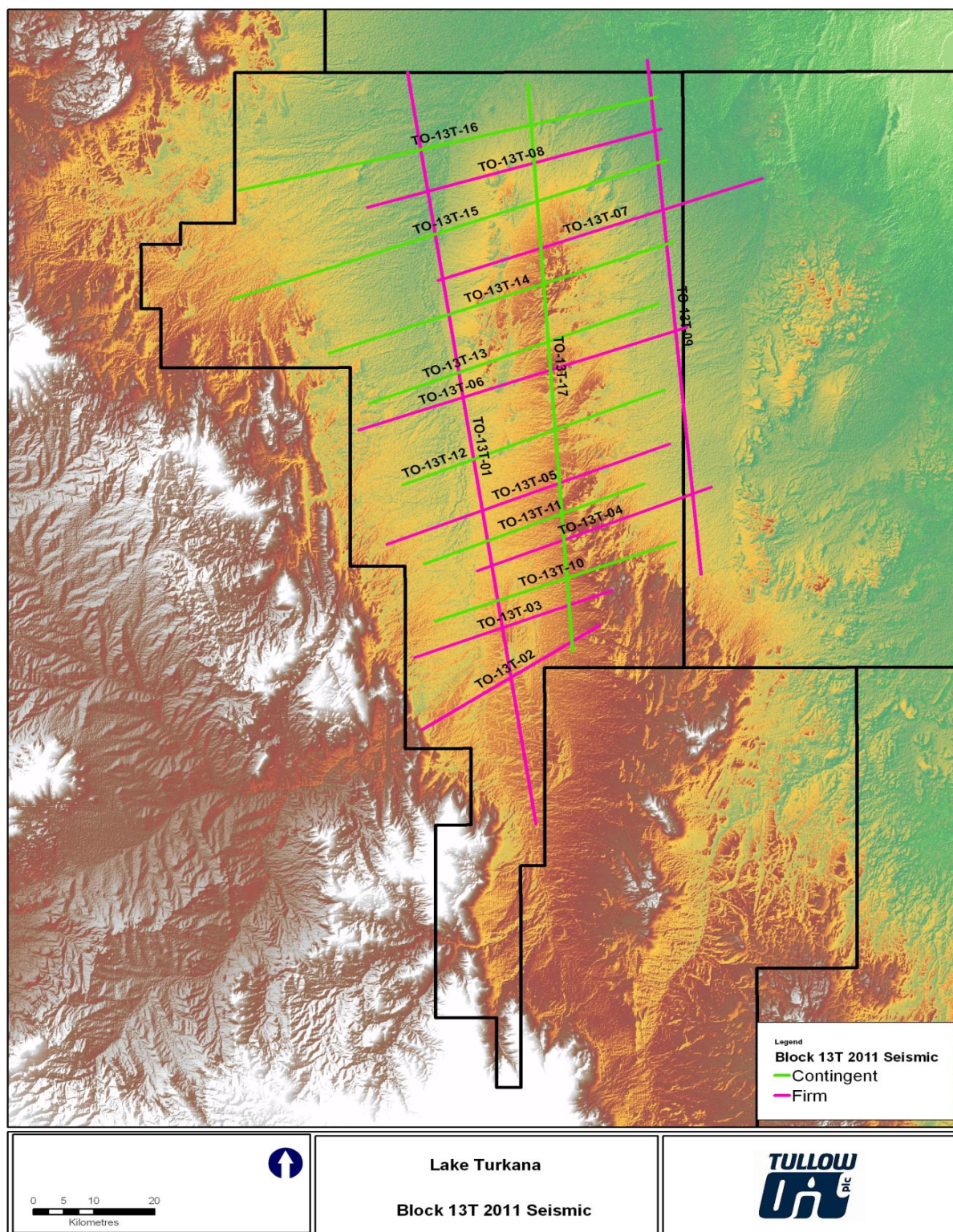
The seismic survey operation will involve the collection of approximately 1055 line kilometres of seismic data within Block 13T area (see Figure 2.3 below). It should be noted that while there are pre-determined seismic line transects based on analysis of pre-existing data, the actual locations of the seismic transects may be varied prior to and/or during the seismic data acquisition exercise which will take approximately eight to twelve weeks beginning October 2011.

The seismic survey operation will be constrained along the seismic survey lines and to the base and fly camps, as well as to the access roads to these areas.

Proposed and Contingent Seismic Lines, Block 13T. UTM36N			
Name	x	y	Length (km)
KE13T-11-01	759838	331495	141
KE13T-11-01	781047	191987	
KE13T-11-02	762299	209504	35
KE13T-11-02	791505	228867	
KE13T-11-03	761069	222869	35
KE13T-11-03	793504	235311	
KE13T-11-04	771358	239002	42



KE13T-11-04	809945	254520	
KE13T-11-05	756455	243923	50
KE13T-11-05	803039	262517	
KE13T-11-06	751841	265116	57
KE13T-11-06	805808	284172	
KE13T-11-07	764898	292938	57
KE13T-11-07	818250	311824	
KE13T-11-08	753225	306457	51
KE13T-11-08	801655	321052	
KE13T-11-09	799348	333801	96
KE13T-11-09	808253	238387	
KE13T-11-10	764437	229636	42
KE13T-11-10	803962	244231	
KE13T-11-11	762607	240232	39
KE13T-11-11	798887	255135	
KE13T-11-12	759069	254981	46
KE13T-11-12	802117	272499	
KE13T-11-13	753533	270038	51
KE13T-11-13	801194	288632	
KE13T-11-14	746919	279404	60
KE13T-11-14	803501	299997	
KE13T-11-15	730925	289401	76
KE13T-11-15	802578	315361	
KE13T-11-16	732001	309671	71
KE13T-11-16	800886	327034	
KE13T-11-17	779662	329495	106
KE13T-11-17	787045	224099	



**Figure 2.3: Proposed seismic survey lines. These lines pass near major centres like Lorugum, Lokichar and Kainuk situated in the project area.**

### 2.4.3 Seismic Survey Logistics

The seismic surveys are expected to take about three months to complete and will involve approximately one hundred and fifty personnel (see Chapter 8 for more details on the activity time frame). A base camp will support the crew, and “fly camps” will accommodate smaller-



sized groups of personnel in outlying areas, and will be set up as and when required (see section 2.4.5 below). A fully equipped and staffed ambulance will be on standby in case of accidents or emergencies, and will be supported by a fully equipped and staffed clinic that will be located in the base camp. There are a number of airstrips in the area that can handle small fixed-wing aircraft. They are found in the following major centres: Lokichar, Lorugum, Kaputir, Katilu and Kalemnyang, and can receive 12-seater Caravans. They are served only by charter flight companies. A Medevac plan will be developed for transporting injured parties out of the field.

Where possible, unskilled and semi-skilled workers will be hired locally from towns and villages representative of the area and after consultation with the local authorities and communities. The aim will be to ensure a fair distribution of employment opportunities.

### **Seismic survey operations**

Approximately 40 vehicles (4x4s, light trucks and pickups) will be required for movement of personnel and equipment, and to support camp operations. A number of Vibroseis trucks will be used for acoustic energy generation, and there will also be recording trucks to receive the data relayed from the geophones. Bulldozers and mulchers will be used for improving or opening up new access roads (the latter only if absolutely necessary), and for cutting the transect lines, respectively. For areas requiring the use of dynamite as a source instead of Vibroseis, small 'shot hole' drill rigs will be used.

#### **2.4.4 Data Acquisition Methods and Equipment**

The seismic survey will be conducted using Vibroseis (Plate 2.1) and/or dynamite charges (Plate 2.2). The seismic acquisition methodology has been designed to minimise disruption to local flora and fauna as well as the local communities. Low Impact Seismic technologies (see Chapter 7) will include: the use of Vibroseis and/or deep-drilled dynamite charges as acoustic energy sources; line-cutting with mulchers to minimise line width and accelerate re-growth of vegetation; and use of bulldozers and graders to open up new or improve existing access roads.



**Plate 2.1: Vibroseis vehicles operating in Kenya**



**Plate 2.2: Dynamite charge (with plastic anchors) proposed as secondary acoustic source for the survey.**

The seismic data acquisition plan is as follows:

- Survey teams will first lay out the seismic transects on the ground using pre-plot coordinates of planned seismic lines. They will take care to avoid existing infrastructure and minimize any damage to cultivated land, natural water points and pastureland.
- Transects line placements and program size will be adjusted accordingly to bypass habitations or areas of particular sensitivity. A detailed evaluation of each line will be carried out as work progresses and line placements will be adjusted to achieve maximum effect at minimum disruption.
- Vibroseis and/or dynamite charges will be the source of acoustic energy. One “receiver cable” will be laid out at a time on the ground. This cable will have an anticipated length of between 9 to 12 kilometres. After every 25 metres or so a group of small geophones (Plate 2.3) will be placed on the ground and connected to the cable.



Plate 2.3: Geophones, batteries, cables and digitizing boxes before deployment on a seismic line

The proposed onshore seismic survey will involve the use of four-wheel drive (4x4) vehicles and recording trucks, small 'shot hole' drill rigs, a grader, and a bulldozer to provide vehicular access roads (cut-lines).

**Uphole Survey:** In addition, there will be seismic 'Upholes' drilled and surveyed at the intersections of the land seismic lines. These upholes will involve using a water-well drilling rig to drill to about 100m below ground level, allowing seismic velocity data to be collected for the shallow weathered layers of bedrock. It is likely that about 25 upholes will need to be drilled and surveyed. These boreholes are typically backfilled and plugged on completion of the survey.

**LVL Survey:** Shallow seismic refraction (Low Velocity Layer, LVL) surveys will be carried out along the land seismic lines at approximately 5km intervals. These low impact surveys are required to collect data on the shallow weathered layers, allowing the calculation of 'statics' required for accurate seismic processing.

## 2.4.6 Occupational Health and Safety

Safety and environmental protection responsibility are among the most important aspects of modern seismic surveying in oil and gas exploration and production activities. The health and safety of all personnel and the impact of operations on third parties and on the environment are of paramount importance. It is the responsibility of crew managers to ensure that safety standards are maintained and safe working practices are adhered to by all members of the crew. No work can be done efficiently if it is not performed safely. Some of the safety issues include, but are not limited to, the following factors:

- Risk of personal injury at work, especially during excavation and construction.
- Noise generation;
- Solid and liquid waste management, including wastewater and effluent discharges;

- Oil and chemical spills;
- Transportation;
- Fire protection; and
- Material handling.

Occupational health and safety issues are best addressed when company internal management systems that address worker and public safety are compliant with Oil and Gas Industry guidelines on international good practices, e.g. International Association of Oil and Gas Producers (OGP), International Association of Geophysical Contractors (IAGC), World Bank – International Finance Corporation (WB-IFB).

It is a requirement that the Tullow Oil Environmental, Health and Safety Management System (EHS-MS), together with the EHS and CSR (Corporate Social Responsibility) policies be integrated into the project lifecycle. The crew must also ensure that they adhere, at all times, to all international health and safety standards applicable in the Oil and Gas industry, in addition to TKBV's internal management systems.

#### **2.4.7 TULLOW OIL PLC POLICIES**

(next two pages)



# Environmental, health and safety policy



At Tullow Oil, we are committed to high standards of Environment, Health and Safety (EHS) performance across our business.

Our goal is to preserve biodiversity and promote sustainable development by protecting people, minimising harm to the environment and reducing disruption to our neighbouring communities.

We seek to achieve continual improvement in our EHS performance.

**Tullow Oil has established an EHS management system to ensure that:**

- We plan and organise EHS efficiently and effectively.
- Safe places, safe systems of work and suitable procedures are provided and maintained.
- We minimise discharges, emissions and waste that adversely affect the environment.
- Staff and contractors are given appropriate EHS training to perform their tasks competently, safely and with due regard for the environment.
- Risks from our activities are assessed and either eliminated or reduced to acceptable levels.
- We comply with all applicable EHS laws and regulations, and apply responsible standards where the legislation is inadequate or non-existent.
- We are comprehensively prepared to respond effectively in the event of an emergency.
- We promote a culture of reporting and investigating accidents, incidents and near misses, and the sharing of lessons learned.
- We have an audit programme which verifies compliance with this policy and monitors our EHS performance.
- We are all empowered to stop any activity if there is an unacceptable risk of accident or environmental incident.

This EHS policy is reviewed periodically to ensure its ongoing suitability and effectiveness.

Whilst we provide a strong and visible leadership commitment to EHS, everyone in Tullow Oil has individual authority, responsibility and accountability for the safety of themselves and others, and an obligation to actively participate in promoting an effective EHS culture. We will regularly set and review our EHS objectives and targets with the aim of driving continual improvement in EHS knowledge and performance.

**Aidan J Heavey,**  
Chief Executive Officer, Tullow Oil plc  
May 2009



TO-EHS-POL-001-Rev7

# Corporate social responsibility policy

**Tullow Oil's policy is to conduct all our business operations to best industry standards and to behave in a socially responsible manner.**

**Our goal is to behave ethically and with integrity in the communities where we work, and to respect cultural, national and religious diversity.**

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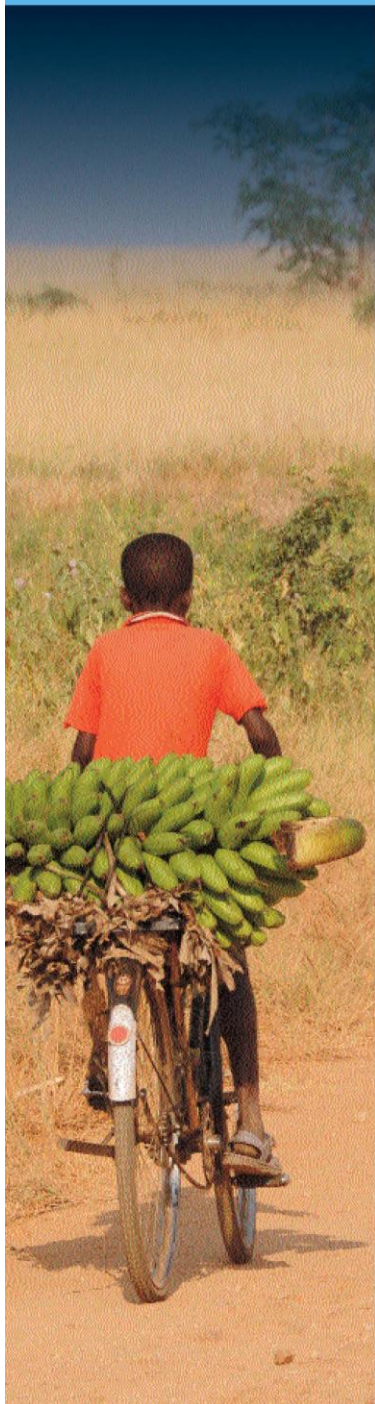
**Directors, company personnel and contractors are responsible for ensuring compliance with this policy, and specifically to:**

- Respect the rights of all employees, treating them fairly and without discrimination
- Commit to providing opportunities for staff development
- Provide equal employment opportunities
- Recognise individual and team contributions
- Ensure compliance with Tullow's EHS policy by all personnel involved in our activities
- Provide clear direction on key CSR initiatives, policies, performance data and targets
- Actively engage with communities in areas where we operate
- Support selected social and community development projects
- Maintain high ethical standards and support transparency in our activities
- Encourage our partners and stakeholders to observe similar standards wherever possible

**Tullow is committed to continual improvement in all its standards and practices.**



**Aidan J Heavey,**  
Chief Executive Officer, Tullow Oil plc  
May 2009



TO-EHS-POL-001-Rev7



### 2.4.8 Waste Management

The types of waste that will be generated at the camp sites and/or work sites during the survey operation can be grouped into two categories, non-hazardous and hazardous, as per the NEMA Waste Management Regulations of 2006. The non-hazardous wastes would include: domestic wastes and effluents, plastics, metal cans, and paper. The hazardous wastes would include: medical and pharmaceutical wastes, waste oils, small quantities of chemicals (e.g. paint, thinners etc) and used batteries.

The domestic waste disposal facilities will be located outside the perimeter fence of the camp compound. Typically, they would consist of solid waste pits and unlined grey water pits that would receive effluent from the bathrooms and kitchens. There would also be black water pits serving as settling and overflow discharge pits, set in a cascading sequence that should be treated and allowed to evaporate. The conveyance of waste water and black water effluents from the bathrooms, kitchens and toilets will be via PVC-drain pipes.

All waste material from field operations should be brought back to the base camp for proper disposal. Disposal options include: incineration, compaction and removal from site and buried (especially for biodegradable material), or a combination of these activities. Where practical, non-hazardous and non-recyclable wastes should be managed on site by burial in pits. During construction of the campsite, qualified personnel should survey the land to determine the best site for construction of waste pits and/or landfills. At particularly sensitive locations, or with hazardous materials, these disposal methods are not permitted, requiring the wastes to be transported to off-site locations for disposal at an approved licensed commercial disposal facility or municipal landfill. Metallic and other materials such as timber may be donated to the local communities for their own use in a controlled fashion, or otherwise sold to dealers in the town centres.

All solid wastes generated during the survey will be weighed and quantities recorded so that all waste streams can be tracked.

Hazardous (medical, pharmaceutical and waste oils) and non-hazardous wastes will be segregated, and disposed of in the waste disposal facility as provided for by the relevant Local Authority (Turkana County Council or Pokot County Council) (Table 2.1). Biomedical waste will not be stored above 0°C for more than seven days without the written approval of the relevant lead agency, provided that untreated pathological waste shall be disposed of within 48 hours.

**Table 2.1 Biomedical and pharmaceutical waste handling (NEMA Waste Management Regulations (2006)).**

	Type of Wastes	Details	Colour of Container and Markings	Type of Container
1.	Infectious Waste	Waste suspected to contain pathogens e.g. laboratory cultures, waste from isolation wards, tissues (swabs), materials, or equipment that has been in contact with tubings, catheters, IGS toxins, live or attenuated vaccines, soiled plaster casts and other materials contaminated with blood infected patients, excreta.	Yellow	Strong leak-proof plastic bag with biohazard symbol
2.	Pathological waste	Human and animal tissues or fluids, e.g., body parts, blood and other body fluids, fetuses, animal carcasses.	Yellow	Strong leak-proof plastic bag with biohazard symbol
3.	Sharps	Sharp waste, e.g., needles, infusion sets, scalpels, knives, blades, broken glass that may cause puncture and cuts. This includes both used and unused sharps.	Yellow – (marked sharps)	Puncture proof
4.	Pharmaceutical waste	Waste containing pharmaceutical e.g. pharmaceuticals that are expired or no longer needed; items contaminated by or containing pharmaceuticals (bottles, boxes).	Brown	Plastic bag or container
5.	Genotoxic Waste	Waste containing substances with genotoxic properties, e.g., waste containing cytostatic drug (often used in cancer therapy), genotoxic chemicals.	No details provided	No details provided
6.	Chemical waste	Waste containing chemical substances e.g. laboratory reagents; film developer, disinfectants, (disinfectants) that are expired or no longer needed solvents	Black	Plastic bag or container
7.	Waste with high content of heavy metals	Batteries, broken thermometers, blood-pressure gauges, etc	No details provided	No details provided
8.	Pressurized containers	Gas cylinders, gas cartridges, aerosol cans.	No details provided	No details provided
9.	Radioactive waste	Waste containing radioactive substances e.g. unused liquids from radiotherapy or laboratory research, contaminated glassware, packages, or absorbent paper, urine and excreta from patients treated or tested with unsealed radionuclides, sealed sources.		Lead box, labeled with radioactive symbol
10.	General solid waste	Waste generated from offices, kitchens, packaging material from stores.	No details provided	No details provided
11.	Micro organisms	Any biological entity, cellular or non-cellular capable of replication or of transferring genetic material.	No details provided	No details provided
	Non-infectious/non-hazardous (non-clinical)		Black	Plastic bag or container

## 2.4.9 Sourcing of Equipment and Supplies

All the technical equipment and machinery that are required for the seismic survey will be imported as they are not available locally. Other support vehicles such as pick-ups and trucks may be purchased or hired locally. It is a Tullow corporate requirement that all

vehicles working for or on behalf of Tullow are compliant with OGP Land Transportation Safety Recommended Practice and Tullow's Driving Policy.

TKBV will source general goods, consumables and food items, in the first instance, locally within the project area to support the service industries there. Where these are not available locally, they will be sourced from other parts of the country. TKBV will have its own water supply (borehole) for the camps. In order to be able to drill water well, the services of a registered<sup>1</sup> professional hydrologist or hydrogeology firm will be required.

#### **2.4.10 Emergency Response Plans**

A number of different types of accidents or hazards can occur in this kind of operation, including: personal injury; fire; collisions between vehicles, collisions between vehicles and humans or animals; oil pollution from storage bladders/tanks or pipe leaks or rupture, during its transportation by trucks, and indiscriminate disposal of used lubricating oil, amongst others. Mitigation of these risks is outlined in Chapter 8 of this report (Environmental Management Plan). However, it is noted that comprehensive response plans to specific hazards will need to be developed, which are in line with both the national regulations and regulations that govern the oil and gas industry activities in Kenya, and Tullow Oil's robust policies on environmental, health and safety (EHS) and Corporate Social Responsibility (CSR) that are in tandem with current good practices in the oil and gas industry (see sections 4.3, 4.4, 4.5 and 4.6). TKBV will need to customise and domesticate these plans to fit into the Kenyan context.

### **2.5 CAMPSITE(S) DECOMMISSIONING**

The decommissioning plan will involve the following sequence of activities:

- Workers lay-off and compensation;
- Equipment demobilization (such as containers, vehicles, accommodation facilities)
- Dismantling of camp facilities;
- Cleaning the camps and disposal of solid, liquid and hazardous waste;
- Restoration of waste pits, cesspools and the whole camp site;
- Restoration of cut lines, shot hole repairs, removal of any debris and recovery and destruction of dead charges within the project area; and
- Audit and sign off.

The decommissioning will cover the base camp and any fly camps or any other facility that shall be erected. The decommissioning will lay emphasis on:

- Examining the conformity to the EMP's developed during the EIA for the seismic survey project;
- Preparation of a decommissioning strategy and EMP before decommissioning begins;
- Awareness creation;
- Ecological, socio-cultural and economic survey of camp sites and impacts;
- Conforming to national legislation and regulatory requirements and international best practices.

The decommission will be carried out as soon as is practicable after the end of the seismic survey, hence the specifics of it, which will depend largely on what was actually constructed on the ground, will need to be formulated well in advance.

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<sup>1</sup> A hydrologist or hydrogeology firm is registered by the Ministry of Water and Irrigation under the classification "classification "Consultant Hydrologists". A list of the registered consultants can, on request, be obtained from the Ministry.

## CHAPTER 3:

### ENVIRONMENTAL IMPACT ASSESSMENT METHODOLOGY

#### 3.1 APPROACH TAKEN FOR THE EIA

The approach that was taken for the EIA assessment included, with respect to the proposed seismic survey, the following:

1. Scaling and work evaluation (determination of geographical and other boundaries; preliminary assessment);
2. Detailed assessment based on: project design and technologies vis-à-vis environment, social, cultural and economic considerations of the project area; evaluation of pre-existing environmental, social, cultural and economic conditions, pressures and impacts; identification and evaluation of potential environmental, social, cultural and economic impacts that may arise from the proposed project; public consultations to explain what the project is all about and to receive their views, perceptions, concerns and local expert knowledge and advice with respect to the proposed project;
3. Determination/evaluation of the significance of the potential project impacts and recommendation of mitigation measures; development of an Environmental Management Plan and Monitoring Programme; and decommissioning of the project.
4. Preparation of the EIA Project Report.

#### 3.2 WORK EVALUATION FOR THE EIA

The work evaluation for the EIA was based on the NEMA requirements (section 1.6.2) and customised for the project to be undertaken (outlined in Chapter 2), as per the objectives and terms of reference outlined sections 1.8 and 1.9.

#### 3.3 TOPICS ADDRESSED AND ISSUES CONSIDERED

**Table 3.1: Topics addressed and issues considered**

Topic or Context	Issues Considered	Rationale	Spatial Scope	Limitations of Methodology and Consequences for the Study Outcomes
Project Design, Technologies, Scale and Extent	<ul style="list-style-type: none"> <li>• Project components</li> <li>• Equipment and machinery used</li> <li>• Personnel required</li> <li>• Facilities required</li> <li>• Management of fluid and solid wastes</li> <li>• Occupational and public health and safety</li> <li>• Supplies</li> <li>• Decommissioning</li> </ul>	<ul style="list-style-type: none"> <li>• Project components equipment/ machinery used, and facilities will have a number of environmental impacts related to construction, operations and decommissioning</li> <li>• Identification and prioritisation of factors requiring mitigation</li> <li>• Personnel and public safety during operations needs to be ensured</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-determined seismic survey lines</li> <li>• Access roads</li> <li>• Selected camp sites, storage, repair and waste disposal and facilities</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>
Legislative and Regulatory Framework	<ul style="list-style-type: none"> <li>• Legislation and regulations applicable to project design, execution, affected parties, and environment protection</li> </ul>	<ul style="list-style-type: none"> <li>• Need to ensure that all applicable laws are followed during project execution</li> <li>• Need to be conversant with the authorizations required for the regulatory approval of the project</li> <li>• Some legislation, regulations and guidelines</li> </ul>	<ul style="list-style-type: none"> <li>• National legislation and regulations and authorities responsible</li> <li>• International best practices in Oil and Gas industry</li> <li>• Company</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>

		have embedded mitigations relevant to the proposed seismic survey	EHS, CSR and Code of Conduct	
Geographical Aspects and Boundaries	<ul style="list-style-type: none"> <li>• Description of the setting of the project area</li> <li>• Identification of key features</li> </ul>	<ul style="list-style-type: none"> <li>• Determination of the context within which the work is to be done</li> <li>• Assessment of the scale and extent of the work</li> </ul>	• Entire project area	• None
Administrative set-up	<ul style="list-style-type: none"> <li>• Key administrative units and their roles in the project area</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of jurisdictions</li> <li>• Identification of key administrative contacts</li> <li>• Role in emergency situations (e.g. security threats) and response</li> </ul>	• Entire project area	• None
Communication and Transport	<ul style="list-style-type: none"> <li>• Road infrastructure</li> <li>• Air transport network</li> <li>• Land, radio and mobile communications network</li> </ul>	<ul style="list-style-type: none"> <li>• These will determine the ease with which the project will be carried out</li> <li>• Identification of areas difficult to access</li> <li>• Inform on types of equipment/ machinery that will be required for the project</li> <li>• Assist in development of contingency/ emergency plans</li> </ul>	• Entire project area	• None
Governmental, Non-Governmental and Community Based Organisations	<ul style="list-style-type: none"> <li>• Activities and projects carried out in the area</li> </ul>	<ul style="list-style-type: none"> <li>• Identification of potential local partners particularly with respect to CSR</li> </ul>	• Entire project area	• None
Physiography and Geology	<ul style="list-style-type: none"> <li>• Physiography and geology</li> <li>• Assessment of terrain ruggedness</li> <li>• Assessment of susceptibility to landslides, earthquakes, subsidence and floods</li> <li>• Active surface processes</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of baseline conditions</li> <li>• Identification of potentially difficult areas to work in – terrain and accessibility by vehicles</li> <li>• Identification of areas requiring extra safety precautions</li> <li>• Identification of hazard-prone areas</li> <li>• Assessment of project impacts, primarily cut-lines and access roads, and mitigations</li> </ul>	• The entire project area	<ul style="list-style-type: none"> <li>• Some areas were not accessible due to lack of roads or security concerns hence data is in some cases incomplete but samples representative of the whole area were assessed.</li> </ul>
Soils	<ul style="list-style-type: none"> <li>• Soil degradation status</li> <li>• Areas subject to wind and water erosion</li> <li>• Soil texture and drainage characteristics</li> <li>• Soil chemical quality</li> <li>• Assessment of rehabilitation potential</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of baseline conditions</li> <li>• Ease of accessibility by vehicles</li> <li>• Identification of hazard prone areas (e.g. ponding/flooding)</li> <li>• Assessment of impacts of opening up access roads and cut-lines and campsite construction</li> <li>• Assessment of impacts of domestic effluent discharges on soils</li> <li>• Identification and</li> </ul>	• Entire project area	<ul style="list-style-type: none"> <li>• Some areas were not accessible due to lack of roads or security concerns hence data is incomplete</li> </ul>

		prioritisation of factors requiring mitigation		
Climate	<ul style="list-style-type: none"> <li>• Temperature</li> <li>• Winds</li> <li>• Precipitation</li> <li>• Climate change</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of baseline conditions</li> <li>• Information useful for project elements such as cooling of temperature-sensitive equipment and installations</li> <li>• Wet seasons can significantly impede progress in seismic data acquisition</li> <li>• Sudden, torrential rains can pose a danger to personnel through flash flooding in lugga crossing zones</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-determined seismic survey lines</li> <li>• Access roads</li> <li>• Selected camp sites and facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Poor data coverage: the weather station at Lodwar (outside project area to the north) is the one closest to the project area and is clearly not representative.</li> <li>• No data available for trend analysis.</li> </ul>
Air Quality	<ul style="list-style-type: none"> <li>• Ambient air quality</li> <li>• Generation of dust, smoke, odorous fumes, and other toxic gaseous emissions</li> <li>• Release of gases which contribute to the greenhouse effect or ozone damage</li> <li>• Identification of project components that can lower air quality</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of baseline conditions</li> <li>• Assessment of project impacts on air quality</li> <li>• Identification and prioritisation of factors requiring mitigation</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-determined seismic survey lines</li> <li>• Access roads</li> <li>• Selected camp sites and facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of air quality data on particulate loading, SO<sub>x</sub> and NO<sub>x</sub> or any other gaseous compounds in the area. Area is, however, rural and undeveloped so air quality can be assumed to be good and varies mainly due to variations in wind speeds (natural particulate loading).</li> </ul>
Surface and Ground Water Resources	<ul style="list-style-type: none"> <li>• Ground and surface water sources</li> <li>• Ground and surface water use</li> <li>• Planned water use</li> <li>• Changes in quantity</li> <li>• Identification of project components that can affect water use</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of baseline conditions</li> <li>• Potentially high demand for water by project group in a water scarce region</li> <li>• Planned water uses that affect water quantity may be blamed on the project proponent</li> <li>• Identification and prioritisation of factors requiring mitigation</li> </ul>	<ul style="list-style-type: none"> <li>• Selected camp sites and facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Inaccessibility of some areas due to lack of roads and security concerns</li> </ul>
Water Quality	<ul style="list-style-type: none"> <li>• Current ground and surface water quantity</li> <li>• Current point and non-point sources of water pollution</li> <li>• Identification of project components that can potentially alter water quality</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of baseline conditions</li> <li>• Assessment of project impacts (e.g. effluent disposal and accidental spills) on water quality</li> <li>• Domestic effluent discharges</li> <li>• Identification and prioritisation of factors requiring mitigation</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-determined seismic survey lines</li> <li>• Access roads</li> <li>• Selected camp sites and facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Representative water samples were taken.</li> </ul>
Terrestrial Environment (Habitats,	<ul style="list-style-type: none"> <li>• Vegetation cover and classes</li> <li>• Habitat conditions</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of baseline conditions</li> <li>• Physical disturbance of</li> </ul>	<ul style="list-style-type: none"> <li>• Entire project area</li> </ul>	<ul style="list-style-type: none"> <li>• Old data, but the ecosystem structures are</li> </ul>

Flora and Fauna)	<ul style="list-style-type: none"> <li>• Floral and faunal communities which are uncommon, threatened or endangered</li> <li>• Environmentally sensitive localities</li> <li>• Wildlife corridors</li> <li>• Pastoral areas</li> <li>• Assessment of ecosystem state</li> </ul>	<ul style="list-style-type: none"> <li>• terrestrial environment during operations, e.g. line cutting</li> <li>• Determination of pre-project endangered communities</li> <li>• Assessment of areas requiring special precautions</li> <li>• Avoidance of human-human and human-wildlife conflicts</li> <li>• Identification and prioritisation of factors requiring mitigation</li> </ul>		resilient to the effects of land degradation and deforestation, Land cover, for example, has become more patchy, but the species diversity within the various ecotones remain the same.
Aquatic Environment (Habitats, Flora and Fauna)	<ul style="list-style-type: none"> <li>• Habitats</li> <li>• Floral and faunal communities which are uncommon, threatened or endangered</li> <li>• Fish, reptile or invertebrate breeding and nesting areas</li> <li>• Fishing areas</li> <li>• Bird nesting and breeding areas</li> <li>• Assessment of ecosystem state</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of baseline conditions</li> <li>• Physical disturbance of aquatic environment and ecosystems e.g. by vehicles and associated equipment</li> <li>• Potential impacts of accidents such as localised oil and chemical spills, collisions</li> </ul>	<ul style="list-style-type: none"> <li>• Perennial rivers and luggas.</li> </ul>	<ul style="list-style-type: none"> <li>• Changes to aquatic life</li> </ul>
Land Resources and National Parks	<ul style="list-style-type: none"> <li>• Land use and designation</li> <li>• Existing activities in the area</li> <li>• Currently known and exploited mineral resources</li> <li>• Tourism</li> <li>• Resource inventory</li> </ul>	<ul style="list-style-type: none"> <li>• The land resources are critical resources supporting livelihoods in the area.</li> <li>• Parks are national and global heritage areas</li> <li>• Consideration of competing resources</li> </ul>	<ul style="list-style-type: none"> <li>• Entire project area</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>
Archaeological , Historical and Cultural Sites	<ul style="list-style-type: none"> <li>• identification of archaeological, historical, cultural sites</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of currently known sites</li> <li>• Avoidance of such sites during line cutting and seismic data acquisition</li> </ul>	<ul style="list-style-type: none"> <li>• Project area</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>
Visual Aesthetics	<ul style="list-style-type: none"> <li>• Aesthetic or high scenic value</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of baseline conditions</li> <li>• Assessment of project impacts such as vegetation clearance along cut lines and at campsites</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-determined seismic survey lines</li> <li>• Access roads</li> <li>• Selected camp sites and facilities</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>
Noise and Vibrations	<ul style="list-style-type: none"> <li>• Ambient noise and vibration levels in the area</li> <li>• Potential sources of noise and vibrations produced by project operations</li> <li>• Noise impacts on fauna</li> </ul>	<ul style="list-style-type: none"> <li>• Establishment of baseline conditions</li> <li>• Acoustic source impacts on fauna and mitigation</li> <li>• Noise and vibrations impacts on the project workforce and the neighbouring public</li> <li>• Impacts on nearby structures and facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-determined seismic survey lines</li> <li>• Access roads</li> <li>• Selected camp sites and facilities</li> </ul>	<ul style="list-style-type: none"> <li>• Lack of studies on noise and vibration impacts on fauna</li> </ul>

Solid and Liquid Wastes	<ul style="list-style-type: none"> <li>Disposal of sewage or domestic wastes</li> <li>Damage to environment through accidental localised spills of oil, fuel, cargo, waste or sewage</li> </ul>	<ul style="list-style-type: none"> <li>Establishment of baseline conditions</li> <li>Campsites will require to install waste discharge systems</li> </ul>	<ul style="list-style-type: none"> <li>Campsites</li> <li>Working areas</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Social Characteristics	<ul style="list-style-type: none"> <li>Level of services available</li> <li>Social support information</li> <li>Identification of key community needs</li> </ul>	<ul style="list-style-type: none"> <li>Quality of life baseline.</li> <li>Ability to absorb change</li> </ul>	<ul style="list-style-type: none"> <li>Entire project area</li> </ul>	<ul style="list-style-type: none"> <li>Language barrier in some places</li> <li>Reluctance to adopt new social practises</li> </ul>
Economic Setting	<ul style="list-style-type: none"> <li>Area targeted for growth</li> <li>Labour and employment</li> </ul>	<ul style="list-style-type: none"> <li>Quality of life baseline</li> <li>Development level baseline</li> <li>Willingness to adopt new economic activities</li> </ul>	<ul style="list-style-type: none"> <li>Entire project area</li> </ul>	<ul style="list-style-type: none"> <li>Reluctance to adopt new economic opportunities by the locals</li> </ul>
Health Setting	<ul style="list-style-type: none"> <li>Status of health facilities</li> <li>Access to health services</li> <li>Occupational health and safety hazards</li> <li>Hazards due to the use, storage, disposal or transportation of flammable, explosive, toxic, carcinogenic or mutagenic substances</li> <li>Traffic hazards</li> </ul>	<ul style="list-style-type: none"> <li>Determination of the available health facilities in the area</li> <li>Availability of officials in the available health facilities</li> <li>Emergency preparedness</li> </ul>	<ul style="list-style-type: none"> <li>Project area and the surrounding environment</li> </ul>	<ul style="list-style-type: none"> <li>Inaccessibility of some areas</li> </ul>
Security and Public Safety	<ul style="list-style-type: none"> <li>Public risks</li> <li>Crime</li> <li>Conflicts over resources</li> <li>Fires</li> </ul>	<ul style="list-style-type: none"> <li>Need to enhance security in some parts of the project area</li> <li>Emergency preparedness</li> </ul>	<ul style="list-style-type: none"> <li>Project area and the surrounding environment</li> </ul>	<ul style="list-style-type: none"> <li>Some areas are considered as high risk areas in terms of security</li> </ul>
Public Consultations	<ul style="list-style-type: none"> <li>Awareness creation on the project</li> <li>Environmental pressures in the area</li> <li>Expert and indigenous knowledge of the area</li> </ul>	<ul style="list-style-type: none"> <li>Involvement of all stakeholders</li> <li>Information gathering on environmental issues and concerns in the project area</li> <li>Acceptability of the project</li> </ul>	<ul style="list-style-type: none"> <li>Entire project area</li> </ul>	<ul style="list-style-type: none"> <li>Language barrier</li> </ul>
Corporate Social Responsibility	<ul style="list-style-type: none"> <li>Community prioritisation of areas/projects for possible CSR assistance</li> </ul>	<ul style="list-style-type: none"> <li>These were stated during the public consultations</li> </ul>	<ul style="list-style-type: none"> <li>Project area</li> </ul>	<ul style="list-style-type: none"> <li>Expectations may require management</li> </ul>
Mitigation Measures	<ul style="list-style-type: none"> <li>Mitigation hierarchy</li> </ul>	<ul style="list-style-type: none"> <li>Avoiding or reducing at source</li> <li>Abating at receptor</li> <li>Abating on site and off-site</li> <li>Repair or remedy</li> <li>Compensate for loss or damage</li> </ul>	<ul style="list-style-type: none"> <li>Pre-determined seismic survey lines</li> <li>Access roads</li> <li>Selected camp sites and facilities</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Environmental Management	<ul style="list-style-type: none"> <li>Effective mitigations specified for the</li> </ul>	<ul style="list-style-type: none"> <li>Least possible interference with the environment</li> </ul>	<ul style="list-style-type: none"> <li>Pre-determined</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>



Plan	topics addressed <ul style="list-style-type: none"> <li>• Costs</li> <li>• Responsibility</li> <li>• Management</li> <li>• Relevant legislation and regulations</li> <li>• Decommissioning</li> </ul>	<ul style="list-style-type: none"> <li>• Compliance with principles, policies and legislation relating to conservation of environment</li> <li>• Decommissioning of campsites</li> </ul>	seismic survey lines <ul style="list-style-type: none"> <li>• Access roads</li> <li>• Selected camp sites and facilities</li> </ul>	
Environmental Monitoring Plan	<ul style="list-style-type: none"> <li>• Parameters to be monitored</li> <li>• Personnel required</li> <li>• Training needs</li> </ul>	<ul style="list-style-type: none"> <li>• Ease of monitoring</li> <li>• Effectiveness of monitoring method</li> <li>• Cost of monitoring</li> <li>• Frequency</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-determined seismic survey lines</li> <li>• Access roads</li> <li>• Selected camp sites and facilities</li> </ul>	<ul style="list-style-type: none"> <li>• None</li> </ul>

### 3.4 COLLECTION OF BASELINE DATA

#### 3.4.1 Overview of Methods

The general framework of the baseline data collection was as follows:

- Scoping (determination of geographical and other boundaries; preliminary assessment).
- Review of existing regulatory framework and Institutional arrangement.
- Detailed environmental assessment and community sensitization.
- Impact identification and development of mitigation measures.
- Development of an Environmental Management Plan (EMP) including costs estimates and responsibility assignment.

Prior to the field study, a desktop study was conducted to review the available reports, and to design plans and maps in order to compile relevant biophysical and socio-economic information of the project area. The field study (detailed environmental impact assessment, community sensitization and social impact assessment, and development of mitigation measures and environmental management plan) was carried out from 21<sup>st</sup> February to 4<sup>th</sup> March 2011. GPS coordinates were taken and recorded for all the sampling points in the field as shown in Figure 3.1. Biophysical studies covered environmental aspects such as physiography, climate, hydrology, drainage, soils, geology/hydrogeology, vegetation, wildlife and aquatic environment. The socio-economic environmental study covered information on issues such as population, literacy, social amenities (healthcare and schools), land use, land tenure, the social dimensions of well being and income levels, water supply, sanitation levels and security, along with other pertinent issues. The field study also enabled cross checking of the data compiled during the desktop study.

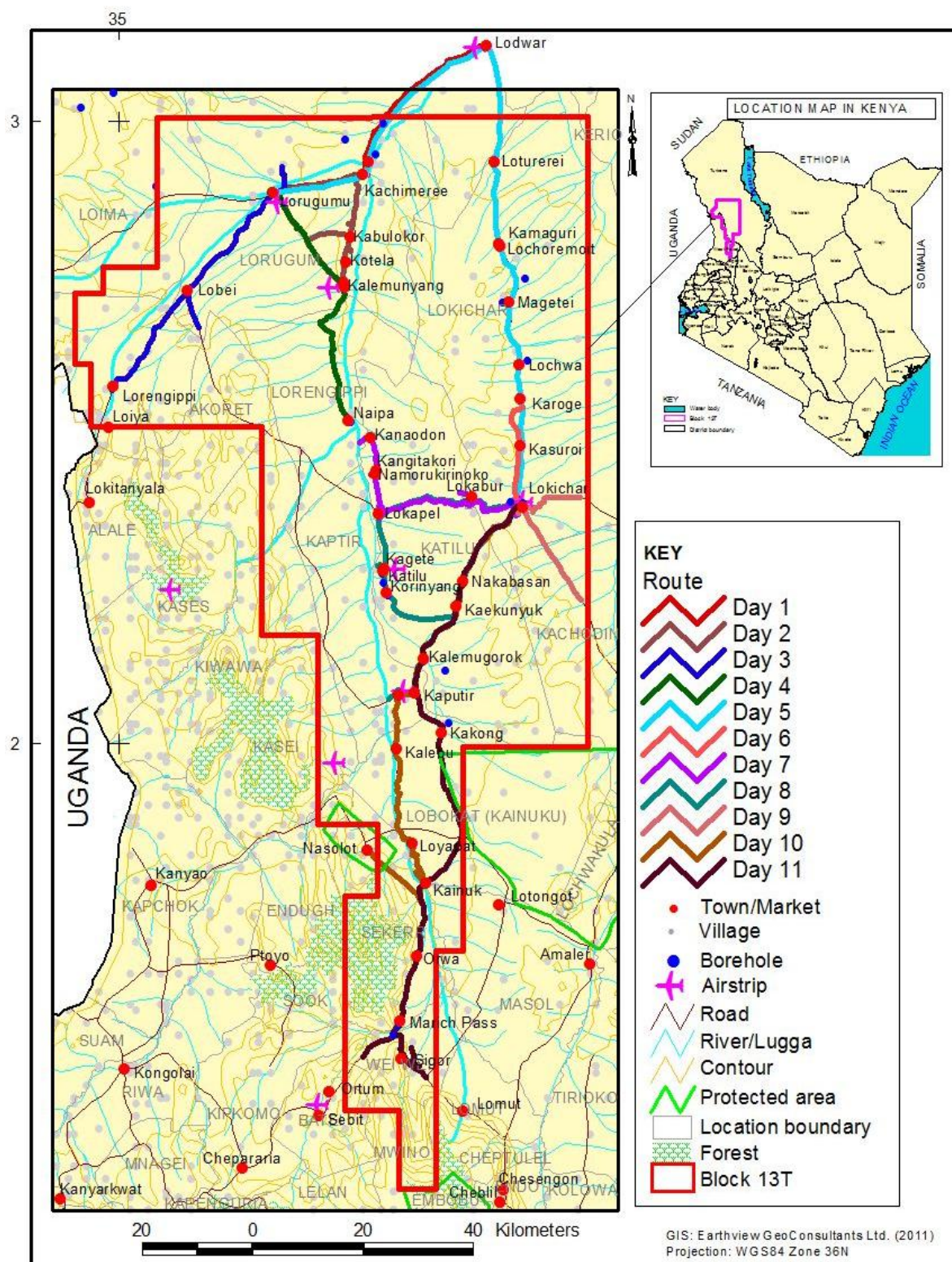


Figure 3.1: Route map of the study area.

### 3.4.2 Physiography and Geology

A literature review and field verification of the physiography, regional geology and geological setting of the project area was undertaken and the potential of related hazards such as subsidence, landslides, earthquakes, soil erosion, etc were assessed in relation to the proposed seismic survey to be done in the area.

### **3.4.3 Soils**

Primary soil data was obtained using the exploratory soil and agro-climatic zone map and report of Kenya (Sombroek et al., 1982). Reference was also made to the NOCK oil blocks map for boundary delineation. The scale used in this report was 1:50,000. Field data was collected through visual observation of soil units and road/riverbed cut descriptions where applicable. The surface description assisted in classification of the soil units. Parameters assessed in surface description included: soil texture, colour, structure, drainage, soil depth, surface stones and rock outcrops. Surface physical characteristics were described to determine wind and soil-water erosion hazards, flooding, ponding and water-logging potential and accessibility of the units by equipment and vehicles. A GPS was used to geo-reference the sampling points. Soil samples were collected for fertility and texture laboratory determination. Desktop work included soil map compilation and correlation to assign soil boundaries and harmonize the soil legend.

### **3.4.4 Climate**

Temperature, wind and precipitation data were obtained from desktop studies of existing literature covering the area. In addition, wind data was supplemented by visual observations in the field.

### **3.4.5 Air Quality**

Determination of the ambient air quality in this rural and sparsely populated setting was assessed qualitatively.

### **3.4.6 Surface and Ground Water Resources**

In order to assess the water quality, samples (from boreholes, shallow wells, water pans, springs, streams and rivers) were collected and analysed to determine their physico-chemical parameters, and compared with data from published literature. The locations of all sampling points were determined (Figure 3.2) and recorded using a GPS receiver.



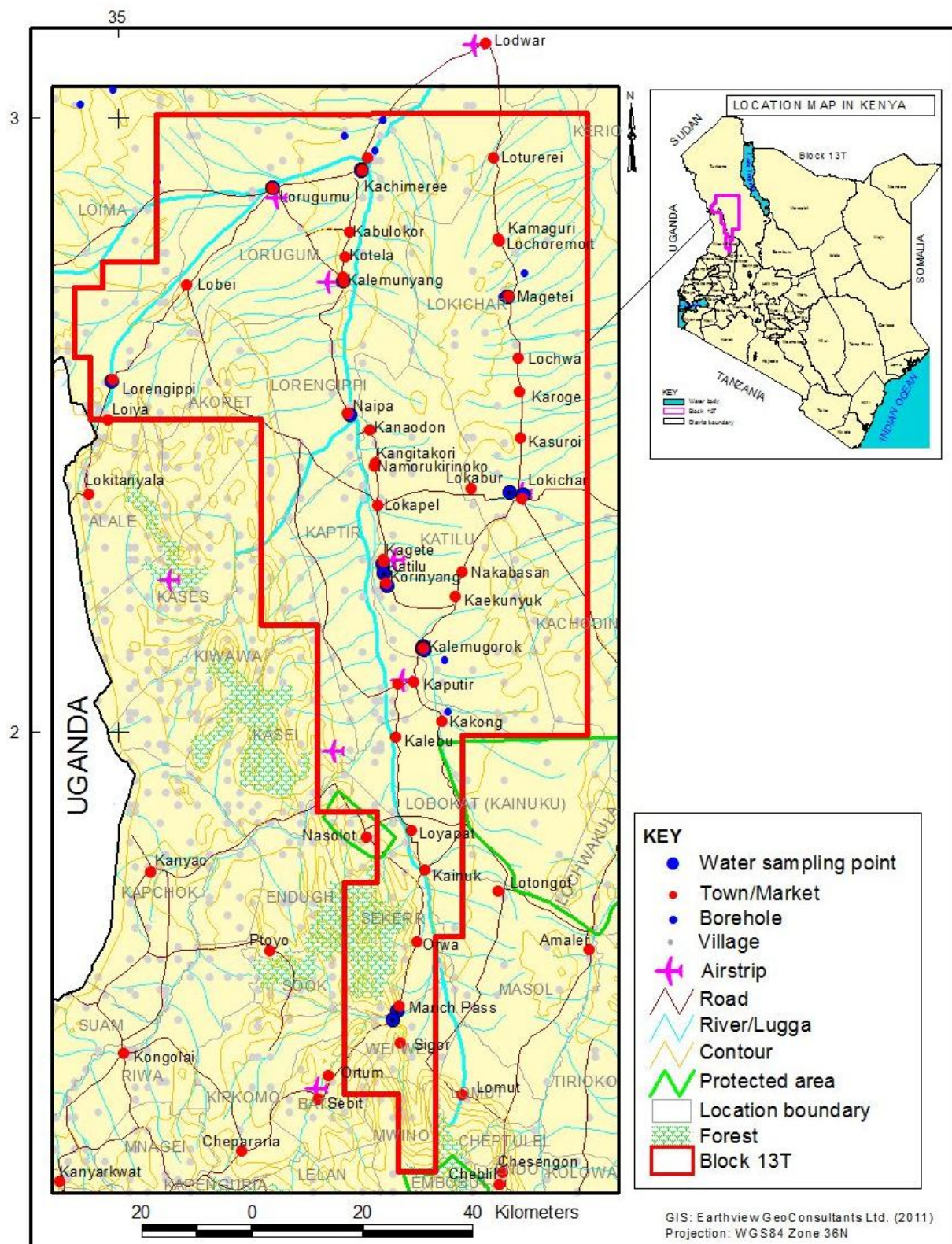


Figure 3.2: Water sampling points

### 3.4.7 Terrestrial Environment

Collection of baseline information for the terrestrial environment including floral and faunal components in the project area was based on field observations and supported by literature review. Considerations included inventories of habitat types and species (including local names, where provided); vegetation cover, classes, and dominance levels; presence of rare

and endangered species; presence of ecological reserves, and any critical ecosystem components. In addition, assessment was done to determine whether the area has experienced any known loss of habitat or biodiversity decline, and whether the proposed seismic survey activity would have any adverse effect on the existing ecosystems, flora, and fauna. Field guide books were handy in helping to confirm identified species.

Habitats and animal encounters of interest were recorded, and photographs of species of mammals, birds, reptiles, amphibians, and arthropods present at the time of observation were taken.

### **3.4.8 Aquatic Environment**

Assessment of the riverine environments (along the perennial rivers Turkwel and Wei Wei) included field-based identification of floral and faunal components and sampling, supported by literature review. River habitat types and species (common, rare, endemic and endangered) were noted.

### **3.4.9 Land Resources and Parks**

The assessment was achieved through literature review and field observations. The issues considered included land use patterns in the area as well as available natural resources and heritage sites (including cultural and archaeological). Also considered was the potential impact of the seismic exploration in the area on land use patterns and their sustainability.

### **3.4.10 Visual Aesthetics**

An assessment of visual aesthetics was based on observations in the field. The following issues were considered:-

- Scenery;
- Geomorphology and landscapes;
- Pristine natural environments;
- Potential impacts of seismic surveys and associated operations on the visual aesthetics of the area.

### **3.4.11 Noise and Vibrations**

The potential disturbance caused by noise levels during the seismic operation within the study area were taken into consideration during the fieldwork period. The mitigation of noise and vibrations arising from the use of Vibroseis and dynamite to generate the acoustic (seismic) waves, and associated support vehicles and equipment, was addressed.

### **3.4.12 Solid and Liquid Wastes**

Possible impacts from solid and liquid wastes generated as a result of the proposed seismic operation were assessed taking into account the increased use of motor vehicles and marine vessels, and mitigation measures suggested. An assessment of methods to be employed in solid waste and effluent management in the proposed project was made and implementation suggestions recorded.

### **3.4.13 Public Consultations and Socio-Economics**

Public consultations were carried out in diverse parts of the project area (Table 3.1 below) with the following aims:

- To inform the local people and their leaders about the proposed seismic data acquisition project and its objectives.
- To gather the concerns and views of the local people and fishermen on the proposed project.
- To establish if the local people foresee any positive and/or negative impacts associated with the proposed seismic survey project, and suggest possible ways of mitigating negative impacts and enhancing positive impacts arising from it.
- To identify and document the diverse socio-cultural and economic setups in the project area that could be potentially impacted by the project activities.

**Table 3.2 Order of meetings held in Block 13T**

<b>ORDER OF KEY MEETINGS HELD IN BLOCK 13T</b>					
	<b>DAYS &amp; DATES</b>	<b>TIME (Start/End)</b>	<b>AREAS COVERED</b>	<b>DISTRICTS</b>	<b>GPS COORDINATES</b>
1	THURSDAY 24/02/2011	10:00 A.M 11:15 A.M	Lorugumu Location Turkwel Division	LOIMA	253/N02.53'04.2" E035.14'58.2 618M
2	THURSDAY 24/02/2011	12:30 P.M 1:50 P.M	Turkwel Location Turkwel Division	LOIMA	254/ N02.55'33.3" E035.24'09.0 576M
3	THURSDAY 24/02/2011	3:40 P.M 5:00 P.M	Kalemungyang Sub location Lorugumu Location Turkwel Division	LOIMA	254/ N02.44'07.1 E035.22'14.1 585M
4	FRIDAY 25/02/2011	9:00 A.M 12:35 P.M	Lorengipi Location Turkwel Division	LOIMA	256/ N02.57132 E034.98971 887M
5	SATURDAY 26/02/2011	10:10 A.M 11:35 A.M	Naipa Sub location Kotaruk Location Turkwel Division	LOIMA	257/ N02.52152 E035.37367 631M
6	MONDAY 28/02/2011	10:48 A.M 1:00 P.M	Lochwaang'ikamatak Sub location Lochwaa Location Lokichar Division	TURKANA SOUTH	258/ N02.60549 E035.65100 714M
7	MONDAY 28/02/2011	2:48 P.M 5:00 P.M	Locheremoit Village Lochwaang'ikamatak Sub location Lochwaa Location Lokichar Division	TURKANA SOUTH	259/ N02.75561 E035.64242 721M
8	TUESDAY 1/03/2011	10:00 A.M 1:20 P.M	Lokichar Location Lokichar Division	TURKANA SOUTH	260/ N02.38608 E035.65413 753M
9	WEDNESDAY 2/03/2011	11:45 A.M 1:30 P.M	Kanaodon Sub location Katilu Location Katilu Division	TURKANA SOUTH	261/ N02.49658 E035.40873 639M
10	WEDNESDAY 2/03/2011	3:10 P.M 4:50 P.M	Lokapel Sub location Katilu Location Katilu Division	TURKANA SOUTH	262/ N02.36633 E035.41929 680M
11	THURSDAY 3/03/2011	11:15 A.M 12:35 P.M	Kaputir Location Kainuk Division	TURKANA SOUTH	263/ N02.04275 E035.44865 734M
12	THURSDAY 3/03/2011	3:10 P.M 4:50 P.M	Kalemung'orok Sub Location Kaputir Location Kainuk Division	TURKANA SOUTH	264/ N02.13855 E035.49628 754M
13	FRIDAY 4/03/2011	2:25 P.M 4:35 P.M	Kainuk Location Kainuk Division	TURKANA SOUTH	265/ N01.77603 E035.50081 827M
14	SATURDAY 5/03/2011	12:45 P.M 2:15 P.M	Wei Wei Location Sigor Division	CENTRAL POKOT	265/N01.48925 E035.47150 959M

Other social and economic aspects relating to the project area, including livelihoods and cultures, education and health, among others, were assessed.

The methodologies employed include review of available literature, public meetings and consultation with local residents and their leaders; and administration of formal questionnaires and interviews with interested parties and at household level.

### 3.4.14 Health and Public Safety

This assessment carried out by way of literature review of the available health data in the area. It also consisted of a site-walk survey using a checklist of environmental health issues such as general level of sanitation, waste disposal practices, water supply and availability of health facilities.

The main issues assessed included:

- Sources of water;
- Types of sewage disposal/facilities;
- Types and quality of housing;
- Refuse disposal;
- The general cleanliness of the environment;
- Availability of health facilities;
- Interaction between environment and health, and;
- Potential health impacts related to the project.

### 3.4.15 Key informant interviews

Some administrative, social, economic, cultural and health issues were captured through interviews with key informants such as district administration officers, opinion leaders, councillors, community elders, chiefs, teachers, health workers and spiritual leaders, among others. Some of the information elicited during such interviews included:

- Cultural practises;
- Religion and belief systems;
- Social amenities and infrastructure;
- Health facilities available within the communities in the project area;
- Common diseases in the community;
- Community health concerns relating to the project;
- Health expectations from the project;
- View on employment of locals for the project, and;
- Security issues.

## 3.5 IMPACT ASSESSMENT CRITERIA AND RATING SCALES

CRITERIA	RATING SCALES
<b>Intensity</b> (expected size or magnitude of impact)	<b>Negligible</b> <b>Low</b> - where the impact affects the environment in such a way that natural, cultural and social functions and processes are minimally affected <b>Medium</b> - where the affected environment is altered but natural, cultural and social functions and processes continue albeit in a modified way; and valued, important, sensitive or vulnerable systems or communities are negatively affected <b>High</b> - where natural, cultural or social functions and processes are altered to the extent that it will temporarily or permanently cease; and valued, important, sensitive or vulnerable systems or communities are substantially affected
<b>Extent</b> (predicted scale of impact)	<b>Site-specific</b> <b>Local</b> (immediate surrounding areas) <b>Regional</b> <b>National</b>
<b>Duration</b> (predicted lifetime of impact)	<b>Short-term</b> - 0 to 5 years <b>Medium term</b> - 6 to 15 years <b>Long term</b> - 16 to 30 years - where the impact will cease after the operational life of the activity either because of natural processes or by human intervention <b>Permanent</b> - where mitigation either by natural process or human intervention

CRITERIA	RATING SCALES
	will not occur in such a way or in such a time span that the impact can be considered transient
<b>Probability</b> (likelihood of impact occurring)	<b>Improbable</b> – where the possibility of the impact materialising is very low <b>Probable</b> – where there is a good possibility (<50% chance) that the impact will occur <b>Highly probable</b> – where it is most likely (50-90% chance) that the impact will occur <b>Definite</b> – where the impact will occur regardless of any prevention measures (>90% chance of occurring)
<b>Status of impact</b>	<b>Positive</b> - a “benefit” <b>Negative</b> - a “cost” <b>Neutral</b>
<b>Degree of confidence</b> (specialist’s level of confidence in predictions +/- information on which it is based)	<b>Low</b> <b>Medium</b> <b>High</b>

### Assigning significance ratings

The application of all the above criteria to determine the significance of potential impacts uses a balanced combination of duration, extent and intensity, modified by probability, cumulative effects and confidence.

### Significance is described as follows:

**Low:** Where the impact will have a negligible influence on the environment and no modifications or mitigations are necessary for the given programme description. This would be allocated to impacts of any severity/magnitude, if at a local scale and of temporary duration.

**Medium:** Where the impact could have an influence on the environment, which will require modification of the programme design and/or alternative mitigation. This would be allocated to impacts of moderate severity/magnitude, locally to regionally, and in the short-term.

**High:** Where the impact could have a significant influence on the environment and, in the event of a negative impact the activities causing it, should not be permitted (i.e. there could be a ‘no-go’ implication for the programme, regardless of any possible mitigation). This would be allocated to impacts of high magnitude, locally for longer than a month, and/or of high magnitude regionally and beyond.

The relationship between the significance ratings and decision-making can be broadly defined as follows:

**Low:** Will not have an influence on the decision to proceed with the proposed programme, provided that recommended measures to mitigate impacts are implemented;

**Medium:** Should not influence the decision to proceed with the proposed programme, provided that recommended measures to mitigate impacts are implemented; and



**High:** Would strongly influence the decision to proceed with the proposed programme.

## **CHAPTER 4:**

### **POLICY, LEGAL, AND REGULATORY FRAMEWORK**

#### **4.1 THE CONSTITUTION OF KENYA, 2010**

The Constitution provides that every person has the right to a clean and healthy environment (Article 42). The State is obliged to ensure that the environment and natural resources are conserved and genetic resources and biological diversity are protected. In that regard it must eliminate any processes or activities that would be likely to endanger the environment. Everyone is expected to cooperate with the State organs and other people to protect and conserve the environment and ensure that the use and development of the natural resources are ecologically sustainable (Article 69). These environmental rights are enforceable in a court of law (Article 70). Land must be used in a sustainable manner, and in accordance with the principles of sound conservation and protection of ecologically sensitive areas. The State may regulate the use of any land or right over any land in the interest of land use planning (Article 66).

The Constitution of Kenya gives recognition to public, community and private land. Land use regulation goes beyond exploitation merely for economic purposes, and lays emphasis on conservation. It is required that wildlife conservation promotes sustainable development which includes both environmental conservation and economic development. Parliament has five years from the date of promulgation to enact legislation to give full effect to the provisions relating to the environment. Community land vests in communities identified on the basis of ethnicity, culture, or other similar common interest. Apart from land registered or transferred, it consists of land that is lawfully held, managed or used by specific communities as grazing areas or shrines, and ancestral lands (Articles 60 – 72). The State is generally mandated to regulate the use of any land in the public interest. Public land is described as including: all minerals and mineral oils; specified government forests; government game reserves; water catchment areas; national parks; government animal sanctuaries; specially protected areas; and all rivers, lakes and other water bodies as defined by law. However, land on which mineral and mineral oils exist is held by the national government in trust for the Kenyan people (Article 62).

#### **4.2 THE POLICY FRAMEWORK**

##### **4.2.1 Environment and Development Policy**

The Environment and Development Policy is outlined in the draft Sessional Paper No.6 of 1999. It covers the following environment and development issues: biological diversity; land and land based resources; water resources; fisheries and marine resources; energy resources; atmospheric resources; waste management; management of toxic and dangerous chemicals; radiation management; environmental health and occupational safety; human settlements; disaster management; implementation strategies; priorities for action; human resources development; environmental planning; environmental laws; environmental impact assessment; environment and land use practices; environment, industry and economic development; environment, research and technology coordination and participation; regional and international cooperation; and environmental management authority.

It outlines the following principles, goals and objectives:

##### ***Principles***

- a) Environmental protection is an integral part of sustainable development.

- b) The environment and its natural resources can meet the needs of present as well as those of future generations if used sustainably.
- c) All the people have the right to benefit equally from the use of natural resources as well as an equal entitlement to a clean and healthy environment.
- d) Poverty reduction is an indispensable requirement for sustainable development.
- e) Sustainable development and a higher quality of life can be achieved by reducing or eliminating unsustainable practices of production and consumption, and by promoting appropriate demographic policies.
- f) Endogenous capacity building is essential for development, adaptation, diffusion, and transfer of technologies for sustainable development.
- g) Indigenous/traditional knowledge and skills are vital in environmental management and sustainable development.
- h) Effective public participation is enhanced by access to information concerning the environment and the opportunity to participate in decision-making processes.
- i) Public participation including women and youth is essential in proper environmental management.
- j) For sustainable management, the polluter pays principle should apply.
- k) Access to judicial and administrative proceedings, including redress and remedy, is essential to environmental conservation and management.
- l) Private sector participation in environmental management is essential for sustainable development.
- m) Effective measures should be taken to prevent any threats of damage to the environment, notwithstanding lack of full scientific certainty.
- n) Peace, security, development, and environmental protection are interdependent and indivisible.
- o) International co-operation and collaboration is essential in the management of environmental resources shared by two or more states.

### **Overall Goal**

The overall goal is to integrate environmental concerns into the national planning and management processes and provide guidelines for environmentally sustainable development.

### **Specific Goals**

- a) To incorporate environmental management and economic development as integral aspects of the process of sustainable development.
- b) To promote maintenance of a quality environment that permits a life of dignity and well-being for all.
- c) To encourage sustainable use of resources and ecosystems for the benefit of the present generations, while ensuring their potential to meet the needs of future generations.
- d) To promote maintenance of ecosystems and ecological processes essential for the functioning of the biosphere.
- e) To promote the preservation of genetic resources, biological diversity, their cultural values and their natural heritage.
- f) To incorporate indigenous knowledge, skills, and interests for effective participation of local communities in environmental management and sustainable development.

### **Objectives**

- a) To conserve and manage the natural resources of Kenya including air, water, land, flora, and fauna.
- b) To promote environmental conservation with regard to soil fertility, soil conservation,

- biodiversity, and to foster forestation activities;
- c) To protect water catchment areas;
- d) To enhance public awareness and appreciation of the essential linkages between development and environment;
- e) To initiate and encourage well-coordinated programmes of environmental education and training at all levels of society;
- f) To involve NGOs, private sector, and local communities in the management of natural resources and their living environment;
- g) To support a coordinated approach to policy formulation on environmental matters;
- h) To ensure development policies, programmes, and projects take environmental considerations into account;
- i) To ensure that an acceptable environmental impact assessment report is undertaken for all public and private projects and programmes;
- j) To develop and enforce environmental standards;
- k) To enhance, review regularly, harmonize, implement, and enforce laws for the management, sustainable utilization, and conservation of the natural resources;
- l) To provide economic and financial incentives for sustainable utilisation, conservation, and management of natural resources;
- m) To apply market forces, taxation, and other economic instruments including incentives and sanctions to protect the environment and influence attitudes and behaviour towards the environment;
- n) To ensure adherence to the polluter pays principle; and
- o) To develop adequate national laws regarding liability and compensation for the victims of pollution and other environmental damage.

#### **4.2.2 National Policy on Water Resources Management and Development (Sessional Paper No.1 of 1999)**

The management of water resources in Kenya is guided by four specific policy objectives, namely:

- a) Preserve, conserve and protect available water resources and allocate it in a sustainable, rational and economic way.
- b) Supply water of good quality in sufficient quantities to meet the various water needs, including poverty alleviation, while ensuring the safe disposal of wastewater and environmental protection.
- c) Establish an efficient and effective institutional framework to achieve a systematic development and management of the water sector.
- d) Develop a sound and sustainable financing system for effective water resources management, water supply and sanitation development.

#### **4.2.3 Energy Policy (Sessional Paper No. 4 of 2004)**

The broad objective of the national energy policy is to ensure adequate, quality, cost-effective and affordable supply of energy to meet development needs, while protecting and conserving the environment. The specific objectives are to:

- a) provide sustainable quality energy services for development;
- b) utilise energy as a tool to accelerate economic empowerment for urban and rural development;
- c) improve access to affordable energy services;
- d) provide an enabling environment for the provision of energy services;
- e) enhance security of supply;
- f) promote development of indigenous energy resources; and
- g) promote energy efficiency and conservation as well as prudent environmental, health and safety practices.

#### 4.2.4 Land Policy (Sessional Paper No. 3 of 2009)

The overall objective of the National Land Policy is to secure land rights and provide for sustainable growth, investment and the reduction of poverty in line with the Government's overall development objectives. Specifically, it seeks to develop a framework of policies and laws designed to ensure the maintenance of a system of land administration and management that will provide:

- a) all citizens with the opportunity to access and beneficially occupy and use land;
- b) an economically, socially equitable and environmentally sustainable allocation and use of land;
- c) effective and economical operation of the land market;
- d) efficient use of land and land-based resources; and
- e) efficient and transparent land dispute resolution mechanisms.

#### 4.2.5 Mining Policy

The National Mineral Resources and Mining Policy is currently at an advanced stage of being adopted. In tandem with this process, the Government has developed new mining legislation (currently The Mining and Minerals Bill, 2011) to replace the *Mining Act, Cap.306* of 1940, which is both antiquated and ineffective. Under the new mining legislation, rights and interests in minerals of all kinds, including commonly found minerals, will be regulated. The new mining legislation is being harmonised with existing environmental legislation. In particular, mining companies will be required to comply with the requirements of the Environmental Management and Co-ordination Act and other applicable environmental legislation and, the new legislation will provide that mining licences may not be granted unless the applicant has obtained an Environmental Impact Assessment ('EIA') Licence.

#### 4.2.6 Health Policy

The Kenya Health Policy Framework (1994) sets out the policy agenda for the health sector up to the year 2010, so this is likely to be reviewed in the near future. The policy includes strengthening of the central public policy role of the Ministry of Health (MoH), adoption of an explicit strategy to reduce the burden of disease, and definition of an essential cost-effective healthcare package. To put into operation this Health Policy Framework Paper, the National Health Sector Strategic Plan (NHSSP, 1999-2004) was developed in 1994. The strategic plan emphasized the decentralisation of healthcare delivery through redistribution of health services to rural areas. The plan is currently being revised to reflect the Poverty Reduction Strategy Paper (2001-2004) agenda. The new plan focuses on the essential key priority packages based on the burden of disease and the required support systems to deliver these services to the Kenyans. Major players in the health sector include the government represented by the Ministry of Health and the Local Government, private sector and non-governmental organisations (NGOs). The organisation of Kenya's healthcare delivery system revolves around three levels, namely the MoH headquarters, the provinces and the districts. The headquarter sets policies, coordinates the activities of NGOs and manages, monitors and evaluates policy formulation and implementation. The provincial tier acts as an intermediary between the central ministry and the districts. It oversees the implementation of health policy at the district level, maintains quality standards and coordinates and controls all district health activities. In addition, it monitors and supervises district health management boards (DHMBs), which supervise the operations of health activities at the district level.

#### 4.2.7 Economic Recovery for Wealth and Employment Creation Strategy

The overall goal of the Strategy is to ensure clear improvements in the social and economic well-being of all Kenyans, thereby giving Kenyans a better deal in their lives and in their struggle to build a modern and prosperous nation (GVEP Kenya, 2006). The key areas covered in the Strategy are:

- a) expanding and improving infrastructures;
- b) reforms in Trade and Industry;
- c) reforms in forestry;
- d) affordable shelter and housing;
- e) developing arid and semi-arid lands; and
- f) safeguarding environment and natural resources.

The Strategy, which has commanded a great deal of attention in recent years, essentially subsumes the Poverty Reduction Strategy Paper (PRSP).

#### 4.2.8 Kenya Vision 2030

Kenya Vision 2030 was launched on October 30, 2006, and is the country's new development plan for the period 2008 to 2030. It seeks to transform Kenya into an industrialized "middle-income country providing a high quality of life to its citizens by the year 2030".

Vision 2030 is based on three 'pillars': the economic, the social and the political. The adoption of the Vision follows the successful implementation of the Economic Recovery Strategy for Wealth and Employment Creation (ERS) launched in 2002. The Vision is to be implemented in successive five-year medium-term plans, with the first such plan covering the period 2008-2012.

The economic, social and political pillars of Kenya Vision 2030 are anchored on macroeconomic stability, continuity in government reforms, enhanced equity and wealth-creation opportunities for the poor, infrastructure, energy, science, technology and innovation, land reform, human resources development, security, as well as public sector reforms.

The foundations for the Vision are:

- 1. Macroeconomic Stability for Long-term Development:** The Vision places the highest premium on Kenya's current stable macroeconomic environment which works in favour of the poor, and expects it to continue in the future as a matter of policy. The projects proposed under Vision 2030 will be subjected to the parameters set under the macroeconomic stability framework.
- 2. Continuity in Governance Reforms:** These will be accelerated in order to create a more conducive environment for doing business, and also to enable Kenyans to fully enjoy their individual rights under the Constitution. Towards this end, the government will intensify the anti-corruption programme through more efficient investigation and prosecution; eliminating bribery in the public service and increasing public education and judicial and legal reform. The government will also fully support the people of Kenya, parliament, civil society and the press, recognising that they are the ultimate defence against abuse of office.
- 3. Infrastructure:** The Vision aspires for a country firmly interconnected through a network of roads, railways, ports, airports, water and sanitation facilities and telecommunications. This is a high priority issue.

- 4. Enhanced Equity and Wealth-Creation Opportunities for the Poor:** The Vision includes equity as a recurrent principle in economic, social and political programmes. Special attention has been given to arid and semi-arid districts, communities with high incidence of poverty, the unemployed youth, women, and all vulnerable groups.
- 5. Science, Technology and Innovation (STI):** The government will intensify the application of STI to increase productivity and efficiency levels across all three pillars. It recognises the critical role played by research and development in accelerating development in the emerging nations. The government will create and implement an STI policy framework to support Vision 2030.
- 6. Land Reform:** Land is a vital resource for the socio-economic and political developments set out in the Vision. It is recognized that respect for property rights to land, whether owned by individuals, communities or companies, is key to rapid economic growth (A national land use policy has now been created to enable this growth) (section 4.2.4).
- 7. Human Resources Development:** Kenya will create a globally competitive and adaptive human resource base to meet the needs of a rapidly industrializing economy through training and education, raising labour productivity to international levels, creating a human resource database to facilitate better planning, and establish more training institutions.
- 8. Security:** The government will increase security in order to lower the cost of doing business and provide Kenyans with a more secure environment to live and work in. The strategies will include improving community policing, reducing the police-to-population ratio, and adopting information and communication technology in crime detection and prevention. These measures will be supported by judicial reforms.
- 9. Energy:** Since development projects recommended under Vision 2030 will increase demand on Kenya's energy supply, she must generate more energy at a lower cost and increase efficiency in energy consumption. The government is committed to continued institutional reforms in the energy sector, including a strong, regulatory framework, and will encourage more power generation by the private sector. New sources of energy will be found through the exploitation of geothermal power, coal, and renewable energy sources.
- 10. The Public Sector:** An efficient, motivated and well-trained public service is expected to be one of the major foundations of the Vision. Kenya intends to build a public service that is more citizen-focused and results-oriented. The government will intensify efforts to bring about an attitudinal change in public service that values transparency and accountability to the citizens of Kenya.

#### 4.3 KENYA LEGISLATION AND REGULATIONS

##### 4.3.1 The Petroleum (Exploration and Production) Act, Cap. 308

The purpose of this legislation is to regulate the Government's negotiation of petroleum agreements relating to oil exploration, among other things. The Act, its regulations, and the terms and conditions of the petroleum contract, together govern oil operations. The Minister has the power to make regulations for the conservation of petroleum resources, the safety measures to be taken on site, environmental protection and the prevention of pollution, waste and accidents. The contractor<sup>2</sup> is expected to take necessary measures to conserve petroleum and other resources, as well as protect the environment and human life. Should the rights of the owner or occupier be infringed in the course of the petroleum operations, the contractor must pay a fair and reasonable compensation (Sections 4, 6, 9, 10). In our view,

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<sup>2</sup> "Contractor" here means the individual(s) or company undertaking the work or project.

precedent cases of compensation under similar conditions, where they exist, should be considered as guidelines to the level of compensation.

#### **4.3.2 The Petroleum (Exploration and Production) Regulations**

The existence of a petroleum agreement or the issue of a permit under the parent Act does not authorize the contractor or the grantee to occupy or exercise any rights in a) any burial land in the locality of any church, mosque or other places of worship; b) any area within fifty metres of any building in use, or any reservoir or dam; c) any public road; d) any area within a municipality or township; d) any land within one thousand metres of the boundaries of any aerodrome; and any land declared to be a national park or national reserve under the Wildlife (Conservation and Management) Act. However, directional drilling into the subsurface from land adjacent to the mentioned areas is permitted with the consent of the competent authority (Regulation 6).

It relates to interference with sensitive cultural, natural heritage sites, and the use of Vibroseis machines, dynamite charges and exhaust emissions from vehicles, machines and equipment such as generators, etc. It also relates to disturbance of flora and fauna.

#### **4.3.3 The Explosives Act, Cap. 115**

There are restrictions on transport, storage and possession of both authorized and unauthorized explosives. A permit is required to purchase and use blasting materials as well as to convey explosives within Kenya (Sections 6, 7, 11, 13). It applies to noise and vibrations from dynamite charges.

#### **4.3.4 The Explosives (Blasting Explosives) Rules**

The use of explosives in the vicinity of any public road is not permitted. Also prohibited is the use or transport of explosives in the working of a mine, quarry, excavation or other project, unless an “explosives manager<sup>3</sup>” has been appointed and the inspector notified in writing. The explosives manager is responsible for the safety and security of all explosives used, transported or stored, until they are handed to the blaster for use. He is also responsible for the safety of every person who may be employed on the project, whether under his direct supervision or not (Rules 78 – 80) in the context of the use of explosives. Also, such responsibility does not extend to a situation where the person was operating under the direct supervision or control of someone else who holds a valid permit to use explosive materials when the prevailing rules were contravened, or an accident occurred.

#### **4.3.5 The Energy Act, No. 12 of 2006**

Anyone in the petroleum business must comply with the Kenya Standard or other approved standard on environment, health and safety and in conformity with the relevant laws in that regard. A person transporting petroleum by inland waters, pipeline or any other mode must institute measures to ensure that the mode of transportation is safe. Anyone engaged in any licensed undertaking must notify the Energy Commission of any accident or incident causing loss of life, personal injury, explosion, oil spill, fire or any other accident or incident causing significant harm or damage to property or to the environment (Sections 98, 117).

It relates to the health and safety of the project crew and the environment.

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<sup>3</sup> “Explosives Manager” here means any person assigned to be responsible for the explosives.



#### **4.3.6 The Public Health Act, Cap. 242**

This legislation focuses on securing and maintaining health. It is the duty of every local authority to take measures to prevent any pollution dangerous to the health of any supply of water which the public uses for domestic purposes. They must purify the water supply should it become polluted, and take appropriate action against any person polluting any such water supply or any stream so as to cause a nuisance or danger to health (Section 129). They are also obligated to take measures to maintain the locality in clean and sanitary condition and to prevent or remedy any nuisance that may cause injury to health (Section 116). The Minister may make rules (a) as to the standard or standards of purity of any liquid which may be discharged as effluent after treatment, (b) establish or prohibit trade premises or factories likely to cause offensive smells, or (c) to discharge liquid or other material prone to cause such smells, or to pollute streams, or are likely in any way to be a nuisance or dangerous to health (Section 126).

This statute relates to the waste generated at the camp and worksite(s) and its safe discharge.

#### **4.3.7 The Occupational Safety and Health Act, No. 15 of 2007**

This legislation applies to all workplaces. Every occupier must ensure the health, safety and welfare at work of all the people working in his workplace as well as protect other people from risks to safety and health occasioned by the activities of his workers. The occupier's duty to ensure the safety, health and welfare of all persons at work in his premises includes providing a working environment and work procedures that are safe. The likely emission of poisonous, harmful, or offensive substances into the atmosphere should be prevented, and where such incidents occur, they must be rendered harmless and inoffensive. Machinery, protective gear, and tools used in all workplaces have to comply with the prescribed safety and health standards. Dust, fumes or impurity must not be allowed to enter the atmosphere without appropriate treatment to prevent air pollution or harm of any kind to life and property. Highly inflammable substances must be kept in a safe place outside any occupied building. Where dangerous fumes are liable to be present, there must be a means of exit and suitable breathing apparatus made available. Means for extinguishing fire must be available and easily accessible, and evacuation procedures tested regularly (Sections 6, 21, 47, 55, 64, 78, 79, 81, 82).

This covers activities that may be a hazard to the health and safety of the project workers and other persons both onshore and offshore, due to accidents caused by, for instance, vehicle collisions, collisions with animals, and vessel to vessel collisions. It includes injury involving equipment, as well as emissions from vehicles, equipment and vessels. It also relates to Vibroseis machines and dynamite charges.

#### **4.3.8 The Water Act, Cap. 372**

The Minister is mandated to prescribe a system for classifying water resources in order to determine resource quality objectives of each water resource. It is an offence to wilfully obstruct, interfere with, divert or obstruct water from any watercourse or water resource, or to negligently allow such acts, or to throw any dirt, effluent, trade waste or other offensive or unwholesome matter or thing into or near any water resource in such a way as to cause or be likely to cause pollution of the water resource (Sections 12, 44 and 94).

This relates to storage of oil and chemicals, and waste generation – solids, effluents and oils at camp and work areas – and its safe discharge.

#### **4.3.9 The Water Resources Management Rules, 2007**

No one may discharge any toxic or obstructing matter, radioactive waste or other pollutants into any water resource unless the discharge has been treated to permissible levels. Discharge of effluent into a water resource requires a valid discharge permit issued by NEMA. The wilful and deliberate spilling into any water source or onto land where such spillage may contaminate any surface or groundwater is not permitted. Any threat of contamination must swiftly be dealt with (Regulations 81, 82, 88). NEMA may identify a catchment area or part of a catchment area or water resource to be identified as protected areas or designated as groundwater conservation areas if it is satisfied that it is necessary to protect the water resource and its multiple uses (Regulation 123).

This applies to the safe discharge of waste emanating from camp and worksites.

#### **4.3.10 The Local Government Act, Cap. 265 (Revised 2010)**

This Act gives local authorities the power to control or ban businesses, factories and workshops which may emit smoke, fumes, chemicals, gases, dust, smell, noise or vibration, and in so doing become a danger or annoyance to the vicinity. The local authority may therefore lay down conditions under which such enterprises may carry on business (Section 163). A local authority may refuse to grant or renew a licence, or cancel it on various grounds, some of which are (a) that it would cause nuisance or annoyance to the residents; and (b) that the method adopted or proposed to prevent noxious or offensive vapours, gases or smells arising from the trade are not efficient (Section 165). However, the Local Government Bill, 2009, is intended to repeal and replace this statute and will provide for various classes of local authorities. It is worth noting that the Bill provides that a municipality will be granted city status and a city metropolitan status only if they demonstrate an effective programme of environmental conservation and the ability to render environmental conservation services within their areas respectively. The Bill went through the second reading in Parliament in June 2010.

This relates to the project's compliance with the laws and regulations regarding the protection of the environment from forms of pollution that may occur as a result of the use of Vibroseis machines, dynamite charges, waste discharge and disposal, storage of oil and chemicals, as well as exhaust emissions from vehicles, machines and equipment.

#### **4.3.11 The Physical Planning Act, Cap. 286**

The statute establishes Physical Planning Liaison Committees to determine development applications relating to industrial location, dumping sites or sewerage treatment which may have adverse impact on the environment. If a local authority is of the opinion that a proposed development, dump site, sewerage treatment plant, quarry or other development activity will impact on the environment adversely, it will require the applicant to submit an environmental assessment report for consideration (Section 36).

This covers all development activities that may result in adverse effects on the environment, particularly the generation of waste and the method of its discharge.

#### **4.3.12 The Wildlife (Conservation and Management) Act, Cap. 376**

Where the Minister is satisfied that in order to secure the safety of the flora and fauna or to preserve the habitat and ecology within a national park, reserve or sanctuary, it is necessary to restrict or forbid any activity in the adjacent area, he may declare it a protected area and prohibit those activities. The Wildlife Director or his agent or any authorized officer of the Service may close a portion of a national park or any road or part of a road within the park to

the public or any class of people, for a period for the protection of animal or plant life, or for the safety of the public, or for the protection of a road, or for climatic reasons, or for any other reason (Regulation 4). The Minister may declare that any provision of the Act shall apply to non-game animals, or to any trophy or meat of any such animal, and on publication of the notice the animal concerned will be deemed to be a game animal or game bird (Section 15).

This statute relates to the disturbance of, and interference with, sensitive cultural, natural heritage and archaeological sites.

#### **4.3.13 The National Museums and Heritage Act, Cap. 216**

The Minister may prohibit or restrict access or any development which in his/her opinion is liable to damage a monument or object of archaeological or palaeontological interest there. A protected area means a site which has been and remains so declared by the Minister under section 25 (1). These include (a) an open space, (b) a specified site on which a buried monument or object of archaeological or palaeontological interest exists, including the adjacent area, or (c) a geo-park. The protected area may be placed under the control of the National Museums of Kenya. Where private land is included in a protected area, the owner of the land is entitled to compensation. All antiquities lying in or under the ground, or on the surface of any land protected under the law as a monument, or being objects of archaeological, palaeontological and cultural interest are the property of the Government (Sections 25, 34, 35, 46).

This statute relates to the disturbance of, and interference with, sensitive cultural, natural heritage and archaeological sites.

#### **4.3.14 The Penal Code, Cap. 63**

The following acts constitute offences under section 191 to 193 of the Penal code:

- Voluntarily fouling the water of any public spring or reservoir, thereby making it less fit for its normal purpose.
- Corrupting the atmosphere in any place, so as to make it noxious to the health of people in the vicinity.
- For trade or other purposes, making loud noises or offensive smells in circumstances causing annoyance to others.

This relates to compliance with the law as regards air and water pollution from site activities.

### **4.4 NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY - ACT AND REGULATIONS**

#### **4.4.1 The Environmental Management and Co-ordination Act, 1999**

The Environmental Management and Co-ordination Act, 1999, provides for the establishment of an appropriate legal and institutional framework for the purpose of managing the environment and matters connected with it. The National Environment Management Authority (NEMA) is established under section 7 of the Act. Its mandate is to monitor the operations of industries, projects or activities to determine their immediate and long-term effects on the environment. TKBV, being a project whose activities fall within the ambit of the Act, is therefore subject to its provisions. The Act (Part VIII) lays down provisions pertaining to environmental quality standards. It establishes a Standards and Enforcement Review Committee whose broad functions are to (a) advise NEMA on how to establish criteria and procedures to measure water and air quality and (b) issue standards and guidelines for the safe and proper disposal of waste (Sections 70, 71, 78, 86). Where

Kenya is a party to an international convention, treaty or agreement on the management of the environment, NEMA must initiate legislative proposals to give effect to them (Section 124). The law does not permit anyone to deposit any substance in a lake, river or wetland or in, on or under its bed, if that substance is likely to cause adverse environmental effects. NEMA may prescribe measures to ensure that the biological resources in place are preserved, issue guidelines to promote the conservation of the various terrestrial and aquatic systems, and protect species, ecosystems and habitats threatened with extinction. Any area of land, lake or river may be declared a protected natural environment in order to promote and preserve specific ecological processes, natural environment systems or species of indigenous wildlife. It is an offence to discharge pollutants into the aquatic environment. No one is permitted to discharge any hazardous substance, chemical, oil or mixture containing any oil into any waters or any other parts of the environment. Noise must not be emitted in excess of the laid-down standards (Sections 42, 43, 51, 54, 71, 72, 93, 102, 108).

This statute regulates all the activities of projects that may have adverse environmental impacts.

#### **4.4.2 The EIA Guidelines and Administrative Procedures**

The Environment Impact Assessment and Administrative Procedures arose from the policy framework and the legislative and regulatory (the Environmental Management and Co-ordination Act, 1999, and its regulations) procedures in order to assist in the integration of environmental concerns in economic development so as to foster sustainable development. The document sets out guidelines for carrying out Environmental Impact Assessment, Environmental Audit and Monitoring, Strategic Environmental Assessment and dealing with issues of transboundary, regional and international conventions, treaties and agreements. It sets out the procedure in EIA studies and Environmental Audits as well as the contents and format of the reports required to be submitted to NEMA for consideration. The EIA study review process and decision-making are also explained. The guidelines are mainly intended to assist project proponents, EIA practitioners, lead agencies and members of the public to understand the process and the basis on which decisions are made.

#### **4.4.3 The Environmental Management and Co-ordination (Water Quality) Regulations, 2006**

Everyone is required to refrain from any act which directly or indirectly causes water pollution, and no one may throw or cause to flow into or near a water resource any liquid, solid or gaseous substance or deposit any such material in or near it so as to cause pollution. No one is permitted to carry out any activity near lakes, streams, springs and wells that is likely to have an adverse impact on the quality of the water without an environmental impact assessment licence. It is an offence to discharge or apply any poison, toxic or obstructing matter, radioactive wastes or other pollutants or permit the dumping or discharge of any such matter into water meant for fisheries and wildlife (Regulations 4-8, 12 and 24).

This applies to solid or liquid waste generated from the campsite or from the project site(s) and other work areas, and the manner of disposal of such waste in, or close to, the named water sources.

#### **4.4.4 The Environmental (Impact Assessment and Audit) Regulations, 2003**

Any project that is likely to have a negative impact on the environment must be submitted to an environmental impact assessment process. The terms of reference must include matters considered germane in the environmental impact assessment process as set out in the Second Schedule to the Regulations. In addition, the study must take into account environmental, social, cultural, economic, and legal considerations. The report must state: a)

the proposed location of the project and a description of the environment likely to be affected; b) the products, by-products and waste generated by the project; c) the project's environmental effects, including the socio-cultural consequences and the anticipated direct, indirect, cumulative, irreversible, short-term and long-term impacts; d) an environmental management plan proposing the measures for eliminating or mitigating adverse impacts on the environment; e) an action plan to prevent and manage foreseeable accidents and dangerous activities in the course of carrying out the project; and f) the measures to prevent health hazards and to ensure security in the workplace for the employees (Regulations 4, 7, 11, 16 and 18).

It applies to the requirements of the environmental impact assessment process.

#### **4.4.5 The Environmental Management and Co-ordination (Conservation of Biological Diversity and Resources, Access to Genetic Resources and Benefit-Sharing) Regulations, 2006**

Regulation 4 provides that no person shall engage in any activity that may have an adverse impact on any ecosystem or lead to the unsustainable use of natural resources. The conservation of biological diversity applies to any area of land, lake or river which the Minister has declared to be a protected natural environment system for purposes of promoting and preserving biological diversity in accordance with section 54 of the parent Act (Regulation 8).

This relates to disturbance of flora and fauna, vegetation disturbance and removal, and the disturbance of soil, surface and groundwater, and the marine environment.

#### **4.4.6 The Environmental Management and Co-ordination (Wetland, Riverbank, Lakeshore and Seashore Management) Regulations, 2009**

These Regulations aim to ensure the sustainable use of wetlands for ecological and aesthetic purposes and in addition seek to prevent and control pollution and siltation as well as other activities that may degrade the environment. All wetland resources must be used in a sustainable manner compatible with the continued presence of wetlands and their hydrological, ecological, social and economic functions and services. Some permitted uses of wetlands include cultivation, fishing (subject to the Fisheries Act), small-scale fish farming, domestic consumption, grazing, and hunting (subject to the Wildlife (Conservation and Management) Act). Areas that have national significance may be declared to be protected wetlands due to their biological diversity, ecological importance, natural heritage, aesthetic value or landscape. Environmental Restoration orders may be given to allow a wetland, riverbank or lakeshore that has been degraded to regenerate. Local authorities are mandated to make bye-laws to manage solid waste and waste waters on lakeshores and riverbanks in accordance with the Public Health Act, Cap. 342 (Regulations 4, 5, 8, 11, 16, 17, 22, 24).

This applies to interference with fishing and other marine activities, and the possible disturbance of aquatic life, flora and fauna. In addition it relates to interference with grazing and other economic activities close to the project area, as well as visual aesthetics, and interference with the natural heritage.

#### **4.4.7 The Environmental Management and Co-ordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009**

The Regulations prohibit the making of loud, unreasonable, unnecessary or unusual noise or excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of other people and the environment. There are laid-down permissible noise levels

which no one may exceed unless the noise is reasonably necessary to preserve life, health, safety or property. Any person intending to engage in any commercial or industrial activity likely to emit noise or excessive vibrations must carry out that activity within the prescribed level (Regulations 3-5, 11, 20).

These regulations relate to noise and vibrations from the use of Vibroseis machines, dynamite charges, vehicles, machines and equipment such as generators, etc.

#### **4.4.8 The Environmental Management Co-ordination (Fossil Fuel Emission Control) Regulations, 2006**

Every person in Kenya is entitled to a clean and healthy environment and is obligated to safeguard and enhance that environment. Internal combustion engines are subject to inspection and must pass tests to show that they comply with the standards and requirements for the control of air pollution or contamination. It is an offence to operate an internal combustion engine which emits smoke or other pollutant in excess of the emission standards. NEMA may approve any substance to be used as a fuel catalyst if it improves fuel economy, enhances combustion and reduces harmful emissions that adversely affect human, animal and plant health and degrade the environment. The cost of clearing the pollution through fuel emission is borne by the polluter (Regulations 4, 7, 12).

This relates to vehicular exhaust emissions that could be potentially harmful to the project crew as well as to other persons in the vicinity. It includes all other equipment that emit fumes.

#### **4.4.9 The Environmental Management and Co-ordination (Waste Management) Regulations, 2006**

Anyone generating waste must minimize it by adopting cleaner production methods. This may be done by improving the production process through conserving raw materials and energy, eliminating the use of toxic raw materials and reducing toxic emissions and wastes. Other methods would be to monitor the product cycle by identifying and eliminating the product's potential negative impacts, recovering and reusing the product where possible, and reclaiming and recycling it. Waste can also be minimized by incorporating environmental concerns in the design and disposal of the product. Every industrial undertaking must mitigate pollution by installing at its premises anti-pollution equipment for treating the waste it generates. Discharge or disposal of any waste in any form into the environment is not permitted without prior treatment. An Environmental Impact Assessment licence must be obtained by anyone intending to engage in any activity likely to generate hazardous waste. Anyone generating toxic or hazardous waste must have it treated according to the laid-down guidelines (Regulations 14, 15, 17).

This applies to waste generation at camp and the work site(s), and its disposal in a way that does not endanger human health and the environment.

### **4.5 INTERNATIONAL PRACTICES, STANDARDS AND CONVENTIONS**

#### **4.5.1 International Best Practices**

Useful guidelines and practices on the best international practices in the oil exploration and production industry can be drawn from international best practices developed by the industry. Some of the major ones are: a) the International Association of Oil and Gas Producers (OGP) guidelines on best practices to improve health, safety, environment, security, corporate social responsibility, engineering and operations, b) the International Association of Geophysical Contractors (IAGC) whose focus areas include government

issues, standards and best practices with an emphasis on health, safety and the environment, and c) the E&P Forum which has specific guidelines for the development and application of health, safety and environmental management systems, among others.

The E&P Forum (Oil Industry International Exploration and Production Forum) is an international association of oil companies and petroleum industry organizations. It deals with all aspects of exploration and production operations with major emphasis on health, safety and environment. The Forum is continuously engaged in developing guidelines and codes of practice based on the experiences of both UNEP and the oil industry. These guidelines have become widely accepted as providing a strong basis for preparing regulations, policies and programmes to minimize the impact that these operations visit on the environment.

E&P, jointly with UNEP, published a document on the best approaches to achieving high environmental performance and standards worldwide. Within the framework provided, various technical reviews and guidelines already available from other relevant sources can be applied. It developed a common management system to deal with health, safety and environmental (EHS) issues. Its key elements are as follows:

### **1. Leadership and commitment**

It is vital to have a senior management committed to ensuring that the management system is developed and maintained, and that the company's policy and strategic objectives are achieved. Management should ensure that the policy requirements are adhered to during operations and support local initiatives to protect health, safety and the environment. Management commitment will involve delegating responsibility, providing resources and motivation, and ensuring participation and open communication.

### **2. Policy and strategic objectives**

The EHS management system requires that the company's policies and strategic objectives are well-defined and documented. The policies must be relevant and consistent and should be on a par with other company policies and objectives. Here also, commitment to carrying out the company's policies towards protecting people's health and safety as well as the environment, is vital, as are responses to community concerns. Partnerships with stakeholders are just as essential. Where relevant legislation and regulations do not exist, the company must commit to apply responsible standards.

### **3. Organization, resources and documentation**

Organization of personnel, resources and documentation make for a sound EHS management system. Roles must be clearly defined from the beginning to the end of the project. Appropriate periodic training and review will enhance competence and effective performance.

### **4. Evaluation and risk management**

Procedures must be in place to identify on a regular basis the dangers and effects of the undertaking. This identification should apply to all the activities from the start to the decommissioning of the project. Environmental impact assessment study becomes a suitable criterion to gauge what is acceptable, particularly in the absence of appropriate legislative control.

## 5. Planning

Environmental planning and compliance programmes should include ways and means of preventing or minimizing adverse impacts, as well as enhancing the beneficial impacts that may accrue. It is also imperative that internal standards and targets are set for compliance. A detailed decommissioning plan should be considered in the initial planning of the project, and a plan to restore the environment should be developed before the end of the project.

## 6. Implementation and monitoring

The purpose of monitoring is to ensure that the results forecast at the planning stage are being achieved, and where the contrary is the case, to identify the cause and take action to correct the situation. Managers must strictly adhere to legal and statutory requirements and controls as well as the company's own commitment to responsible management of the environment. Monitoring will indicate whether or not commitments and compliance with legal and corporate requirements are being met. It also provides the basis for audit.

## 7. Audit and review

This management tool enables the senior management to regularly assess its performance, effectiveness and suitability. It also provides an opportunity to obtain feedback on the effectiveness of the organization and its environmental performance. It is also useful in verifying compliance with monitoring programmes and ensuring that plans, procedures and standards are working effectively.

Other renowned national and international standards for best practice, particularly the ISO 9000 and 14000 series, also offer management systems models that can be used by companies to enhance their environmental performance.

### 4.5.2 International Conventions

The Kenya Constitution provides that the general rules of international law shall form part of the laws of Kenya, as shall any treaty or convention that she ratifies (Article 2). Kenya has ratified or subscribed to a number of international conventions that relate to the environment within her borders.

**Table 4.1: International conventions that Kenya has ratified.**

	Convention	Entry into force	Date of ratification
1.	African Convention for the Conservation of Nature and Natural Resources, Algiers, 1968 Parties must conserve their natural resources – soil, water, flora and fauna – ensuring that they are used and scientifically developed in a manner that will benefit their people.	16 June, 1969	12 May, 1969 (accession)
2.	African Convention on the Conservation of Natural Resources (Revised Version) Maputo, 2003 Parties must ensure that developmental and environmental needs are met in a sustainable, fair and equitable manner.	11 July, 2003	17 December, 2003 (signature)
3.	Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar, 1971 It provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources.	21 December, 1975	5 October, 1990
4.	Convention Concerning the Protection of the World Cultural and Natural Heritage, Paris, 1972 It establishes a system of collective protection of cultural and natural heritage of outstanding universal value.	17 December, 1975	1 July, 1983
5.	Convention on International Trade in Endangered Species of Wild Fauna and Flora, Washington, 1973 It aims at ensuring that international trade in specimens of wild animals and plants does not threaten their survival.	1 July, 1975	13 March, 1979
6.	Convention on the Conservation of Migratory Species of Wild Animals, Bonn, 1979 It aims to protect those species of wild animals that migrate across or outside of	1 November, 1983	



	national boundaries. Parties must protect them, conserve and restore their habitat, mitigate obstacles to migration and control other factors that might endanger them.		
7.	Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Basel, 1989 It aims at protecting human health and the environment against the adverse effects resulting from the generation, management, transboundary movements and disposal of hazardous wastes.	5 May , 1992	2000 (accession)
8.	Amendments to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, Geneva, 1995 The amendment prohibits exports of hazardous wastes destined for final disposal or recycling purposes from Annex VII countries to non-Annex VII countries (Annex VII not yet in force).	5 May, 1992	9 September, 2009 (acceptance)
9.	United Nations Framework Convention on Climatic Change, New York, 1992 It sets an overall framework for intergovernmental efforts to tackle the challenge posed by climatic change, recognizing that the climate system can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases.	21 March, 1994	30 August, 1994
10.	Kyoto Protocol to the United Nations Framework Convention on Climate Change, Kyoto, 1997 It sets binding targets for 37 industrialized countries and the European Community as well as for countries undergoing the process of transition to a market economy in order to reduce greenhouse gas emissions.	16 February, 2005	2005 (accession)
11.	Convention on Biological Diversity, Rio de Janeiro, 1992 It aims at granting the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the use of genetic resources.	29 December, 1993	27 June, 1994
12.	Stockholm Convention on Persistent Organic Pollutants, Stockholm, 2001 It protects human health and the environment from chemicals that remain intact in the environment for long periods, become widely distributed geographically and accumulate in the fatty tissue of humans and wildlife. It requires Parties to take measures to eliminate or reduce the release of persistent organic pollutants into the environment.	17 May, 2001	24 September, 2004
13.	Bamako Convention on the Ban of the Import into Africa and the Control of Transboundary Movement and Management of Hazardous Wastes within Africa, Bamako, 1991 It binds Parties to take appropriate legal, administrative and other measures within the area under their jurisdiction to prohibit the import of all hazardous wastes, for any reason, into Africa from non-Contracting Parties.	22 April, 1998	17 December, 2003 (signature)



The baseline draws from both primary and secondary data sources. Primary data sources involved the visit to the project area and undertaking a baseline survey (Table 5.1), while secondary sources of data include various research and published literature including social and economic data from Government reports. It should be noted that some of the information in this chapter may be limited due to lack of previous published research on the biophysical and socio-economic aspects of the project area.

**Table 5.1: Chapter layout.**

Major Sections in this Chapter	Issues Addressed
Introduction	<ul style="list-style-type: none"> <li>• Project Location and Layout of the Chapter</li> <li>• Geographical Aspects and Boundaries</li> <li>• Administrative setup</li> <li>• Communications and transport</li> <li>• Government, Non-Governmental and Community Based Organisations</li> </ul>
Environmental baseline survey	<ul style="list-style-type: none"> <li>• Physiography and Geology</li> <li>• Soils</li> <li>• Climate</li> <li>• Air Quality</li> <li>• Surface and Ground Water Resources</li> <li>• Water Quality</li> <li>• Terrestrial Environment</li> <li>• Aquatic Environment</li> <li>• Land Resources and Parks</li> <li>• Archaeological, Historical and Cultural Sites</li> <li>• Visual Aesthetics</li> <li>• Noise and Vibrations</li> <li>• Solid and Liquid Wastes</li> </ul>
Environment-related Social and Economic baseline	<ul style="list-style-type: none"> <li>• Demography</li> <li>• Education</li> <li>• Housing</li> <li>• Energy Sources</li> <li>• Land Tenure Systems</li> <li>• Labour Force</li> <li>• Livestock and Crop Production</li> <li>• Trade, Commerce and Industry</li> <li>• Health Settings</li> <li>• Security and Public Safety</li> <li>• Community Views and Concerns</li> <li>• Corporate Social Responsibility</li> </ul>

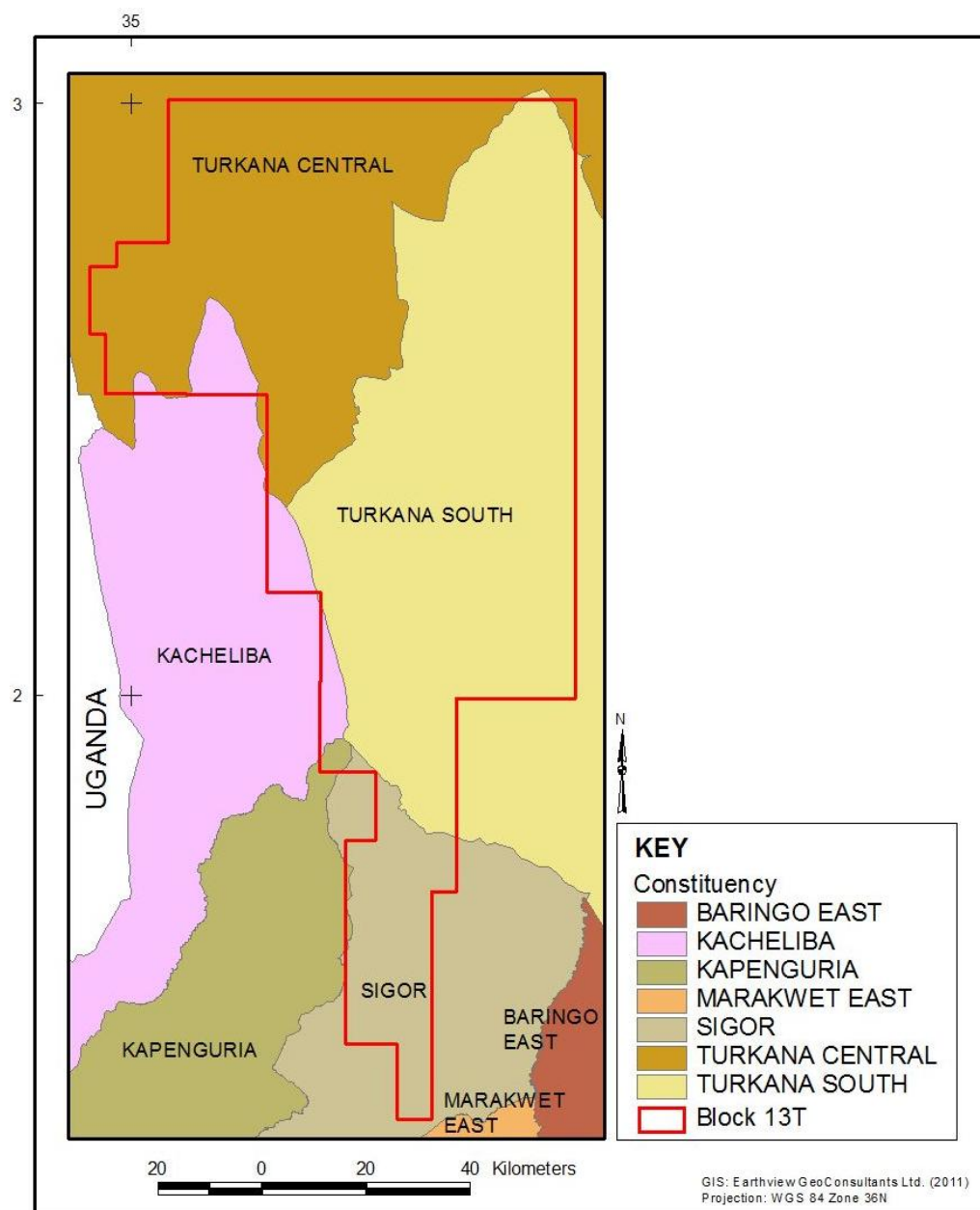
### 5.1.2 Geographical Aspects and Boundaries

The project area lies in the north-western part of Kenya (Figure 5.1), with its most prominent features being the Turkwel River that runs south to north, dissecting the project area into two halves, and the associated hills and ranges that run parallel to the river on either side, marking the western and eastern boundaries of the watershed of the Turkwel River, as well as those of the project area to the west.

### 5.1.3 Administrative Structure

The project area straddles parts of two counties: Turkana County and Pokot County (Figure 5.2). Counties are the new second tier administrative level after the National level and the structures are still being set up in accordance with Kenya's new constitution which was promulgated in August 2010. Counties shall be headed by Governors. There are four administrative districts (Turkana East, Turkana South, Loima, and Central Pokot) that were established under the old constitution but that are still active until such a time that the new

constitutional structures are properly established. They are headed by District Commissioners, who in turn are subject to the Provincial Commissioner of the Rift Valley Province (with its headquarters in Nakuru town), within which these districts fall. Nakuru town is located several hundreds of kilometres south of the project area, and this distance makes administration of the vast area more difficult than it would otherwise be. The project area also covers parts of four parliamentary constituencies, namely, Turkana South, Turkana Central, Kacheliba and Sigor (Figure 5.2).



**Figure 5.2: Administrative boundaries in the project area: Turkana South and Turkana Central are in Turkana County, while Kacheliba and Sigor constituencies are in Pokot County.**

#### 5.1.4 Communications and Transport

A class "A" road (Nairobi-Kitale-Lodwar-Juba highway) traverses the project area (Plate 5.1), but it is in a state of disrepair. A network of internal earth roads managed by the County Council of Turkana and Sigor also serves the area. These roads are also in a bad state of disrepair and may be impassable during the rainy seasons. Most of the terrain



comprises of soft sand, and for this reason, the commonly used mode of transport are four-wheel drive vehicles.



**Plate 5.1: The most commonly used mode of transport and the state of the road in the region respectively.**

There are five light aircraft airstrips serving this vast area, and they are located at Lokichar, Lorugumu, Kaputir, Katilu and Kalemunyang towns. Postal and telecommunication services that are run by both private and public operators are available. The towns and some smaller population centers are covered by both mobile telephony and mobile internet services (Plate 5.2).



**Plate 5.2: Part of the transport and communication infrastructure in Block 13T.**

### **5.1.5 Government, Non Governmental and Community-Based Organizations**

There is a presence of NGOs (Non-Governmental Organizations) and CBOs (Community Based Organizations) carrying out various projects and activities with the communities that dwell in the Arid and Semi-Arid Land (ASAL) area. These organizations mainly deal with relief operations and social welfare. They include international humanitarian organizations such as World Vision, Christian Children's Fund, Practical Action, International Rescue Committee, and the World Food Program. The NGOs work largely in association with the many CBOs and local women and youth groups that the communities have established.

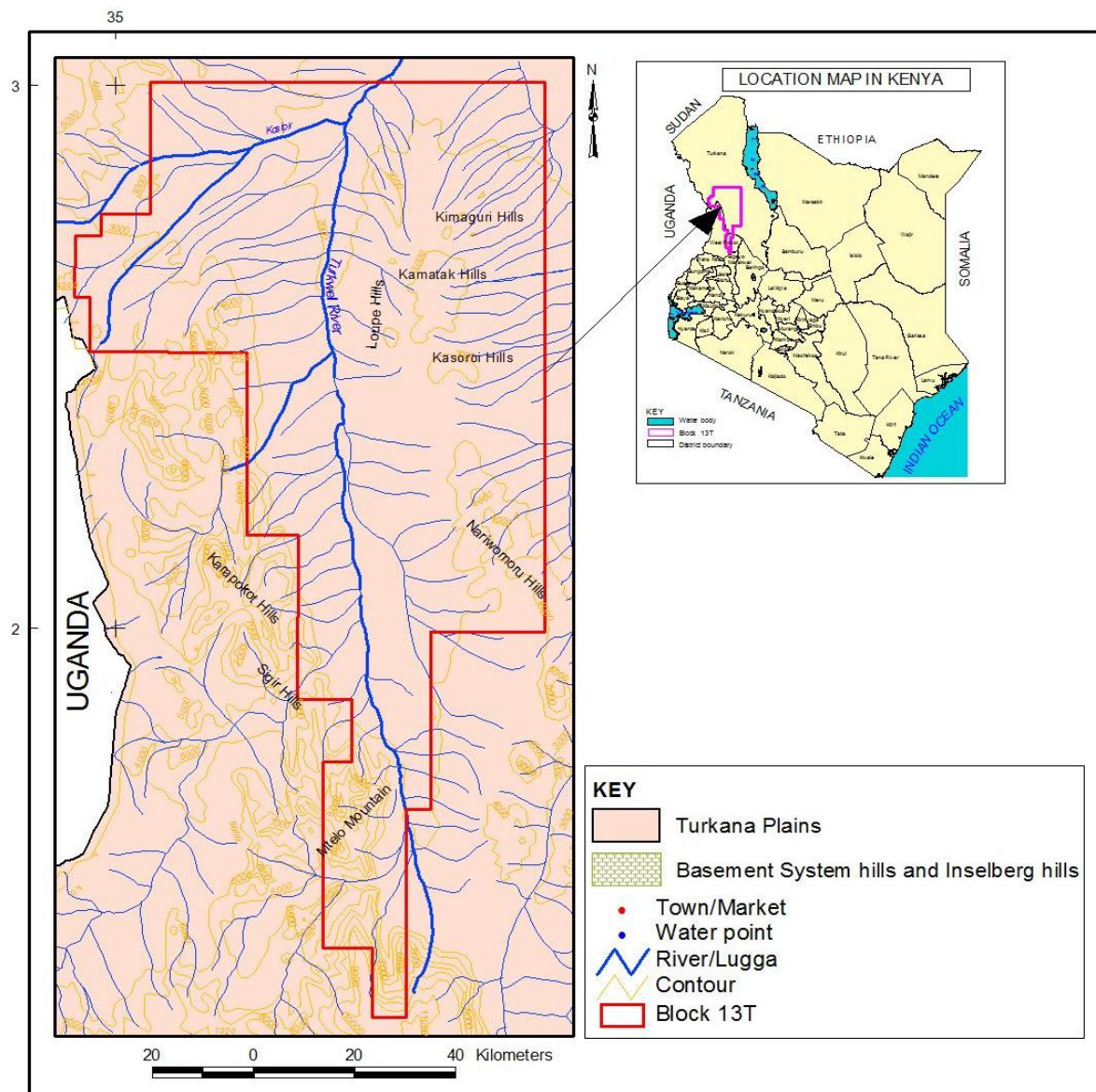
## **5.2 ENVIRONMENTAL BASELINE SURVEY**

### **5.2.1 Physiography and Geology**

#### **5.2.1.1 Physiography**

The southern tip of the block is bordered by the foot slopes of Mount Elgon to the southwest and the Cherangani Hills to the southeast (Figure 5.3) in the Block 13T. The Turkwel River, which has its source in Mount Elgon, enters the block in the south-western area and then

runs south-north, dissecting the block into two almost equal halves, and is the major drainage system (Plate 5.3). Its three major tributaries are the Wei Wei River in the south, Kateruk River in the central part and the Nakaton River in the north-western part of the block.



**Figure 5.3: Physiography of the project area.**

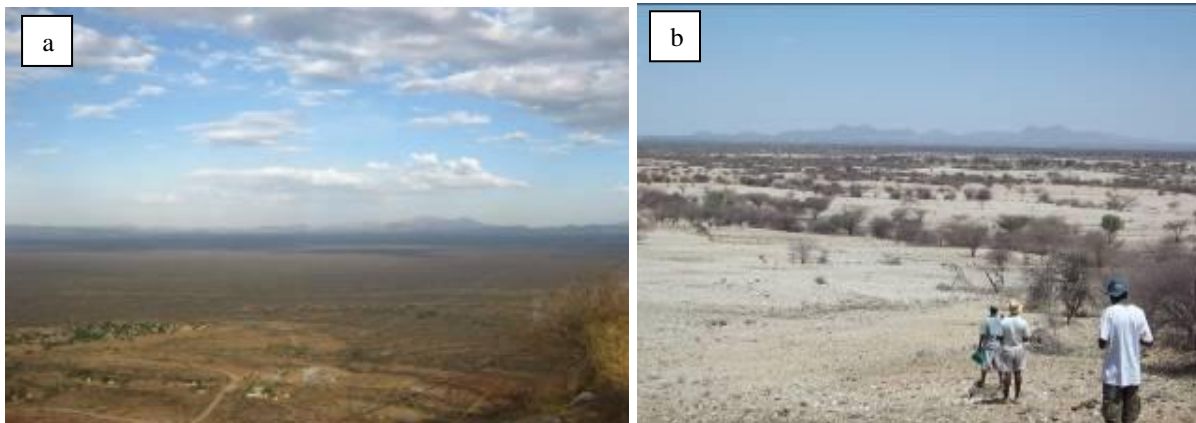
From 2° to 3°N the watershed of the Turkwel River basin is bounded by the Nariwomoru, Kasoroi, Kamatak and Kimaguru hills to the east (these hills are fully within the project area), and the Karapokot, Loropokot, Kobaroch and Moruangelio hills to the west (with their peaks just outside the western border of the project area) (Figure 5.3). Numerous small and ephemeral streams arise from the hills and are oriented east-west, flowing into the Turkwel River (Figure 5.3). Those arising from the Nariwomoru, Kasoroi, Kamatak and Kimaguru hills also flow eastwards from the east-facing slopes into the Kerio River (which lies outside the project area to the east) and eventually to Lake Turkana.

The Turkwel River is as much as a kilometre wide in places and is bordered along most of its length by a belt of alluvium which in some places is over 2 kilometres wide (Plate 5.3). The Turkana Plain, which covers an expansive part of the northern section of the project area, is well-smoothed, dipping gently at about 3 metres per kilometre from the foot of the

escarpment on the western part of the region (Uganda escarpment) at about 900 metres above sea level, to Lake Turkana which lies at about 375m above sea level (Figure 5.3, Plate 5.4) (Fairburn and Matheson, 1970).



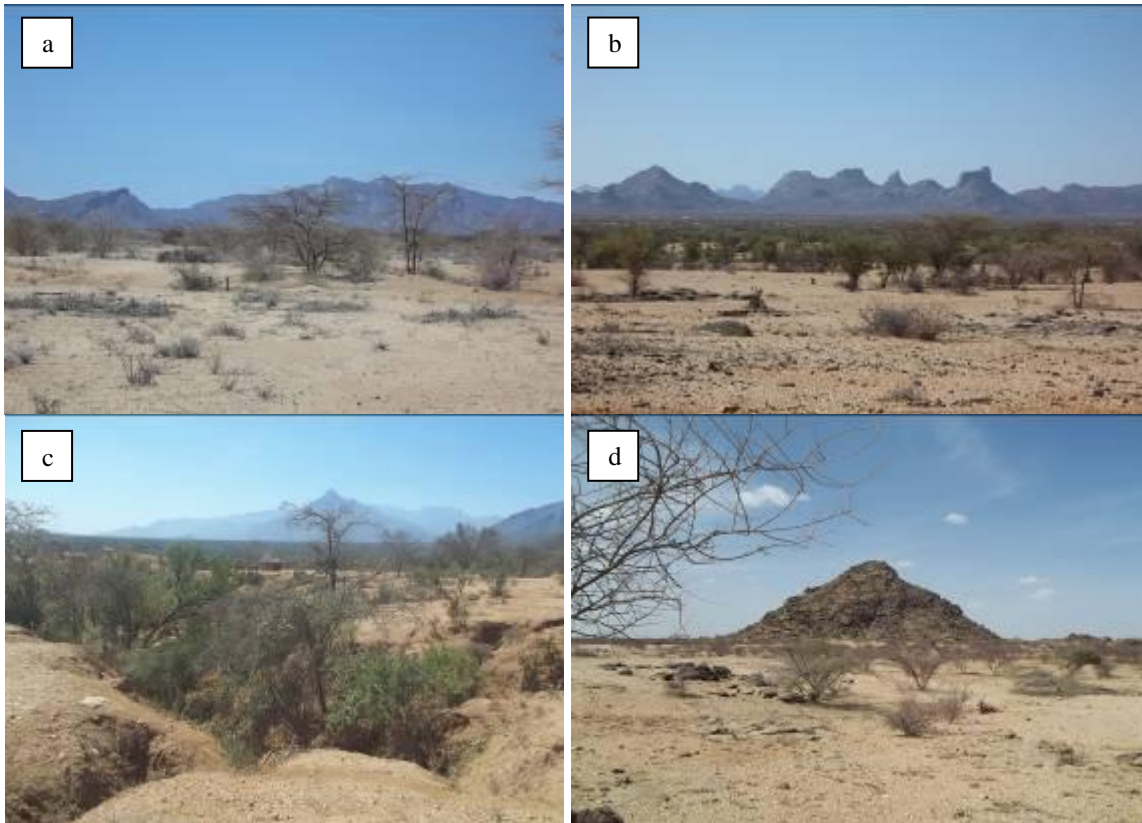
**Plate 5.3: Turkwel River, east of Kainuk town (southern part of the block).**



**Plate 5.4: Physiography of the project area: a) Floodplain of the Turkwel River, photo taken from Siger hills; and b) Turkana Plain in the northern part of the block, photo taken from Kunyupat hill, Lorugumu area.**

The Siger hills and Kunyupat hills comprise mainly of Basement System rocks, becoming smaller in stature and extent northwards, eventually forming only horsts. The Basement System hills in the western part of the area form steep fault and erosional scarps with deep gullies (Plate 5.5).





**Plate 5.5: a) Nariwomoru hills, east of Kaputir area; b) Kong'olot hills, photo taken from Kabulokor area; c) Kohu hills in the background - note the gully erosion in the foreground and plain in the middle ground; and d) Kobroich inselberg hill. Logogo area**

A distinctive feature in the project area is the large number of dry lugga channels that flow for only a few hours or days following rains. Often, gullies with high banks occur in grounds that are slightly more elevated than their immediate surroundings (Plates 5.5 and 5.6).



**Plate 15.6: Gully erosion on the higher ground, Marich area.**



## 5.2.1.2 Geology

### 5.2.1.2.1 Geological Setting

Geologically, the project area can be divided into three parts (southern, central and northern), moving latitudinally from south to north. The thin southern strip (1.3° to 2°N) is dominated by: metamorphosed sediments of the Basement System; Tertiary rocks represented by plugs and dykes of nephelinites or alkali basalt and; Quaternary rocks that consist of soils, alluvium, scree and ironstone cappings (Figure 5.4) (McCall, 1964). In the central section (2° to 2°30'N), there are mainly superficial deposits of Pleistocene to Recent age that occupy the Turkwel plain, while to the west occur a metamorphic and igneous complex of Pre-Cambrian rocks containing recrystallised sediments and volcanics (Walsh, 1966). The rocks in the northern part (2°30' to 3°N) are folded gneisses, schists, granulites and limestones of the basement system that are cut by acid pegmatites and basic intrusions (Figure 5.4) (Fairburn and Matheson, 1970). In the northwest, the basement system rocks are covered by a thick series of basalt, andesites and rhyolitic ignimbrites (Figure 5.4).

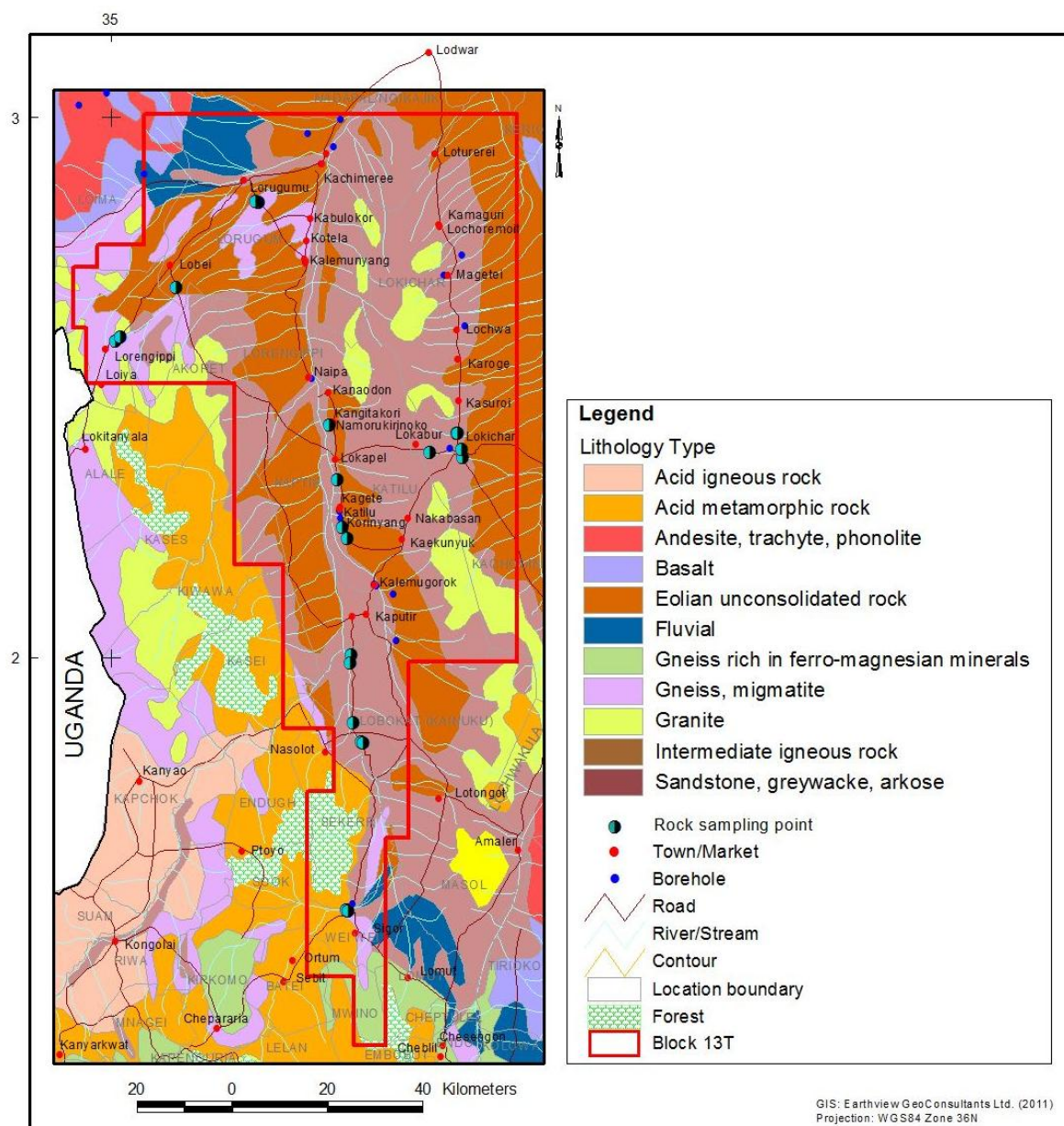


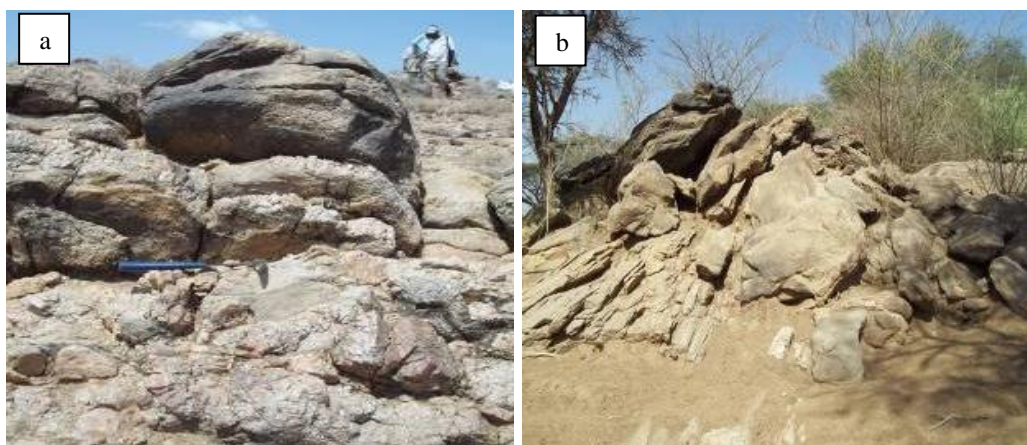
Figure 5.4: Geology of the project area.

### 5.2.1.2.2 Surface Geology

This section describes the geology of the area that was observed in the field (Table 5.2), focusing on those rock-types and geological processes and hazards that are of significance or relevant with respect to the proposed seismic survey operation in the project area, based on field evaluations. The main rock exposures are quartzo-feldspathic granulites and gneisses, as well as rocks belonging to the Turkana Grits formation (Figure 5.4). Other minor rock units include: low gabbroic hills in the west; quartzites confined to the region within Kachemiree, near Turkana Hill (Lorugumu area) and Kalemunyang; dispersed amphibolites that occur as lenses within the gneisses; and mica schists and migmatites in the eastern side of the project area.

**Table 5.2: Rock types observed during the field survey that are significant for project logistics and EMP.**

Type of Rock	Locality	Brief Description	Natural Hazards	Implications for the Project and EMP
Quartzo-feldspathic granulite	Covers areas such as Loima, Lorugumu and Kalemunyang.	Form escarpments, craggy tors and rocky ridges (Plate 5.7)	<ul style="list-style-type: none"> <li>Potential rock falls or topples</li> </ul>	<ul style="list-style-type: none"> <li>Seismic lines may have to be deviated</li> <li>Cut lines will leave long-lasting residual impacts</li> <li>Rugged terrain</li> <li>Occupational safety relating to rock falls and topples</li> </ul>
Turkana Grits and Quartzo-feldspathic gneiss	Kabulokor, Kotella and Kalemunyang	The exposures comprising of a succession of conglomerates, arkoses, quartzites and sandstones form steep-sided ridges and rugged land surfaces in the area (Plate 5.8).	<ul style="list-style-type: none"> <li>Potential rock falls or topples</li> </ul>	<ul style="list-style-type: none"> <li>Seismic lines may have to be deviated.</li> <li>Cut lines footprints will be long-lasting</li> <li>Rugged (gullied) terrain a challenge for access roads and cut lines.</li> <li>Occupational safety relating to rock falls and topples</li> </ul>
	Lorugumu and Logogo area	Have highly rugged topography. They are highly exfoliated with loose boulders on the surface (Plate 5.9)	Potential rock falls or topples	<ul style="list-style-type: none"> <li>Occupational safety relating to rock falls and topples</li> </ul>



**Plate 5.7: a) Quartzo-feldspathic granulites (a) Kachemiree area; and b) Logogo area.**



Plate 5.8: Turkana grits, Kotella area.



Plate 5.9: Quartz-feldspar gneiss, Lokabur area.

## 5.2.2 Soils

### 5.2.2.1 Soil Classification Criteria

Block 13T is a kaleidoscope of varied topography, a toposequence that comprises of hills, foots lopes, uplands, piedmont, sedimentary and lacustrine plains. Floodplains, bottomlands and dunes are also present in the unit. These units (Figure 5.5) have been described below. The soil classification process follows the FAO-UNESCO legend that accommodates the worlds' soils in order to overcome gaps in national classification systems and to provide a common basis for soil correlation. The identification of soils is based on the presence of diagnostic horizons and diagnostic properties which are defined by measurable morphological, physical and chemical criteria related to soil characteristics that are the result of soil formation. Kenya has 23 of the 26 soil units recognized by FAO-UNESCO. The soil mapping unit description refers mainly to the characteristics of the subsoil usually 'B' horizon, to a depth of 100cm (less if impenetrable material such as bedrock occurs at a shallower depth). Among the parameters described are: drainage condition, effective soil depth, colour (moist condition), mottling (if present), consistency (moist condition), calcareousness (if present), salinity, sodicity (if present), rockiness (if present), stoniness (if present), cracking (if present), texture, additional information on special topsoil or subsoil features, landform, geology, inclusions of other soils (Sombroek *et al.*, 1982). For mapping unit classification, the first letter represents the landform while the second letter represents the geology of the unit.

### 5.2.2.2 Soil Mapping Units

**The following soil mapping units are found within the study area and have been captured in Figure 5.5 and described in Table 5.3 below.**

1. Mapping Unit Mu (mountains and major scarps)
2. Mapping Unit H13 (hills and minor scarps)
3. Mapping unit F13 (Foot slopes)
4. Mapping units Ux10 and Um22 (uplands)
5. Mapping units Y5 and Y10 (piedmont plains)
6. Mapping units Ps28 and Ps28 + D1 (sedimentary plains and complex of sedimentary plains and dunes)
7. Mapping units A8 and B8 (flood plains and bottomland)



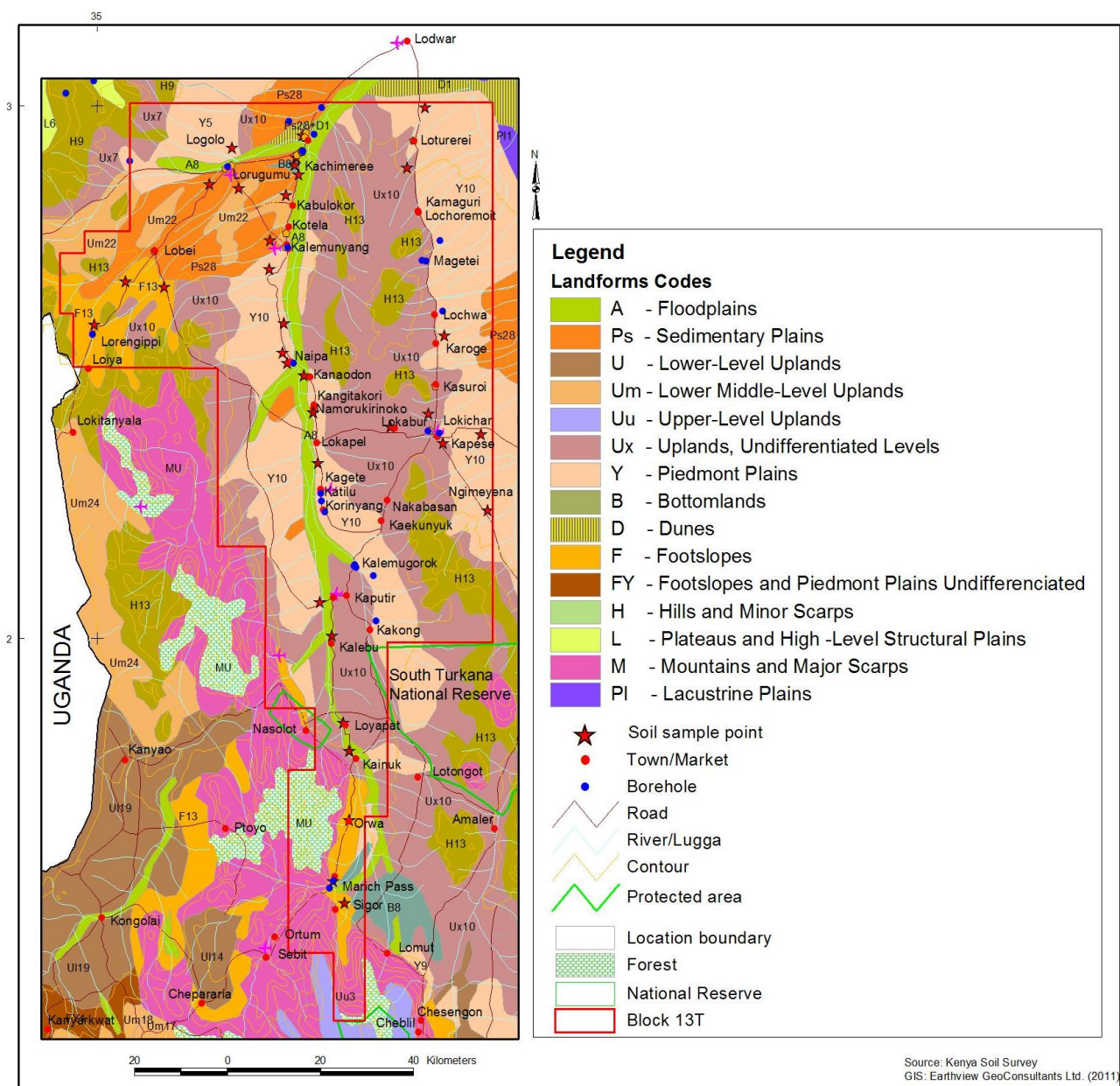
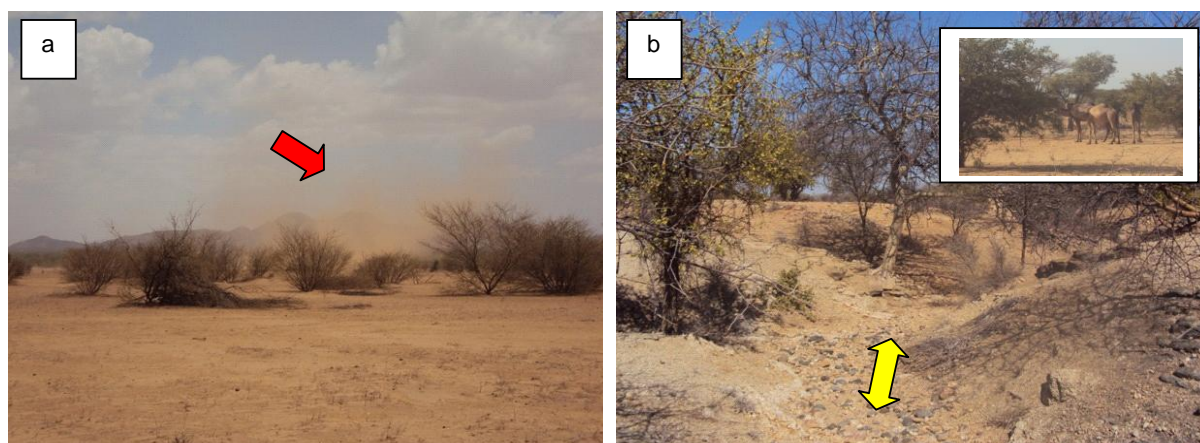


Figure 5.5: Soils of the project area.

**Table 5.3: Soil Description within specified soil mapping units observed during the field survey that are significant for project logistics and EMP.**

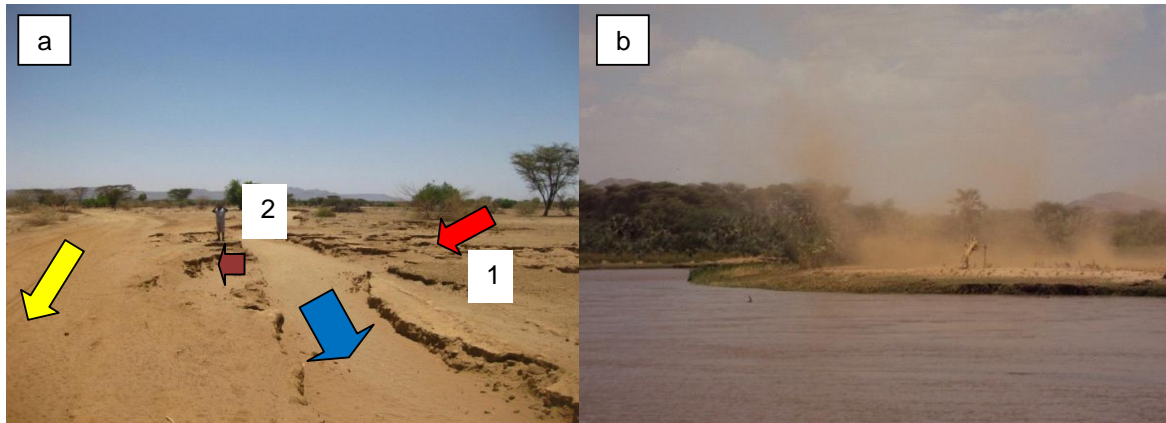
Unit	Locality	Brief Description	Natural Hazards	Implications for the Project and EMP
<b>Mountains and Hills (MU and H13)</b>	South west and south east of the project area and from Kabulokor to the East of Kakong (Figure 5.5).	This units were not sampled but Sombroek <i>et al.</i> (1982), describes the soils as well drained to excessively drained, shallow to moderately deep, reddish brown, stony and rocky sandy clay loam. They classify as Cambisols with Leptosols and Arenosols	<ul style="list-style-type: none"> <li>• Potential landslips</li> </ul>	<ul style="list-style-type: none"> <li>• Seismic lines may have to be deviated due to difficulty in accessibility.</li> <li>• Rugged terrain</li> <li>• Occupational safety relating to landslips</li> </ul>
<b>The Footslopes, Mapping Units (F13)</b>	Found in the north-western and southern parts of the project area (Figure 5.5)	The soils are well drained yellowish red to dark reddish brown loose, loamy coarse sand to sandy clay loam. The surface soils are strong brown sandy soils. Windstorms are frequent and there are gullies forming near luggas in the unit. They classify as <i>Luvisols</i> , <i>Ferrasols</i> and <i>Arenosols</i> , [Sombroek <i>et al.</i> (1982)]	<ul style="list-style-type: none"> <li>• High runoff potential</li> <li>• Wind blown dust</li> </ul>	<ul style="list-style-type: none"> <li>• Any mechanical excavation of soil may encourage wind erosion and soil degradation</li> <li>• Compaction by equipment/machinery may degrade the soil</li> <li>• The unit is accessible via existing routes only</li> </ul>
<b>The Piedmont Plains (Mapping units Y5 and Y10)</b>	Northwest, west (central to south) and east in the project area.	The soils are moderately well drained loose loamy sand to sandy clay loam. The midslopes have sealed and capped sodic soils that enhance runoff and gully formation (Plate 5.10a) while the toe slopes have extensive bare patches that enhance windblown erosion. They classify as <i>Solonchaks</i> , <i>Xerosols</i> , and <i>Arenosols</i> [Sombroek <i>et al.</i> (1982)]	<ul style="list-style-type: none"> <li>• High runoff capacity</li> <li>• Wind blown dust</li> </ul>	<ul style="list-style-type: none"> <li>• Compaction due to machinery/equipment</li> <li>• Windblown dust</li> <li>• Seismic lines may cause /enhance gully formation along waterways (Plate 5.11a)</li> </ul>
<b>The Uplands, Mapping units (Ux10 and Um22)</b>	Extensive, trending north-south through the project area in the eastern sector also occurs along the western margin of the project area, and northern sector (Figure 5.5).	The soils are well drained, shallow to moderately deep, gravelly sandy clay loam. The surface is stony with rock outcrops. Unit Um22 is susceptible to wind erosion (Plate 5.10a) whereas Ux10 has capped and sealed soils in the interfluvies encouraging soil erosion via runoff during the rains. They classify as <i>Acrisols</i> and <i>Luvisols</i> , respectively, Sombroek <i>et al.</i> (1982)]	<ul style="list-style-type: none"> <li>• High runoff capacity</li> <li>• Potential landslips</li> <li>• Wind blown dust</li> </ul>	<ul style="list-style-type: none"> <li>• Vehicles and equipment movement would be a challenge due to the rugged topography</li> <li>• Seismic lines may have to be deviated due to difficulty in accessibility.</li> <li>• Occupational safety relating to landslips</li> <li>• Compaction due to machinery/equipment</li> <li>• Seismic lines and access routes may trigger gully formation where they cross interfluvies</li> <li>• Dust may affect equipment</li> </ul>

<b>Sedimentary Plains and Dunes Mapping units (Ps28 and Ps28 + D1)</b>	Mainly western part of the northern sector (Figure 5.5).	The soils are well drained, sandy clay loam. The dunes are less than 3 m in height, formed around scattered bushes. There is wind erosion in the unit and seasonal flooding influenced by the Kosipir lugga. The soils classify as a complex of <i>Arenosols</i> and <i>Luvisols</i> , <i>Sombroek et al. (1982)</i>	<ul style="list-style-type: none"> <li>• Seasonal flooding</li> <li>• Windblown dust</li> </ul>	<ul style="list-style-type: none"> <li>• Flooding may impede seismic survey work</li> <li>• Dust may affect equipment; health-related risks</li> </ul>
<b>Soils of the Floodplains and Bottomland Mapping Units (A8) and Bottomland (B8)</b>	Mainly the Turkwel River floodplain trending south-north in the central part of the project area (Figure 5.5).	The soils are well drained to imperfectly drained, very deep, loamy sand soils. The unit is susceptible to frequent windstorms and seasonal flooding (Plate 5.11b). Rainfed and irrigated agriculture is practiced in the units. The soils classify as; <i>Fluvisols</i> and <i>Solonetz</i> [ <i>Sombroek et al. (1982)</i> ]	<ul style="list-style-type: none"> <li>• Seasonal flooding and ponding</li> <li>• Windblown dust</li> </ul>	<ul style="list-style-type: none"> <li>• Vehicles and equipment movement would be impeded during wet seasons</li> <li>• Compaction by vehicles and equipment</li> <li>• Cut lines footprints will be short-lived</li> <li>• Wind-blown dust may affect equipment</li> <li>• Occupational safety relating to dust generation during dry seasons</li> </ul>



**Plate 5.130: (a) Wind erosion at the Um22 unit near Kabulokor (red arrow); and (b) Ux10 unit with shallow sandy soils Lokapel area, supporting sparse vegetation concentrated mainly on narrow and deep interfluvies (yellow arrow). Inset: camels grazing in the area.**





**Plate 5.11: (a) Y10 unit shoulder-slope at Naipa. Runoff from the crest at Naipa enters the lugga at an angle (1, red arrow), forming a gully. The orientation is angular to the lugga flow (blue arrow). The runoff crosses the lugga (2, brown arrow) extending the gully to the adjacent main road (yellow arrow); and (b) Duststorm in the A8 unit near Lorugumu. The area is susceptible to both windblown erosion and seasonal flooding.**

### 5.2.3 Climate

The area, which is arid to semi-arid, receives an average annual rainfall of between 200 and 400mm and average temperatures range from 24 to 38°C (Republic of Kenya, 2002). During the dry seasons which are between August-February, temperatures vary between 26 and 40°C, while in the rainy seasons between March- July, the range is from 20 to 25°C. The lowest temperatures are experienced in the months of November and December, and the highest in the months of January, March and August and may exceed 37°C especially in the afternoons. The long rains occur between April and August, while the short rains occur in October and November. The annual rainfall amount is between 200 and 400mm (Nicholson, 1980), and is erratic and unreliable (Republic of Kenya, 2002). Rainfall is distributed on an east-west gradient with more rainfall in the western parts and other areas of higher elevation (Republic of Kenya, 2002), and is higher in the southern sector than in the northern sector of the project area. Rain falls in brief violent storms resulting in flash floods, particularly in the northern sector. The high temperatures and low rainfall causes high rates of evapo--transpiration that result in deposition of salt in the soil and capping on the surface (Republic of Kenya, 2002).

#### Relationship to Project and EMP

The climate characteristics have the following implications for the project team:

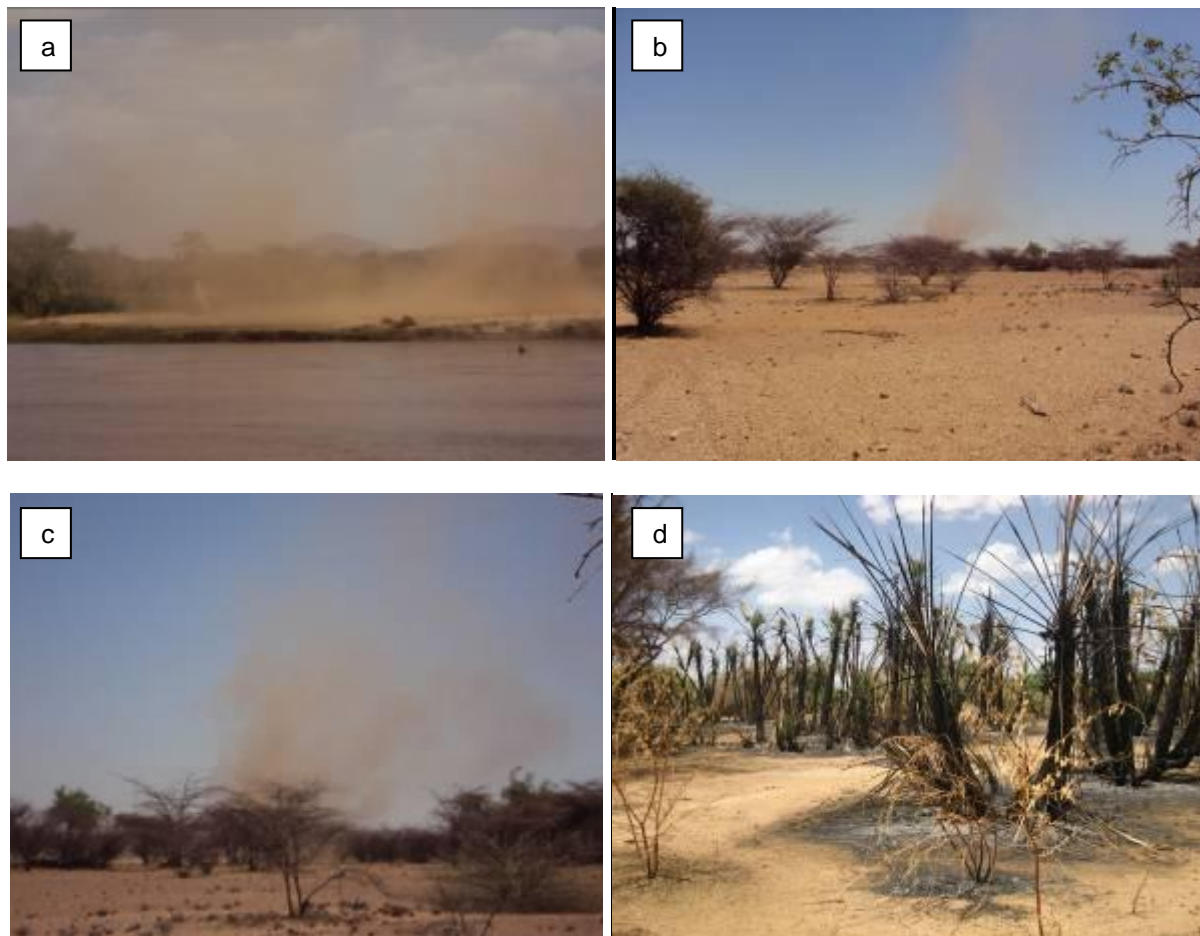
- Due to the high temperatures, the project team should have adequate water supplies, and shaded rest areas when carrying out the seismic acquisition in the field;
- Erratic, unpredictable and torrential rains that result in flash floods can pose a danger to crew especially at lugga crossings (where even huge trucks have been washed downstream in the past), and when working close to steeply inclined areas where there is risk of landslip or rock topples and falls. Transportation in the field can also be bogged down as a result of flooded and ponded areas, with the risk of crews being cut off for a number of hours or even days;
- Strong winds occasionally whip up dust storms that can reduce visibility and pose problems to sensitive electronic equipment, e.g. jamming of cameras which the EIA team experienced in the field.
- Soil erosion from line cutting?



The project operations will not affect any climate parameter.

#### 5.2.4 Air Quality

The project area is rural, sparsely populated, undeveloped and far removed from major towns, cities, agricultural and industrial centres that are the major contributors to air pollution. In the arid to semi-arid northern sector of the project area, strong winds often generate dust storms (Plate 5.12). This is the significant contributor of natural particulate air pollution in the area. It was also noted during the EIA field study that vegetation burning also occurs and contributes to air pollution (Plate 5.2d)



**Plate 5.12: Sources of air pollution; a) dust storm in Naipa area, b) dust storm in Lobei area, c) dust storm in Kakong area; and d) burning of vegetation (duom palm), Kabulokor area.**

The few vehicles that traverse the project area release exhaust emissions and also raise small dust clouds. In addition, herds of grazing animals raise significant amounts of dust as they move about the area.

#### Relationship to Project and EMP

The ambient air quality in the region is good, but frequent dust storms (particularly in the low-lying northern sector) and generally high levels of dust resulting from the strong winds may affect the working conditions. Care is, therefore, needed to shield the workers and sensitive equipment from dust effects. The project operations are only likely to affect air quality locally in work areas, during transportation of the workforce and equipment from one area to

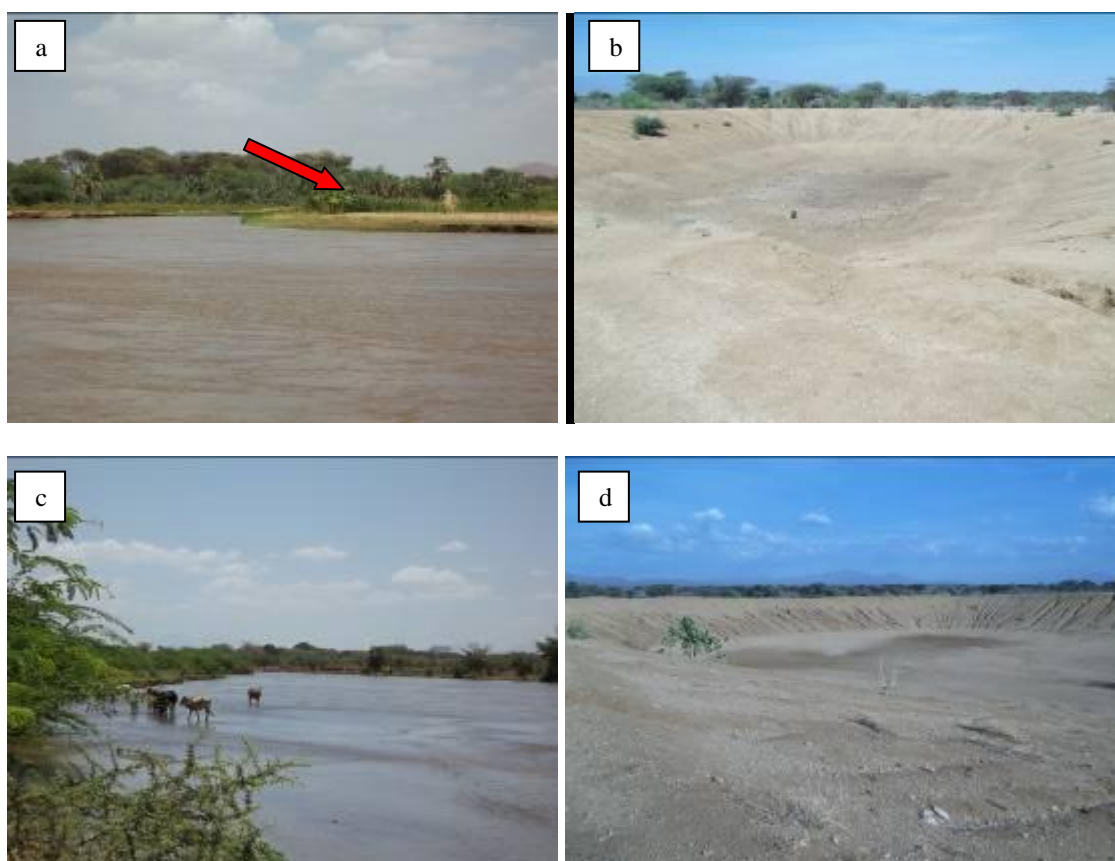
another, and during operation of machinery. An assessment of this impact is presented in Chapter 7 and mitigations recommended in Chapter 8.

## 5.2.5 Surface and Groundwater Resources

### 5.2.5.1 Surface Water Resources

Water is one of the most essential yet scarcest resources in the project area (Plate 5.13). The local communities are adapted to this situation, but persistently long droughts or successive seasonal droughts sometimes put at risk their lives and livelihoods, including frequent loss of livestock.

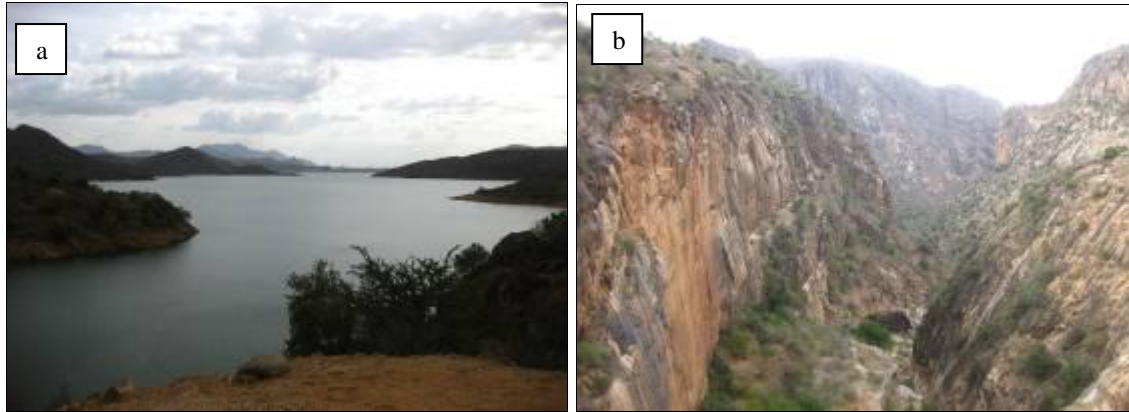
The Turkwel is the main surface water body in the area. The perennial Wei Wei River, a tributary of the Turkwel River, is important in the southern part of the project area. Other sources of surface water are seasonal rivers (luggas) and water pans. There are very few water pans and earth dams in the project area. The construction of some of the existing water pans was sponsored by the World Vision Kenya, particularly in the eastern part of the project area. All the pans found during the study could not hold water through an entire dry season (Plate 5.13b).



**Plate 5.13: a) Turkwel River in Kabulokor area. Note the maize plantation at the background (red arrow), b) dry waterpan in Lokapel area, c) Turkwel River in Kaputir area; and d) dry waterpan in Kakong area.**

The Turkwel River has been dammed for hydroelectric power generation at Turkwel Gorge, and this dam contributes about 40% of the total power consumed in Kenya and is the third largest dam in the country (Plate 5.14). The river's contribution to the improved agricultural activities in the area through providing water for irrigation schemes has been the most

paramount and pronounced benefit to the local community. Some of the irrigation schemes that use water from the Turkwel River are: Kaputiro Irrigation Scheme in Loyapat area (funded by World Vision); Arumoru Irrigation Scheme in Kanaodon area (supported by the Turkana Rehabilitation Programme); and Turkwel Irrigation Scheme in Turkwel area (supported by the Government of Kenya). The waters of this river are highly turbid and not suitable for domestic and/or industrial uses.



**Plate 5.14: a) Turkwel dam on Sigor hill; and b) Turkwel gorge.**

Wei Wei River water is used for irrigation e.g. at the Wei Wei Irrigation Scheme (horticulture, maize), and also for livestock watering.

#### **5.2.5.2 Groundwater Resources**

The numerous dry (ephemeral/seasonal) sandy river beds, locally known as *luggas*, are sources of shallow and potable groundwater. The shallow hand-dug wells may, in a few cases, be equipped with hand pumps. There are also some deep boreholes. Groundwater is the major source of potable water supply for both humans and livestock in the project area (Plate 5.15). The water quality is variable, ranging from clean and potable to turbid (such as in Kalemugorok lugga) and murky.





**Plate 5.15: a) A Turkana woman struggling to draw water from a drying shallow sand well, Kalemugorok lugga; b) Waterpoint, Lorengi centre; c) Dry waterpan in Loyapat area; and d) Borehole, Marich area.**

Some boreholes have dried up due to lack of recharge (e.g. at Lorugumu, Lokichar and Loturerei area). Others have slightly saline water, particularly those that are located far from the luggas, such as the borehole in Kachemiree Primary School in Turkwel area, and the borehole in Kalemugorok centre.

In the larger rivers such as the Lorugumu (Kosipir lugga), Wei Wei and the Turkwel, water can always be obtained in wells even during periods of severe drought. During the present survey, the deepest well found was the Marich borehole which is about 120 metres deep. After periods of rain, low water-yielding springs may flow for several days. There are some perennial springs as well, such as that which is found in Lochwaang'amatak area, though it yields saline water.

#### Relationship to Project and EMP

Due to the scarcity of water resources, TKBV would have to find its own water supply (e.g. drill a borehole) for the personnel that would be residing in the camp and working within the project area, rather than share an already existing resource with the neighbouring community as this can cause problems particularly if the water is in short supply. Such a borehole could be handed over to the neighbouring community at the end of the project. The potential project impact on water resources (quantity) would be the possible compaction of near-surface aquifers, particularly close to where springs emerge, by heavy vehicles and/or machinery, and drawdown of water table levels where dynamite shot-holes are drilled close to shallow wells. Compaction could possibly reduce the aquifer storage capacity and permeability, resulting in lower yields at the spring outlet. Drawdown would also result in lower yields

### 5.2.6 Water Quality

Water sampling points are shown in Figure 3.2, Chapter 3. The water analysis results indicate that deep boreholes provide the best water quality for domestic purposes, such as the Marich and Naipa boreholes (Table 5.4).

Shallow wells are the most common and second best sources of drinking water in the project area, though the quality is highly variable (Table 5.4). Microbiological analysis of the water samples was not undertaken due to technical logistics relating to sample preservation time (only six hours maximum before they are analysed from collection) and lack of analytical water laboratories in the project area. However, high nitrate contents are a pointer to organic contamination, including faecal matter, and hence possible presence of microbiological pathogens in the water. Fluoride levels are relatively high in the shallow wells, and suggest that it may be concentrated in shallow groundwater through surface enrichment of fluoride in soils as a result of rock-weathering and antecedent soil formation, and by wind transportation of fine detrital particles from areas where the soils are rich in fluoride. Water pans have the poorest drinking water quality. Wei Wei River water can also be a good source of quality drinking water except for its high turbidity, while the Turkwel River water is not because of high iron content, colour and turbidity (Table 5.4).

Surface (river) and groundwater are not generally going to be exposed to major threats related to the seismic operations project. Potential ground and surface water pollution will need to be considered in the context of sanitation and domestic waste discharge facilities and systems that will be installed at the campsites (see Chapter 2) and to leakages of oils and/or chemicals at the campsites and in the field working areas. Oils and chemicals should be stored in designated areas and labelled properly to ensure that everyone can easily identify them.

**Table 5.4: Water quality in the project area (SW – Shallow Well; BH – Borehole). WHO limits are for drinking water quality: grey shaded boxes show the limits are exceeded.**

PARAMETERS															
Lab Sample Nos.	2570	2576	2567	2568	2562	2561	2560	2559	2558	2567	2556	2555	2561	2563	WHO limits
	Kalorukogole SW	Kopa SW	Kabulokor waterpan	Naipa BH	Turkwei River	Nageretei SW	Wei Wei River	Lokichar SW	Katilu SW	Marich BH	Kamatak Spring	Nalemuseko SW	Kalemugorok SW	Loupe SW	
pH	8.24	8.6	8.15	8.44	8.14	8.46	8.3	8.26	8.5	8.05	8.67	8.6	8.66	8.63	6.5-8.5
Colour (mgPt/l)	5	70	5	5	60	< 5	5	5	5	5	5	5	5	5	15
Turbidity (NTU)	Nil	395	162	Nil	102	5	29	3	4	3	19	Nil	Nil	6	5
PV (mgO <sub>2</sub> /l)	< 0.4	15.8	7.9	< 0.4	7.9	< 0.4	2.7	0.79	0.79	0.79	2.7	< 0.4	< 0.4	0.79	<100
Conductivity (25°C) (µS/l)	1185	1165	209	351	208	1565	256	634	11801	387	1629	3930	1303	3860	
Fe (mg/l)	< 0.01	2.76	3.4	< 0.01	0.91	0.08	0.02	0.01	0.91	0.19	0.47	0.1	< 0.01	0.03	0.3
Mn (mg/l)	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.1
Ca (mg/l)	25.6	16	22.4	21.6	22.4	40	24	31.2	23.2	28.8	24	56	6.4	24	<100
Mg (mg/l)	47.63	2.93	7.3	15.1	6.82	53.5	11.2	18.97	25.3	13.6	21.9	87.5	28	19.5	
Na (mg/l)	151.3	243.5	8	26.7	8.8	210.4	9.7	73.4	195.9	29.5	304.6	670.4	238	822.2	200
K (mg/l)	0.8	0.6	0.5	0.4	0.4	1.8	0.2	0.4	0.6	0.4	0.8	2.4	1.2	1.2	<10
Total Hardness (mgCaCO <sub>3</sub> /l)	260	52	86	116	84	200	106	1.56	162	128	150	500	132	140	500
Total Alkalinity (mgCaCO <sub>3</sub> /l)	288	508	100	164	98	568	120	288	412	184	620	860	574	1014	<500
Cl (mg/l)	75	15	1.0	4	2	105	3	5	100	3	40	210	25	400	250
F (mg/l)	1.0	12	0.56	0.7	0.35	2.0	0.13	3	2.2	0.78	1.8	3.5	1.0	1.1	1.5
Nitrate (mg/l)	35	6.0	0.40	0.5	0.23	3.6	0.48	0.22	0.45	0.14	3.8	11	0.54	1.7	10
Nitrite (mg/l)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01	< 0.01	< 0.01	< 0.01	0.03	0.03	< 0.01	< 0.01	
Sulphate (mg/l)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	400
Free Carbon Dioxide (mg/l)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total Dissolved Solids (mg/l)	68	< 0.3	< 0.3	2	< 0.3	44.3	1.43	12.9	67	2.57	114.3	725.7	35.71	322.9	1000

### 5.2.7 Terrestrial Environment

The information available on the terrestrial environment is based on research, surveys and published literature and reports that are outdated – no new work is apparently being carried out on species inventory and ecology in the area, or on human impacts such as land degradation and deforestation, that may have some implications on ecosystem integrity, species diversity, and environmental resilience. The remoteness, inaccessibility and insecurity in some parts of the area have hampered these activities. Nevertheless, the ecosystem remains largely pristine due to the nomadic nature of the people, with fragmentation being the most significant factor due to the growing human and livestock populations.

The block lies within the Somali-Masai floristic zone, and the vegetation is mostly shrubs and thickets, with the most common tree species belonging to the deciduous genera *Acacia* and *Commiphora* (Figure 5.6) (White, 1983). The understory consists of shrubby herbs less than one meter high, such as *Acalypha*, *Barleria* and *Aerva*. At lower elevations where rainfall is less consistent, vegetation becomes semi-desert scrubland. *Acacia* and *Commiphora* are joined by *Euphorbia* and *Aloe*, as well as grass species such as *Dactyloctenium aegyptium* and *Panicum turgidum* (Tilahun *et al.*, 1996). Important evergreens include *Boscia*, *Dobera*, *Salvadora*, *Grewia* and *Cadaba*. *Crotalaria* and *Indigofera* are also found here.

Wild fauna is concentrated in the south, especially in the Nasolot National Reserve and South Turkana National Reserves. There are a large number of endemic reptiles, with 33 species believed to be confined to this ecoregion (Hughes and Hughes, 1992). Elephants (*Loxodonta africana* endangered) and Buffalo (*Syncerus caffer*) were previously widespread in the wetter portions of this ecoregion. Elephant populations are decreasing, with limited numbers found in protected areas. Lion (*Panthera leo*, vulnerable), Leopard (*Panthera pardus*, endangered), Cheetah (*Acinonyx jubatus*, vulnerable), and Striped and Spotted Hyenas (*Hyaena hyaena* and *Crocuta crocuta*) are the main large carnivores in this ecoregion. The Gerenuk (*Litocranius walleri*) also occurs in the ecoregion.

The Abyssinian yellow-rumped Seedeater (*Serinus xanthopygius*), the Short-billed Crombec (*Sylvietta philippae* DD), and Sidamo Bushlark (*Heteromira fra sidamoensis*, vulnerable) are all restricted to this ecoregion as well, while the Sombre chat (*Cercomela dubia* DD), White-winged Collared-dove (*Streptopelia reichenowi*), Salvadori's Weaver (*Ploceus dicrocephalus*), and the Scaly Babbler (*Turdoides squamulatus*) are considered near-endemic. The common terrestrial birds include: Fork tailed Drongo, Yellow vented Bulbul, Superb Starling, Kori Bastard, Black bellied Bastard, Brown necked Crow, Mourning Dove, White bellied Cuckoo, Abyssinian Roller, Rufous-crowned Roller, Pied Wagtail, White browed Sparrow Weaver, Crested Lark, Shinning Sunbird, Speckled Pigeon, Blue headed Bee-eater, Carmine Bee-eater, Paradise Flycatcher, Namaqua Dove, White headed Buffalo Weaver, White browed Sparrow Weaver, Ring neck Dove, Eastern pale chanting Goshawk, Sacred Ibis, Red billed Hornbill, White headed Moosebird, and Somali Ostrich.



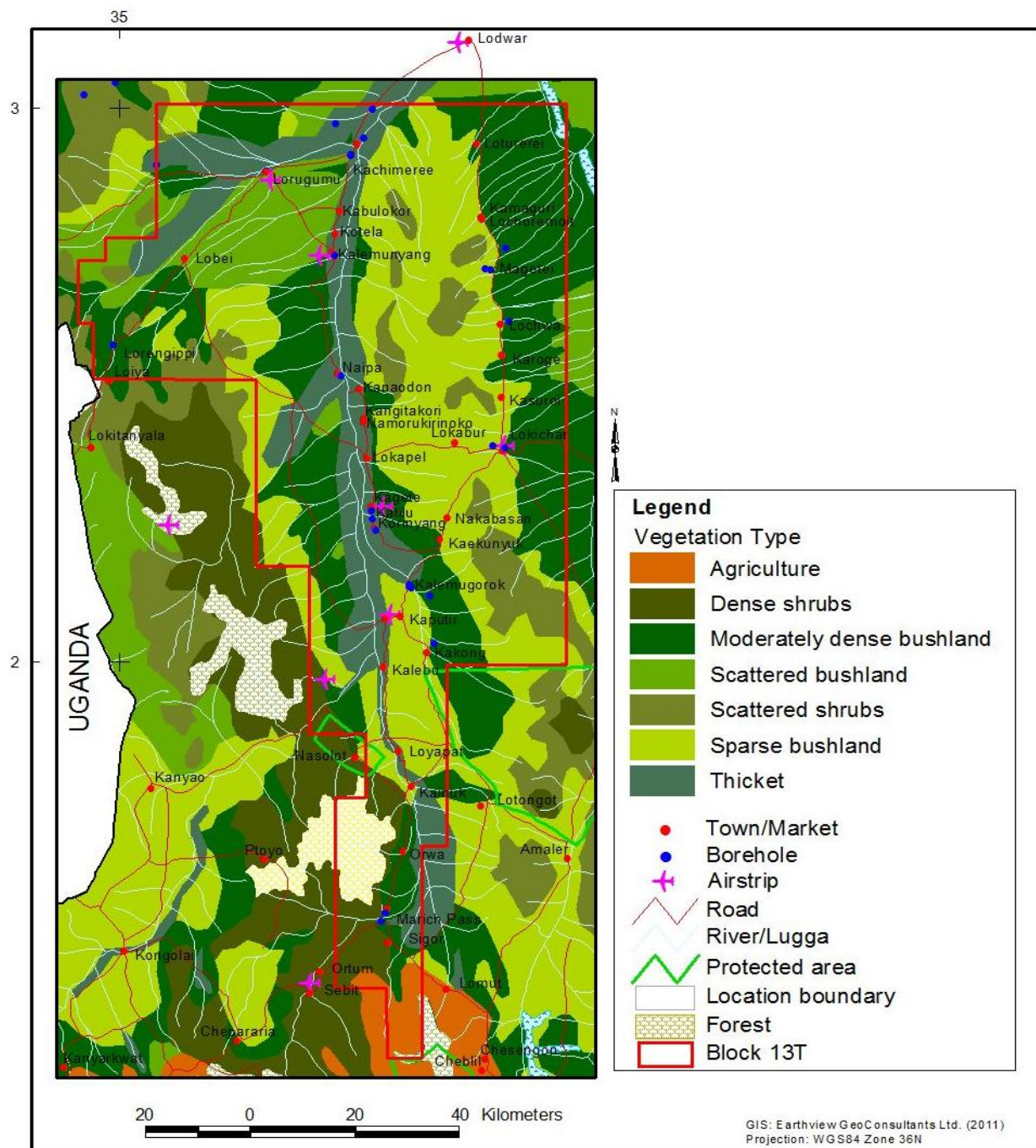
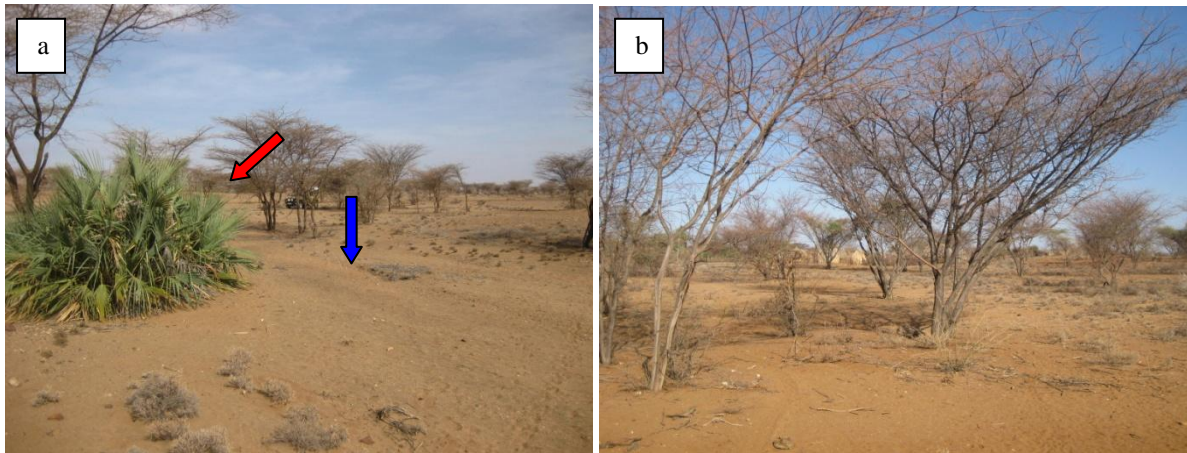


Figure 5.6: Vegetation of the project area.

### 5.2.7.1 Habitat types

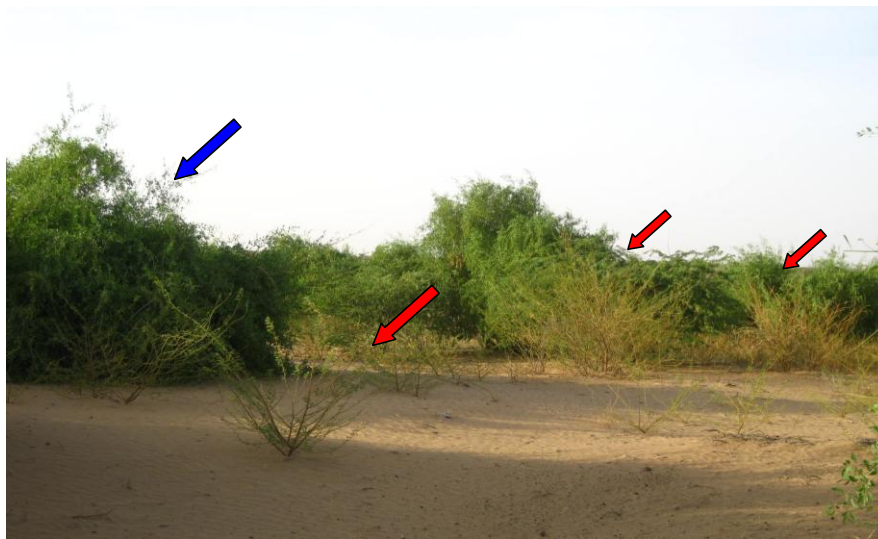
#### (a) Scattered bushland - sedimentary plains

In areas that are predominantly sandy soils that lie on undifferentiated sedimentary plains, the vegetation typically comprises of moderately dense *Acacia* associations (*Acacia tortilis*, *Acacia mellifera* and in some instances *Acacia nubica*) (Plate 5.16) interspersed with stands of *Salvadora persica*, *Cadaba spp* and *Balanites aegyptica* shrubs on shallow and sometimes wide waterways, where they are found in association with the *Indigofera spinosa* dwarf shrub (Plate 5.16) (Figure 5.6). There is a high level of competition between plants for water resources, evidenced by parasitism, e.g. *Salvadora persica* climbers on *Acacia tortilis* trees.



**Plate 5.16: Vegetation (doum palm, red arrow) along a waterway (blue arrow): vegetation found along the banks were typically *Hyphaene compressa* and *Indigofera spinosa* in Turkwel area in the northwest part of the Block, and (b) A typical moderately dense deciduous *Acacia* habitat at Kalemunyang.**

Additionally, sand dunes in this habitat (e.g. at Kospir River in the Turkwel area) are dominated by *Salvadora persica* that is facing the threat of invasion by the infamous weed *Prosopis juliflora* “Mathenge” which is a fierce competitor (Plate 5.17).



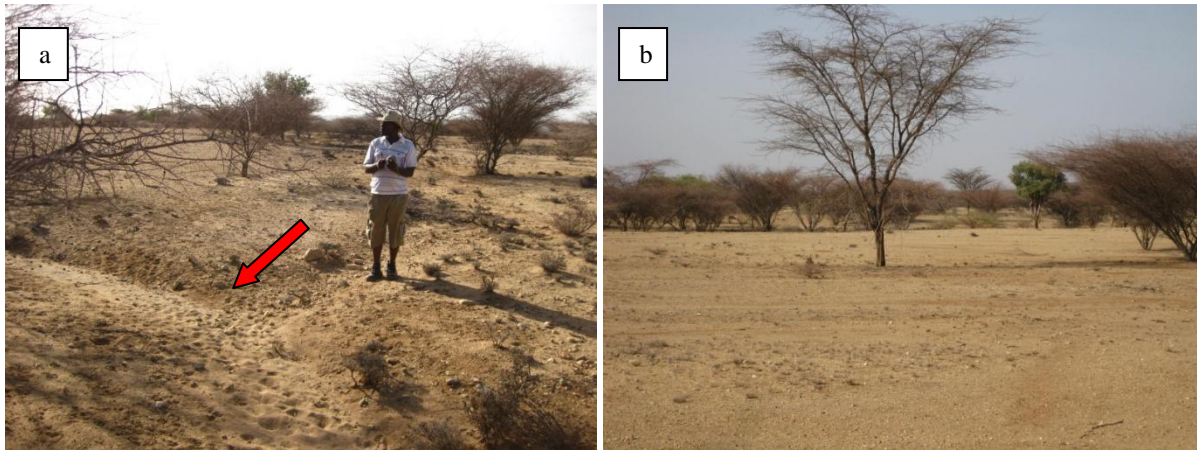
**Plate 5.17: *Salvadora persica* bushes resting on the top of a sand dune in Napetit One area (blue arrow).**

#### **(b) Scattered to moderate bushland - Piedmont plain**

These types of habitats are found on the foot of hills (Figure 5.6). Piedmont plains are characterised by a Crest, Mid-slope and Toe-slope. Consequently, there are variations in vegetation characteristics at each level of the plain as follows:

**The Crest:** This kind of habitat can be found at Lochwan’gamatak and Naipa area. The vegetation composition is moderately dense *Acacia* bushland associations, with *Acacia tortilis* and *Acacia mellifera* being the dominant shrubs. Species found growing adjacent to the numerous narrow and shallow interfluvies include: *Boscia coriacea*, *Salvadora persica* and the *Indigofera spinosa* dwarf shrub (Plate 5.18).





**Plate 5.18: (a) Typical scattered vegetation at a Piedmont plain crest in Lochwan'gamatak area. Note the narrow and shallow interfluves (Red arrow); and (b) Notice the bare patches in the foreground that are susceptible to erosion.**

**Midslope:** Here, a richer diversity of flora is observed but it still has the outlook of a moderately dense bushland with bushes rarely growing above 3 metres in height (Plate 5.19). Species include bush associations of *Acacia tortilis*, *Acacia mellifera*, *Acacia nubica*, and *Commiphora spp.* Other species include *Salvadora persica*, *Balanites aegyptica* and *Sansevieria spp.*



**Plate 5.19: General view of a moderately dense bushland in midslopes of a piedmont plain in Kalemunyang area, vegetation is of mixed species *Acacia tortilis*, *Acacia mellifera*, *Acacia nubica* and *Commiphora* species among others.**

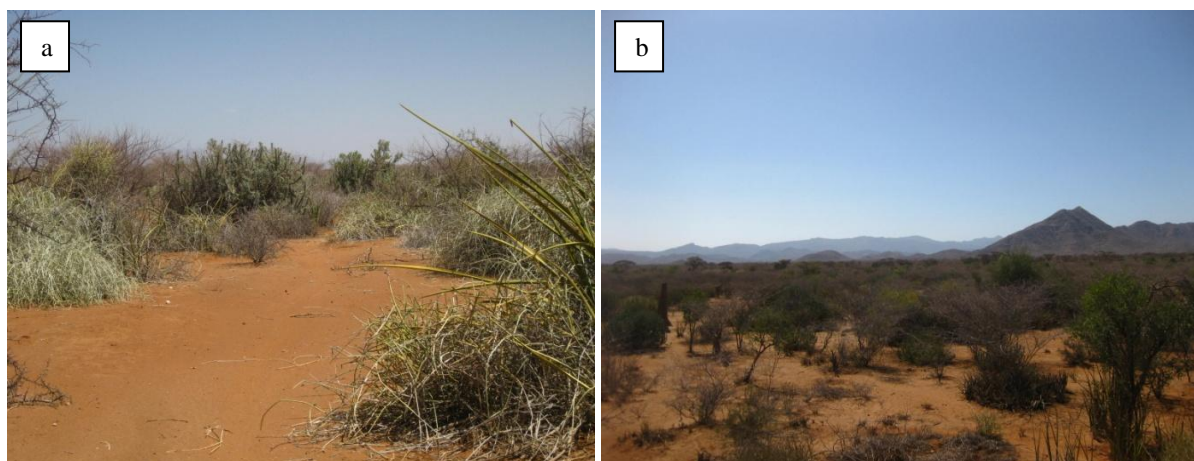
**Toe slope:** At the foot of the piedmont plain scattered *Acacia tortilis* and *Acacia mellifera* bush associations are found dotted with *Balanites aegyptica* and *Cadaba spp* (Plate 5.20).



**Plate 5.20: Scattered vegetation at the toe slope of Kalemunyang.**

### **(c) Moderately dense bushland - foot slopes**

Habitats found on hillside slopes of mountains and hills in the block are generally characterized by dense bushland (Figure 5.6). An example of such a habitat was found in Lorengippi area (Plate 5.21). Common Species found in this habitat include: *Sansevieria spp*, *Commiphora spp*, *Euphorbia spp*, *Aloe spp*, and *Sarcostema andogense*.

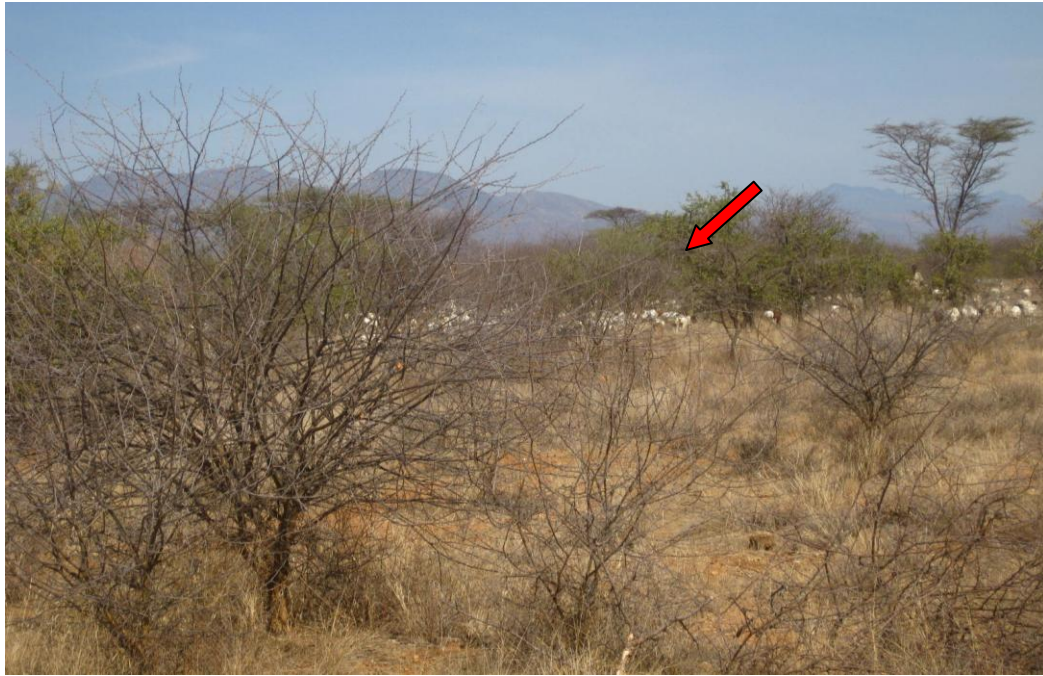


**Plate 5.21: (a) Diverse vegetation types at the footslopes of Moroto, Lorengippi; and (b) A general view of vegetation from Lorengippi.**

### **(d) Dense bushland**

Dense bushland are concentrated at the southern tip of the block and are home to a diverse species of animals. Although the Turkana South National Reserve and Nasolot National Reserve are outside the project area, this habitat is found in areas where the block and park boundaries coincide. The characterization of the vegetation is a mixed association of *Acacia spp*. and *Commiphora spp*. bushes. This habitat also experienced heavy grazing by livestock (Plate 5.22).





**Plate 5.22: Dense bushland in Kikito area. Note the livestock grazing in the background (red arrow).**

#### **(e) Riverine vegetation**

The waterways of river Turkwel and its lugga systems are characterized by riverine forests with the dominant species being *Acacia tortilis*, *Balanites aegyptiaca*, *Salvadora persica*, and *Hyphaene compressa*. *Calotropis procera* and *Prosopis juliflora* are common in disturbed areas. In the block such a habitat can be seen at the Konyipad floodplain (Turkwel area in the north), whose flora is characterized by an increase in *Hyphaene coriacea* (Duom palm) and *Cadaba rotundiflora* which tends to have a dense canopy (Plate 5.23).



**Plate 5.2: Floodplain vegetation, Turkwel area.**



### (f) Riverine forest

These are forests that follow major luggas and/or water flows (Figure 5.6). The dominant tree species in these riverine forests is the *Acacia tortilis* (Plate 5.24). Other species include *Salvadora persica*, *Hyphaene compressa*, *Calotropis procera*, *Cadaba spp* and *Boscia spp*.

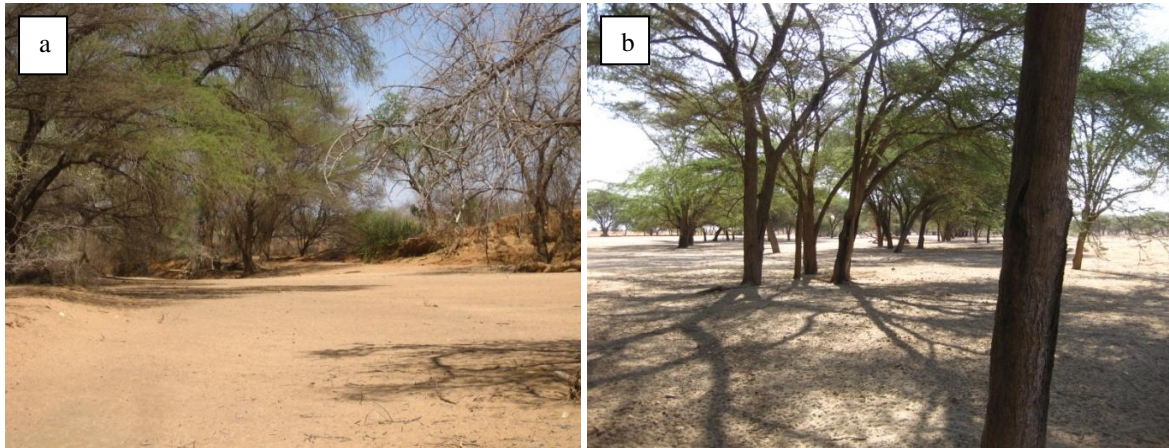


Plate 5.24: (a) Riverine vegetation at Kakimat; and (b) Riverine vegetation at Kapese, dominated by *Acacia tortilis* trees.

### (g) Sparse shrubland

This type of vegetation is found in the upland landscapes of the block (Figure 5.6). This type of landscape is undulating and has deeply incised and narrow interfluvial valleys that at times disintegrate to form gullies. The surface of these landforms is often stony and its soils shallow, and rarely supports bushes that grow taller than 3 meters. Common species found in this habitat are *Acacia tortilis*, *Balanites aegyptica* and *Salvadora persica* growing along the interfluvial valleys/waterways (Plate 5.25).



Plate 5.25: Sparse vegetation on gently undulating land at Lotureirei.

### (h) Bottom lands/ depressions

In the Kachimeree area in the north, agriculture is practiced on a tract of land with a depressed topography without a visible drainage outlet. The dominant vegetation is *Cadaba rotundiflora* (Plate 5.26) bushes growing to a height of less than one meter, dotted with *Acacia tortilis* and *Salvadora persica* bushes.



**Plate 5.26: *Cadaba* spp shrubs in the middle of a bottom land in Kachimeree. The local dwellers use this bottomland depression to grow millet during the rainy season. Note the dried up millet reeds that lace the ground (red arrow).**

#### Relationship to Project and EMP

Scattered bushes in most parts of the block implies that laying seismic lines will not be a problem for TKBV as vegetation clearance is expected to be minimal save for the southern tip of the block where small areas of Nasolot and the South Turkana National Reserves are found. TKBV should avoid felling mature trees and species of particular significance to the local community. Species of greatest interest to the community are:

- *Salvadora persica* (It is also known as the toothbrush tree, it can be used as a toothbrush and is used to treat ailments such as gonorrhoea, stomach and chest pains),
- *Boscia coriacea* (It is an evergreen shrub that produces a fruit that is boiled for hours on end before it is consumed; it is eaten as a fruit of last resort during drought periods)
- *Balanities aegyptiaca* (It is an evergreen shrub that produces a fruit and is eaten during drought periods. An infusion of its roots can also be used to treat malaria and stomach pains).

The activities of TKBV are not expected to significantly alter the flora of the region and the impacts are expected to be short- to medium-term. The area has sound ecosystem integrity, species diversity, and is capable of regenerating itself if left to regenerate once seismic activities are complete.



### 5.2.7.2 Fauna

The block has essential ecosystems that can support wild fauna. These ecosystems can be found at the southern tip of the block which is touched by parts of the Nasolot National Reserve and Turkana South National Reserve. The evergreen *Acacia* and *Commiphora* bushes, papyrus and sedges support a number of wildlife, including Elephant, Greater Kudu, Lesser kudu, Bushbuck, Duiker, Lion, Leopard, Cheetah, Kirk's dik dik, Spotted hyena, Silver backed jackal, Impala, Sykes monkey, Beisa oryx, Fringe-eared oryx, Waterbuck, Olive baboon, Buffalo, Grants gazelle, Hippo, Giraffe, Eland, Impala, and Black backed jackal. There are crocodiles in the rivers and abundant birdlife (over 150 species).

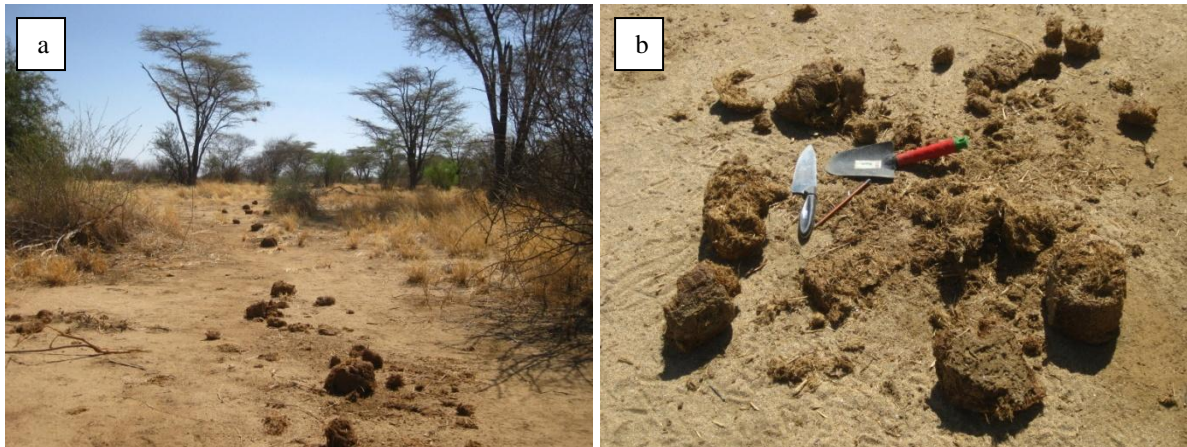
A few live observations were made but a majority of the mammalian life observed was made indirectly by signs of their activity. The animals that were observed include: Greater kudu, Kirk's dik dik, Cape hare, Silver backed jackal, Grant's gazelle, and Olive baboon.

#### 5.2.7.2.1 Mammals

Despite the diverse habitats in the block, mammalian life in the area was difficult to spot visually. The animal species observed in the area include: Dik dik, Cape hare, Ground squirrel, hedgehog and a wild cat at the Kunyupat hills, about 5km from Lorugum. Other animals were recorded by signs of their activity. Signs were documented especially in the Kalebo area close to the South Turkana National Reserve in the southern tip of the block. Porcupine, Feline and elephant activity was also documented (Plate 5.27 and 5.28).



**Plate 5.2: Elephant footprint, Loyapat area (Nasolot National Reserve).**



**Plate 5.28: (a) Elephant corridor; and (b) Elephant dung, Kalebo (Turkana South National Reserve).**

#### **5.2.7.2.2 Birds**

Birdlife is more diverse than the mammals but nonetheless they were still sparsely populated and scattered in the area. They included: Fork Tailed Drongo, Yellow Vented Bulbul, Superb Starling, White Crested Helmet Shrike, Northern White-crowned Shrike, Brown Necked Crow, Mourning Dove, White Bellied Cuckoo, Martial Eagle, Abyssinian Roller (Plate 5.29a), Pied Wagtail, White Browed Sparrow Weaver, Crested Lark, Variable Sunbird, White Headed Buffalo Weaver, Ring Neck Dove, Eastern Pale Chanting Goshawk, Sacred Ibis, Red Billed Hornbill, Headed Moosebird. Evidence of their presence was also observed (Plate 5.29b).



**Plate 5.29: (a) Abyssinian roller lorgum; and b) Social weaver nest overlying Kakimat lugga.**

#### **5.2.7.2.3 Arthropods**

This terrain is also dotted with tall towering anthills (Plate 5.30) and has a rich diversity of invertebrate species ranging from insects which include: Odonata (Dragon flies), Orthoptera (grasshoppers and crickets), Isoptera (termites), Coleoptera (beetles), Lepidoptera (butterflies and moths), Diptera (flies and mosquitoes), Hymenoptera (wasps and bees), Blattodea (cockroaches) and Phasmida (walking sticks). Arachnid present includes ticks, spiders and scorpions.



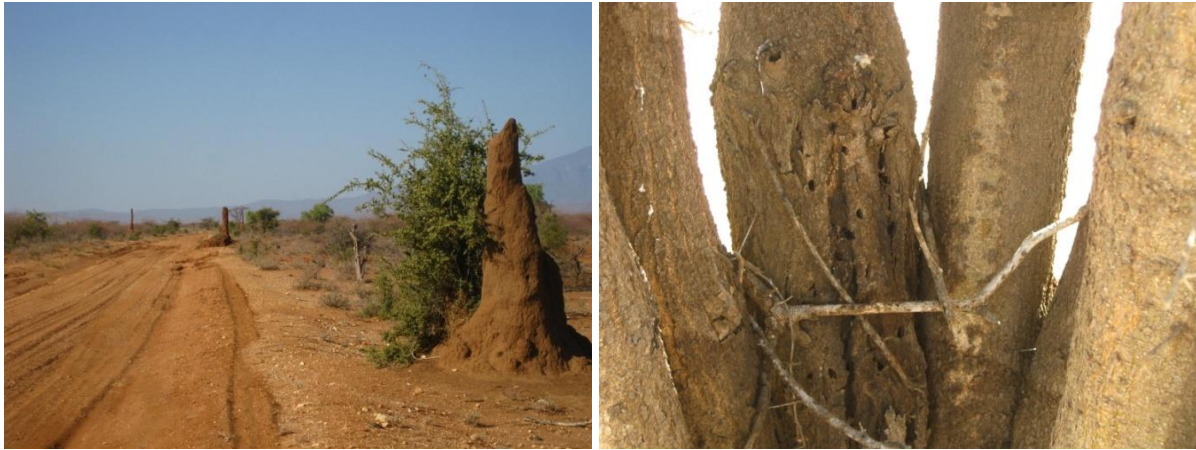


Plate 5.30: Anthills in Lorengippi area and (b) an ant nest on an *Acacia tortilis* bark, Naipa area.

#### Relationship to Project and EMP

The block is home to endangered and vulnerable species of mammal, reptiles and birds. Major threats to wild fauna in the block are habitat encroachment and insecurity. The Nasolot National Reserve and South Turkana National Reserve is the area where most fauna in the block is concentrated. If TKBV is to lay seismic lines in the park they will have to consult with KWS and the NMK further and get clearance for such activities. Bird nests will have to be avoided during seismic line preparations. Seismic operations and activity by TKBV are not expected to have a major impact on the wild animals within the block as seismic activity is not expected to alter wildlife habitats. This is assessed in Chapter 7 and mitigations highlighted in Chapter 8.

#### **5.2.8 Aquatic Environment**

The major aquatic habitat in the block is the perennial Turkwel River. The other seasonal and ephemeral rivers do not support aquatic fauna, but may host macrophytes. Because of the Turkwel River's keystone role in both the natural and human environment, concerns have been raised over recent land-use changes, including the expansion of irrigated agriculture, over-harvesting and river damming (Hughes 1984, 1987; Adams 1989; Thomas, 1996; Stave *et al.*, 2001).

**Phytoplankton, Zooplankton and Fish:** Based on an extensive literature review, it is clear that the phytoplankton, zooplankton groups and more generally the elements of the food web structure (including fish) in the Turkwel river (and other rivers within that regional setting) have not been studied. However, there is one published paper on the phytoplankton structure and composition of the Turkwel Gorge reservoir (Kotut *et al.*, 1998), which we have referred to for the possible phytoplankton groups that can be found in the Turkwel River. The diatom *Achnanthes* dominates the wet season, but in the intervening periods, dominance changed irregularly between diatoms, dinoflagellates, green algae and blue green algae.

**Fish:** There is no published information on the fish species of Turkwel River, but those reported to occur include *Clarias* and *Oreochromis*. There are some fish species that spawn in the Omo and Kerio Rivers where they flow into Lake Turkana – this has not been documented for Turkwel River, perhaps because it can be dry for up to half the year at the influent point (Morgan, 1974).

**Macrophytes:** The emergent macrophytes which were observed as dominating the river channels of Turkwel, and many associated swamps and marshes are *Cyperus papyrus*,

*Phragmites* spp. and *Typha* spp. The submerged macrophytes include *Ceratophyllum demersum* and *Polygonum* spp.

**Riverine Forest:** The riverine forest is largely dominated by *Acacia tortilis*, with *Faidherbia albida*, *Ficus sycomorus*, and *Hyphaene compressa* as sub-dominants on the riverbanks and *Balanites pedicellaris*, *Boscia coriacea*, and *Acacia nubica* on the dry edge of the riverine zone (Plate 5.31). These trees are often covered with lianas (e.g. *Leptadenia hastata*, *Cocculus hirsutus*, *Commicarpus plumbagineus*), while the understorey mainly contains *Cadaba rotundifolia*, *Acalypha fruticosa*, and *Abutilon hirtum* (Van Bremen and Kinyanjui, 1992). The indigenous riverine forest is, however, under threat from the more competitive *Prosopis juliflora* (Plate 5.32).



**Plate 5.31: A riverine forest dominated by *Acacia tortilis*, *Hyphaene coriacea* and aquatic sedges in the foreground.**





**Plate 5.32: An introduced species ' prosopis juliflora ' invading the banks of the Turkwel River.**

**Aquatic Birds:** Few studies have been carried out with respect to the birdlife along the Turkwel River. However, some of the species present are Hadada ibis, Glossy ibis, Yellow billed stork, African pied kingfisher, Goliath heron, White faced whistling duck, Egyptian goose, Blacksmith plover, Cattle egret, Stilts, Grebes, Crowned plover and Spurwinged plover (Plate 5.33).



**Plate 5.33: A Spurwinged plover at the banks of River Turkwel.**

**Aquatic reptiles, amphibians and arthropods:** Due to the construction of the dam between 1983 and 1985 significant numbers of animals were displaced, with many moving to alternative areas such as Lake Turkana, Nasolot National Reserve and other adjacent

areas, hence many species that used to be found here were lost (GoK, 1997). The Turkwel gorge is renowned for its crocodiles that are supported by an ample supply of fish species within the river channel. According to IUCN, the Nile crocodile is accorded a conservation status of least concern, while CITES classifies the species under Appendix I (threatened with extinction) in most of its range; and under Appendix II (not threatened, but trade must be controlled) (Crocodile Specialist Group, 1996). The area also harbours the Nile monitor lizard which was observed in the field. Most reptiles nest during the dry season between November and December in the north section of Africa (which is two months after mating). Nesting localities are usually sandy shores, dry stream beds, or riverbanks: eggs are laid a few meters onshore in holes up to 50 cm deep.

#### Relationship to Project and EMP

It is widely expected that the activities of TKBV will not have a major impact on the activity of the aquatic life in the area. Areas to be avoided are macrophytic habitats that are an important breeding site for many fish species, these habitats are found along the perennial river channels of Turkwel, Kerio and many associated swamps and marshes. Riverine forest should also be avoided as many of the nomadic pastoralists depend on the forests during the dry season, when the adjacent rangelands cannot supply their livestock with sufficient pastures.

Generally, seismic operations and activity by TKBV are not expected to have a major impact on the aquatic life of the region.

### **5.2.9 Land Resources and National Parks**

The project area has varied land resources ranging from vast tracts of land with sparse vegetation to water resources like Turkwel River. Vegetation that includes acacia spp, *Balanites aegyptiaca* and *Commiphora Africanas*, *Cadaba farinosa* and *Indigofera spinosa* dwarf shrub are useful browse for livestock. Residents in the area are largely pastoralists and the main livestock types are camels, goats, donkeys and sheep. There are two National Reserves: Nasolot at Kalebo and Turkana South National Reserve at Loyapat.

#### Relationship to Project and EMP

The nature and scale of the project will not significantly affect the land resources: vegetation will be cleared along thin (4m wide) and linear transects totalling a length of 1055 km: this translates to only 0.05% of the assigned project land area, and will still be considerably less, given the large expanses of almost bare ground. Issues relating to water resources have been addressed in sections 5.2.5 and 5.2.6 above. Permissions will have to be sought from Kenya Wildlife Services and/or the Minister for Forestry and Wildlife in relation to seismic operations in the National Reserves, if it is deemed that such operations are necessary, in accordance with the Wildlife (Conservation and Management Act) Cap. 376 (see section 4.3.14).

### **5.2.10 Archaeological, Historical and Cultural Sites**

There project area does not have archaeological sites that are officially recognised by the National Museums of Kenya. Community cultural sites are dispersed within the region but tend to have very small area of coverage, e.g. meeting places, shrines and burial areas.



There are some traditional sites where community elders perform their rituals - locally known as *Akiriket/Arimo*. These sites are mainly found in the interior parts of the project area especially in Loima District.

#### Relationship to Project and EMP

Known cultural sites will, of necessity, have to be avoided. GPS coordinates of these sites should be obtained from the relevant authority and/or institution such as National Museums of Kenya, KWS and the Turkana Basin Institute who have done a lot of archaeological work in the Turkana area, as they will serve to inform on the selection of seismic line transects. Buffer zones as specified in the mitigations section – chapter 8 - will need to be strictly observed. Personnel from the these relevant Authority and/or institutions with good knowledge of the sites may need to accompany the seismic team so that areas which may need to be avoided do not have a seismic line running through them, as some sites may not have been recorded with accurate coordinates.

#### **5.2.11 Visual Aesthetics**

The area has pristine and rugged scenic beauty with hills, forest in the south, extensive plains in the central and northern parts, and several sand rivers (luggas).

#### Relationship to Project and EMP

There should be limited impact on visual aesthetics of the project area.

Temporary camps should be built sympathetically to the area.

#### **5.2.12 Noise and Vibrations**

Ambient noise in the project area is of low level as it is in a rural setting where there are neither industries nor significant traffic movement even within the towns.

#### Relationship to Project and EMP

All potential noise sources should have their noise levels reduced at source (e.g. purchasing of equipment with noise reduction mechanisms, minimising number of vehicles and traffic to the level required to efficiently carry out the work, regular servicing of equipment, use of personal protective equipment such as ear muffs, and setting up of buffer zones in areas of active seismic survey to keep away unauthorised personnel).

#### **5.2.13 Solid and Liquid Wastes**

There are no significant solid or liquid wastes that are generated within the project area. There are minimal activities concentrated in small town centres that can generate solid waste or oil waste at present.

#### Relationship to Project and EMP

The area is essentially pristine with respect to solid and liquid wastes, and there is no public or private waste management service available in most of the project area. TKBV will have

to ensure that the systems for treating solid and liquid wastes generated in the course of rolling out the project are properly selected, installed, managed and decommissioned according to national legislation, regulations, and international best practices in order to minimise or eliminate their potential environmental impacts.

### 5.3 SOCIO-ECONOMIC BASELINE SURVEY

This section provides information on key social-economic issues and activities relevant to the project. It includes an overview of social characteristics, economic settings, health, education, and demography. While the team tried to exhaust all available information, it should be noted that detailed information on some of the issues are not available and where available, they date back several years. The population census undertaken in 2009 was cancelled in some of the areas due to the as yet unresolved ambiguity in the data collected.

#### 5.3.1 Social Characteristics

##### 5.3.1.1 Demography

Block 13T traverses four districts namely; Central Pokot, Turkana Central, Loima and parts of Turkana South Districts. The major communities within the project area are the Pokot and the Turkana although there are minorities like the Somalis found mainly in the major centres. The project area is sparsely populated with clustered settlements within the major centres. The population density is generally very low (Tables 5.5 to 5.8; Figure 5.7<sup>4</sup>). According to the Kenya National Bureau of Statistics, Turkana South District had a population of 226,379 and a population density of 12 persons in 2009. Turkana Central had a population of 254,606 and a population density of 17 persons with Pokot Central District having 175,616 and 61 persons in total population and population density respectively.

**Table 5.5: Demographic data by district.**

NO.	Districts	Male	Female	Total population	Total household	Area in sq. Km.	Density
1	LOIMA	-	-	-	-	-	-
2	TURKANA CENTRAL	-	-	254,606	-	-	17
3	TURKANA SOUTH	121,022	10,5357	226,379	28,437	1,8670.8	12
4	CENTRAL POKOT	87,199	88,417	175,616	32,548	2,898.7	61

Source: 2009 Kenya population and housing census, KNBS.

**Table 5.6: Demographic data by division.**

NO.	Divisions	Male	Female	Total population	Total household	Area in sq. Km.	Density
1	LOIMA	21,003	19,901	40,904	5,288	3,429.0	12
2	TURKWEL	39,077	39,951	79,028	12,151	5,485.8	14
3	LORENGIPPI	4,110	3,511	7,621	974	617.7	12
4	LOKICHAR	35,756	31,986	67,742	8,175	4,536.6	15
5	KATILU	22,365	19,559	41,924	5,414	1,143.1	37
6	KAINUK	14,470	11,777	26,247	3,684	1,684.1	16
7	SIGOR	43,113	42,091	85,204	16,091	1,582.8	54

Source: 2009 Kenya population and housing census, KNBS.

**Table 5.7: Demographic data by location.**

NO.	Locations	Male	Female	Total population	Total household	Area in sq. Km.	Density
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<sup>4</sup> Current population data could not be put in map form (Figure 5.7) due to changing administrative boundaries, but the spatial distribution trends indicated in the map for 1989 are believed to be not significantly different from today.

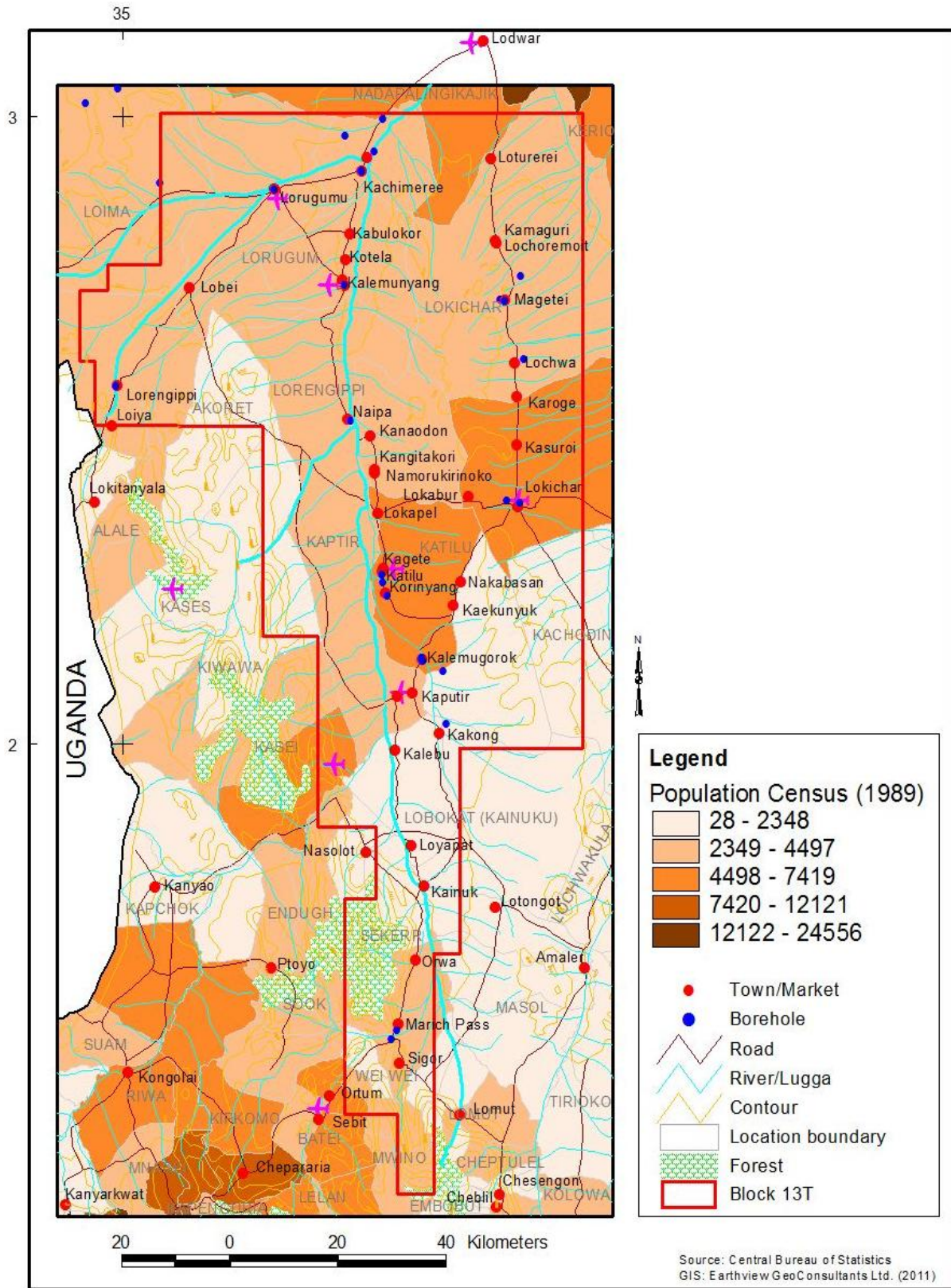
1	LORUGUMU	13,152	13,519	26,671	4,437	1,612.5	17
2	LORENGIPPI	1,393	1,066	2,459	299	209.4	12
3	TURKWEL	3,871	4,268	8,139	1,602	333.3	24
4	KOTARUK	9,246	8,588	17,834	2,314	688.4	26
5	LOCHWAANG'IKAM ATAK	11,137	9,644	20,781	2,346	1,674.3	12
6	LOKICHAR	12,240	11,212	23,452	3,308	878.0	27
7	KATILU	22,365	19,559	41,924	5,414	1,143.1	37
8	KAPUTIR	8,227	6,892	15,119	2,272	682.0	22
9	KAINUK	6,243	4,885	11,128	1,412	1,002.1	11
10	WEI WEI	4,487	4,354	8,841	1,722	185.6	48

Source: 2009 Kenya population and housing census, KNBS.

**Table 5.8: Demographic data by Sub-location.**

NO.	Sub Locations	Male	Female	Total population	Total household	Area in sq. Km.	Density
1	KALEMUNYANG	4,400	4,266	8,666	1,250	450.2	19
2	LORUGUMU	2,172	2,565	4,737	914	582.6	8
3	LOKICHAR	5,630	5,190	10,820	1,644	187.8	58
4	KOTARUK	5,304	4,574	9,878	1,142	225.3	44
5	NAIPA	1,860	1,746	3,606	493	199.2	18
6	LOCHWAANG'IKAM ATAK	7,915	6,646	14,561	1,636	1,071.6	14
7	KANAODON	4,627	3,605	8,232	875	93.4	88
8	LOKAPEL	4,163	3,312	7,475	964	229.6	33
9	KALEMUNG'OROK	4,455	4,076	8,531	1,241	453.7	19
10	KATILU	9,120	8,566	17,686	234	366.4	48
11	KAINUK	3,936	3,215	7,151	900	186.5	38

Source: 2009 Kenya population and housing census, KNBS.



**Figure 5.7: Population distribution trends in the project area (latest population figures (2009 census) are provided in Tables 5.5 to 5.7).**

### 5.3.1.2 Education

The education sector is not well developed among the pastoralists living in this region. Children are often introduced into herding at a very young age instead of going to school.



This may have led to high illiteracy levels among the communities within this region. Many agencies, including the Government and NGOs, have been sensitizing the locals on the need for education. There are several nursery, primary, and secondary schools (Plate 5.34).



Plate 5.34: A sign for an integrated primary school in Katilu area, and Kachemeeri Primary School, respectively.

### 5.3.1.3 Housing

Housing varies from semi permanent to temporary structures. Human settlements are concentrated within administrative centers where essential social services like provision of potable water, schools and dispensaries are available. Watering points for livestock is also a major determinant for siting of human settlement. In addition, there are temporary houses known as *manyatta* that serve as concentration points for livestock herders in transit in search of water and pasture.

### 5.3.1.4 Energy Sources

The major towns and centres get the bulk of their energy supply from the Kenya Power and Lighting Company (KPLC), while in rural areas; communities rely on other energy sources such as solar, diesel generators, kerosene, charcoal and firewood (Plate 5.35).



Plate 5.35: A power transformer in Kainuk Town and charcoal displayed for sale near Turkwel centre respectively.

### 5.3.1.5 Land Tenure System

The land tenure system in the project area is communal. Thus, land is collectively owned by the residents and managed, on behalf of the community, by the Turkana County Council and

Pokot county council as trustees. Pasture and settlement lands have no land ownership documents.

### 5.3.2 Economic Setting

#### 5.3.2.1 Labour Force

There is a readily available pool of unskilled labour in the project area due to lack of major economic activities except for livestock rearing. Many of the young unemployed school leavers are available for work, since there are limited job opportunities at the few urban centres in the area.

#### 5.3.2.2 Livestock and Crop Production

Livestock production in its various forms is an important economic feature in the entire region. The people depend mostly on livestock for their livelihood since they are pastoralists. They keep cattle, sheep, goats and camels (Plate 5.36). The livestock industry in the area is frequently faced with various challenges including cattle rustling and drought, among other issues discussed later in this report. Cattle rustling among the various communities are the major setback for livestock keeping, and this is further compounded by drought that can lead to resource conflicts.



**Plate 5.36: Livestock keeping within the project area.**

Agriculture plays an important role in the economic welfare of the area. Agricultural activities are carried out mainly along the Turkwel River. This includes irrigation and rain-fed farming. There are several irrigation schemes in the area run by the National Irrigation Board, such as Katilu, Koputiro, and Turkwel, while others are proposed e.g. Arumrum and Nakamane irrigation schemes. Rain-fed agriculture is undertaken on a very small scale, and the rains are often unreliable. There are no major cash crops grown in the area, only food crops. Food crops grown along the river include maize, beans, millet, sorghum, and cassava (Plate 5.37). Horticultural produce grown across the region ranges from kales, cabbages, tomatoes to bananas (5.38). All these crops grown along the rivers supply almost the entire Turkana region and are supplemented with supplies from Kitale area.





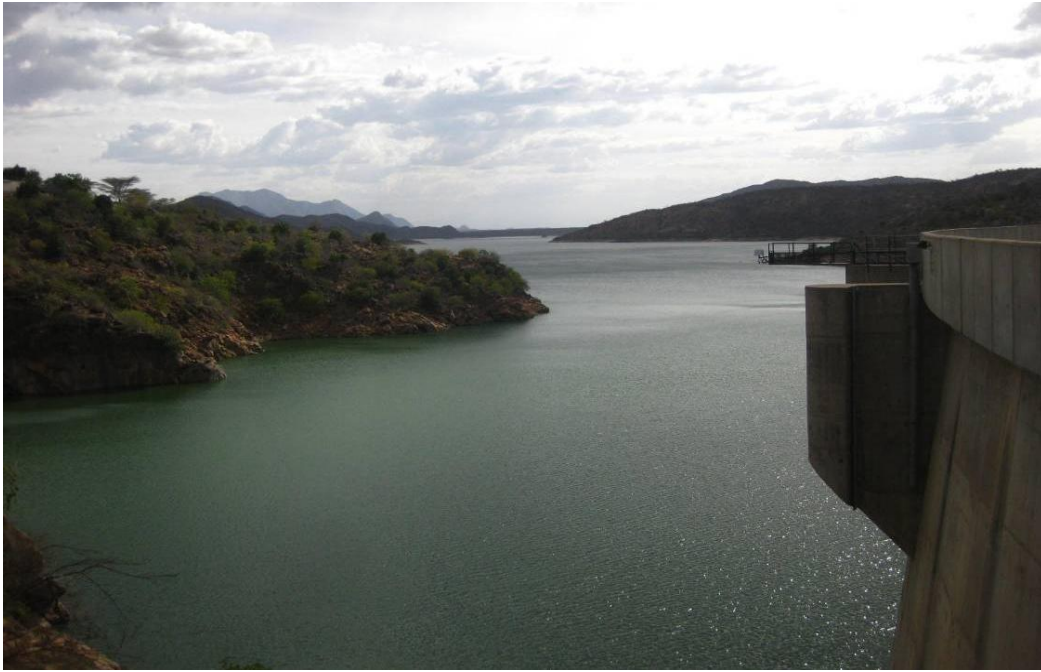
**Plate 5.37: Subsistence maize farming along River Turkwel in Loima District.**



**Plate 5.38: Tomato plants in Katilu Irrigation Scheme.**

### **5.3.2.3 Industry**

Industry is generally poorly developed in the entire region. The only major industrial activity is hydroelectric power generation from Turkwel Gorge Dam, operated by Kenya Electricity Generating Company Ltd. (Plate 5.39).



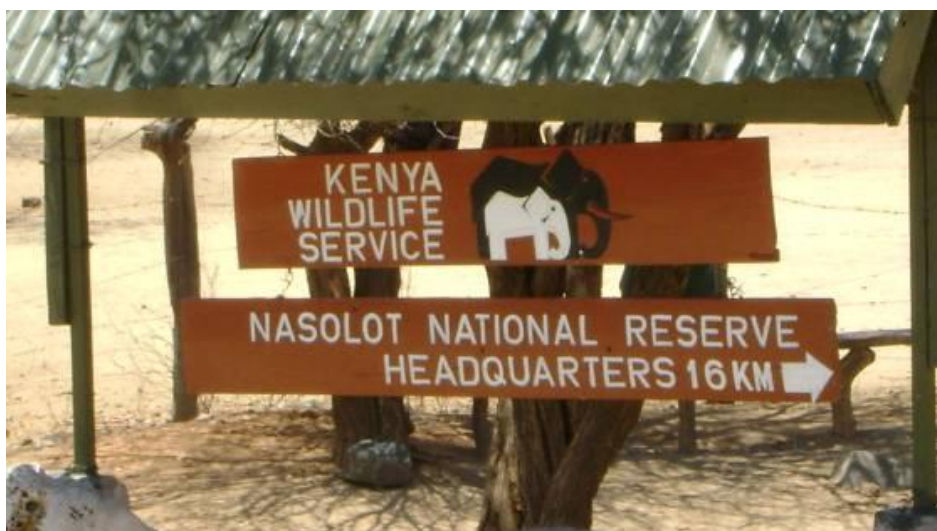
**Plate 5.39: View of the Turkwel Gorge Dam.**

#### **5.3.2.4 Trade and Commerce**

There are many market centres and towns within the project area. The major commercial and trade activities include Jua Kali (artisanship), retail, wholesale, catering, distribution and commercial rental housing. Others are kiosks, hardware, bars, private clinics and chemists, entertainment establishments (pool games and videos), carpentry and tailoring workshops, among others.

#### **5.3.2.5 Tourism**

The region, especially the lower part of the block along Turkwel River, is home to many wild animals. The hospitable people and their culture, unique flora and fauna and the varied landscape, which includes sand dunes and rocky mountains, place the region in a strategic position to benefit from the tourism industry (Plate 5.40).



**Plate 5.40: A sign showing direction to a National Reserve within the project area.**



### 5.3.3 Health Setting

Health facilities serving the project area are located at major centres. There are various public and private health facilities. Most of them are dispensaries, and are both poorly staffed and equipped (Plate 5.41). Most of the people have to travel long distances to get health services. The communities mostly rely on NGOs and missionaries operating in the area to meet their health needs. These NGOs include: Help Care International and Merlin. St. Brigit Dispensary in Naipa area is operated by Catholic missionaries.



**Plate 5.41: Kanaodon Dispensary.**

### 5.3.4 Security and Public Safety

Security is a major concern due to frequent cattle raids among the Turkana, Pokot, Karamoja and Tepes (of Uganda) communities. There are many illegal firearms within these warring communities on the western side of Block 13T. This issue has derailed the development of many sectors of the economy. The people mainly rely on the Administration Police and Kenya Police Reservists for their security needs. Many of the homesteads in insecure areas are nowadays fenced (Plate 5.42) which never used to be the case. The fences are high and extensive (Plate 5.42).



**Plate 5.42: Note the thorny thickets fencing homesteads within Naipa area in Loima District.**

### Relationship to Project and EMP

Social, cultural, health, and the economic situation in the project area will influence how TKBV relates with the communities within the area. The communities have strong social and cultural networks. The area is, however, one of the least developed regions of Kenya, with inadequate support services from the national government and regional authorities. The communities also dwell in a largely harsh environment, and are faced with frequent and recurrent droughts, coupled with widespread and frequent water shortages, that make their daily livelihoods very difficult. Despite these conditions, they do have a thriving pastoral-livestock system which tends to broker ethnic and cross-border conflicts related to cattle rustling. There are several NGOs that have stepped in to fill this needs gap, but their activities are uncoordinated and mostly site-specific in scale.

### **5.3.5 Community Views and Concerns**

The community members who attended the public meetings did welcome the proposed project but appealed for adherence to environmental safeguards and labour legislation. The community, having already seen the benefit of the seismic survey that was undertaken by Africa Oil in block 10BB, is optimistic that more benefit will be realized in the area. However, while in some areas the communities favoured the notion that TKBV works with them through a community committee, others did not support this view but rather preferred that job opportunities be subjected to open advertisement.

### **5.3.6 Corporate Social Responsibility**

The EIA team made extensive field visits in the project area, held public meetings with the local people and administered questionnaires to households. While the community members are aware that TKBV cannot provide all their needs, they requested the company to consider a number of projects which will be beneficial to the communities as part of their CSR.

## **CHAPTER 6:**

### **ANALYSIS OF PROJECT ALTERNATIVES**

#### **6.1 INTRODUCTION**

Alternatives to the project are defined as functionally different ways of achieving the same end (CEA Agency, 1997). Currently, seismic testing, both on land and in marine settings, is a critical and proven technology for refining knowledge about geological formations with a relatively high potential for containing petroleum hydrocarbons in commercial quantities. There are no functionally different alternatives for defining potential for hydrocarbon resources that are not cost prohibitive.

Under the “no-go” or “no-action” alternative, the project does not go ahead, thus the status quo remains. Oil and gas production, however, cannot occur in the absence of exploration activities. It should be noted that this project is a data acquisition project that will enable evaluation of the newly acquired data to identify potential oil and gas prospects. If no oil and gas prospects can be delineated based on the data acquired, then the project will end at that point. If, however, the data indicates that potential oil and gas prospects are likely, then the project would move on (with a time interval of several months during which the seismic data will be processed and analysed, and likely prospects delineated) to an exploratory drilling phase to determine actual presence and amounts of oil and/or gas. In this case, a new EIA would have to be carried out. As a precursor to the drilling of petroleum exploration wells, seismic acquisition is an accepted and well-developed method of petroleum reservoir delineation. While surface mapping, gravity, magnetics, and other forms of geophysical exploration are commonly employed to further understand the geological character of a sedimentary basin, they are generally considered complimentary techniques rather than stand-alone methods of data collection and interpretation. It is, therefore, considered that the proposed seismic acquisition activity is the only viable means to assess the hydrocarbon prospectivity of the 13T licence area. If the project does not go on at this stage, then the potential benefits that have been outlined in Chapter 1, section 1.5.3, will be foregone.

#### **6.2 PROJECT SITE ALTERNATIVES**

One alternative to the project is to leave the assigned project area. The Kenyan Government through previous exploration work by various companies has identified a number of ‘blocks’ with potential for oil and gas. These blocks are found in the Coast, Eastern, North-Eastern and Rift Valley Provinces (including their inland waters) and Kenya’s territorial waters and exclusive economic zones in the Indian Ocean. TKBV has been granted the exploration licence for Block 13T in the Kenya Rift Valley; therefore, the concept of ‘alternative site’ does not apply as each block within the country is agreed upon by the Government of Kenya and the interested party and subsequently licensed. Other blocks have been licensed to other companies under the terms of the PSC, and some of these have already been approved and licensed by NEMA to carry out onshore (land-based) and offshore (marine) seismic surveys. A number of companies have recently completed onshore and offshore seismic surveys with no reported adverse environmental impacts.

#### **6.3 SURVEY DESIGN ALTERNATIVE TECHNOLOGIES AND RECOMMENDATIONS**

The technology to be employed for the seismic survey is the latest state-of-the-art for activities of this nature, and has been outlined in Chapter 2. Approximately 1055 line kilometres of seismic data acquisition will be carried out in the project area. The company will construct a number of seismic survey lines (track lines) along which seismic data will be collected. The seismic survey operations and related activities will be constrained to the seismic survey lines once they are confirmed, and to the base camp, fly camps and access



roads to these areas within the block 13T. On an area-wide survey such as this, there is considerable scope to adjust line placements and program size to bypass habitations or areas of particular sensitivity. A detailed evaluation of each line will be carried out as work progresses and line placements will be adjusted to achieve the survey objectives (see section 2.4.1) with minimum disruption and impact to the environment and resident communities. Thus, the actual coordinates of the proposed survey lines on land shall be based on analysis of pre-existing data and the information acquired on the area through this EIA study, and will be subject to adjustments based on specific issues or conditions encountered when the operation is ongoing. Two methods will be used to generate the seismic waves (1) Truck mounted Vibroseis units, and (2) dynamite charged shot-holes for land-based seismic data acquisition.

The following equipment which will be dedicated solely to the proposed seismic survey activity that will be carried out in Block 13T:

- Seismic source generators (Vibroseis, dynamite charges for land-based data acquisition);
- Data recording truck;
- Transport equipment: e.g. trucks, pick-ups, 4WD vehicles;
- Communication equipment including handheld satellite phones, and vehicle-mounted VHF radio, and will also establish a communication base station at the main camp site;
- Mulchers, Bulldozers, and light-cutting hand-held equipment for clearing of seismic lines;
- Surveying equipment;
- GPS equipment;
- Associated electronics, data processing and printing equipment, and;
- Ambulances.

Additional equipment and facilities that will be available will include:

- Fully serviced and self-contained base camp for all personnel and equipment;
- Adequate fire-fighting equipment, and first-aid kits;
- Fully equipped clinic for medical care of the personnel, and;
- Emergency trained paramedic(s).

### **6.3.1 Acoustic Source Technologies**

#### **6.3.1.1 Vibroseis**

In this case, truck-mounted “vibrators” provide the primary source.

##### **(a) Alternative Technologies**

The Vibroseis technology (see section 2.3) is a state-of-the-art technology that is widely used to carry out seismic surveys around the world. The only other alternative to Vibroseis is using a dynamite shot-hole (discussed in section 6.3.1.2 below). The commonly used type of vibrators generate a peak force of 282 kN (63,500 lbs). Vibroseis is generally preferred over dynamite shot-holes for the following reasons: lower cost than dynamite operations; vibrator settings can be adjusted in the field and hence can greatly improve the results of a survey; and Vibroseis source points can easily be recorded again if for some reason the reflected signals are not of the required quality.

## **(b) Recommendations**

Vibroseis units have the advantage of not requiring shot-hole drilling crews or explosives. However, in wooded areas these large vehicles require much wider lines to be cut or mulched and in water-logged soil the tyres may cause surface damage. Vibroseis will accordingly be restricted to dry, sparsely vegetated areas. Given the semi-arid to wooded conditions of the project area, and the fact that, other than in the Turkwel River floodplain and Turkana plain areas, most of the area is hilly, Vibroseis is the preferred option for seismic survey in the flat-lying or gently undulating areas, while dynamite shot-holes would be preferred in the more rugged and steep hilly ridge areas.

### **6.3.1.2 Dynamite Shot-holes**

In this case, a small charge of explosive is placed in a narrow-diameter hole drilled five to fifteen metres into the ground, before being detonated remotely. Depth of hole, charge size, and type of explosives can affect the final quality of seismic data.

## **(a) Alternative Technologies**

The only other alternative to dynamite shot-holes is Vibroseis (discussed in Section 6.3.1.1 above). Dynamite shot-holes are normally used in cases where Vibroseis method cannot be utilized, such as areas with steep slopes or rough terrain.

This method has some constraints. As earlier mentioned, shot-hole depth, charge size, and type of explosive must be predetermined prior to the actual survey: none of these variables can be easily adjusted to improve data recovery, while Vibroseis field testing is easily conducted to determine optimum sweep frequencies and sweep lengths.

## **(b) Recommendations**

This technique will be useful and effective in hilly, rugged and steep terrain, in dry or water-logged terrain, as well as in sensitive areas such as archaeological sites.

Both hand-powered and machine-powered drill units will be used according to the hardness of the ground and depth of hole. There will be man-portable units in areas where access is very limited and a low-impact technique is required. In most areas, however, drill units will be mounted on wheeled or tracked vehicles as the terrain requires. The drilled “shot” holes are usually destroyed by the detonations and will be backfilled on the surface after use. With this form of acquisition, seismic lines need only to be around two metres wide and can be meandered to avoid mature vegetation.

A flexible approach will be taken in the technique employed for shot-hole drilling. Either a tractor or man-portable rotary type rig capable of drilling up to 20m deep holes will be employed. A small tractor would be able to traverse the reasonably dry sections of line cleared by the Mulcher. In wet areas (such as in river flood plains or water-logged areas), a low-impact man-portable shallow shot-hole drill rig, which could either be rotary or of a flush nature, could be used providing that the underlying rock is not close to the surface and a source of water is close by. In wet areas, the depth of the achievable hole will depend on logistics and subsurface geology.

In some areas, the near surface geology consists of a thin soil cover over hard rocks that may in turn overlie loose unconsolidated materials beneath. To ensure that majority of the energy from the shot is focused downwards it will be necessary to employ a drilling technique capable of penetrating the overlying hard layer of rock and passing through the unconsolidated layers beneath to place the charge at a suitable depth. In such drilling

conditions, a sonic drill would be ideal: however, it may well be possible to achieve the desired depth by using a drill with a combination hammer bit and rotary head, with a compressed air-lift or pumped water-lift technique.

### **6.3.2 Line Cutting Technologies**

#### **(a) Alternative Technologies**

A few decades back, the lines used to be cut using bulldozers: this was not considered environmentally friendly because they removed vegetation entirely, as well as scraped off surface soils. The current state-of-the-art technology is the use of mulchers. The mulching units are self-powered vehicles mounted on low ground pressure tracks or wheels exerting only 3-3.75 *psi* pressure on the surface. These machines cut low-lying vegetation and leave behind fine, rapidly bio-degradable nutrient-rich mulch in their wake with seeds intact. Soil structures and root systems are also left intact. Regeneration of mulched vegetation is rapid and even in arid areas vegetation returns to its pre-cut state in one to two years. Some areas of the block, especially to the south where agricultural activities are undertaken will need mulching to protect the top soil and allow quick re-growth of vegetation.

#### **(b) Recommendations**

Line cutting will not be necessary in some parts of the project area on account of the bare or sparsely vegetated surface with thin soil cover overlying hard rock beneath. In areas where line cutting will be necessary, the method used will range from bulldozers, to the use of mulchers to clear areas with relatively dense vegetation and areas where farming takes place. The mulchers will cut a track of 2.5 metres in width without disturbing the top mat of soil

### **6.3.3 Access Road Technologies**

As far as is practicable, existing routes will be used to reach the seismic line acquisition areas. Where this is not possible, access roads may have to be constructed. These are typically done using a bulldozer (e.g. Caterpillar D8R or equivalent) and light hand-cutting of vegetation using machetes. Some lines may have to be bulldozed to allow access for the Vibroseis vehicles. Such routes should also be planned in liaison with the area authorities and community leaders, and there should be a win-win approach to this so that such access roads can benefit the local communities once the project is over.

### **6.3.4 Seismic Data Recording Equipment**

This will include a recorder and computer workstation mounted in a truck, cables with attached geophones (cables can be several kilometres long), and telemetric data encoding units.



**Plate 6.1: Typical seismic recording truck**

### **6.3.5 Communications Equipment**

The area has an unreliable and variable quality communications network. Communications equipment that will be required include VSAT, hand-held satellite phones, vehicle mounted VHF radios, HF radios and mobile phones. Communications will be coordinated through a central communications base station that will be set up at the base camp. There are several technological options offered by communications equipment supplies companies. The options selected should be based on assessment of the peculiar requirements in the project area.

### **6.3.6 Surveying Equipment**

Once the seismic line coordinates have been determined, it will be necessary to carry out a survey before line cutting commences. Typical survey instruments would include, for example, the survey instrument itself (e.g. DGPS- Differential Global Positioning System), hand-held GPS, and plotters to print out the survey line maps. There are several state-of-the-art technological options that TKBV can choose from.

### **6.3.7 Transport Equipment**

This could include the following: normal saloon/station wagon 4WD cars, pickups, water tanker, fuel tanker, personnel carrier, Vibroseis service truck, recording truck, line equipment layout truck, food transport truck, drill rig trucks and ambulances. Selection of the appropriate make and type of this equipment will be carried out later by the seismic contractor, based on a consideration of the environmental setting and challenges posed to vehicles. Crew personnel changes will usually take place via small aircraft

Seismic surveys are a specialised technical area, and alternative methods and technologies are limited. The survey technique and equipment specifications for the proposed seismic programme are considered to be necessary for the acquisition of quality data to allow geological evaluation and the safe and optimal development of the Block. It is estimated that

the time period in which the seismic survey will take place is within three to four months and therefore minimum disruption to local activities will be envisaged. Impacts that are associated with the seismic activities will be minimal and measures have been put in place in the EMP to mitigate any potential impact that may occur during the exercise.



## CHAPTER 7: ENVIRONMENTAL IMPACT ASSESSMENT

### 7.1 INTRODUCTION

The baseline biophysical and social environmental parameters established in Chapter 3 are critically examined in this section in relation to the potential environmental and socio-economic impacts of the proposed onshore seismic survey. In addition to adhering to the mitigations below, the proponent needs to comply with the requisite national legislation and regulations that are outlined in Chapter 4 of this report.

It should be noted that seismic surveys are of short duration, typically less than three months, and are generally considered to be a low impact activity that generally permits the immediate return of the operational sites to its previous land use. This is indirectly supported by the fact that a suite of seismic surveys have already been conducted in the onshore (land) and offshore (marine) areas of Kenya, and no adverse or long-lasting impacts have been reported from these activities. All such seismic survey EIA project reports that have previously been submitted have been approved by NEMA.

This Chapter identifies the potential environmental and social impacts of the proposed project, based on the components of the proposed survey (Chapter 2), and in the context of the baseline conditions that have been established in Chapter 5, and with due regard to applicable legislation described in Chapter 4. The predicted impacts are then assessed using the methodology outlined in Chapter 3, section 3.2, and appropriate mitigation measures are determined.

### 7.2 ENVIRONMENTAL AND SOCIAL ASPECTS AND IMPACTS IDENTIFICATION FOR THE SEISMIC SURVEY

The components of the seismic survey and survey-related activities that have been outlined in Chapter 2 and that could result in environmental and social impacts are indicated in Table 7.1 below.

**Table 7.1: Survey project environmental and social aspects and impacts.**

	Environmental or Social Parameter	Impact Source	Predicted Impacts
1.	• Physiography and Geology	• Vibroseis and associated equipment • Bulldozer • Dynamite shots	• Cut lines leave long-lasting residual impacts (tracks, and/or scarring on surface rocks) • Vibrators/bulldozers and dynamite used near steep slopes may lead to minor landslips and rock topples
2.	• Soils	• Vibroseis and associated equipment • Bulldozer • Transport Vehicles • Oil or chemical leaks from vehicles and machinery, garage and storage areas	• Compaction of degraded soils along cut lines • Disturbance of soil along cut lines • Cut lines may enhance gulleying and erosion (wind and water) • Rutting in loose soils • Contamination of soils • Potential landslips
3.	• Climate	• None	• None
4.	• Air Quality	• Vehicles and machinery • Sanitary systems	• Pollution from exhaust emissions • Fugitive dust generation from traffic

		<ul style="list-style-type: none"> <li>• Waste disposal points</li> </ul>	<ul style="list-style-type: none"> <li>• Offensive odours</li> <li>• Health risks</li> </ul>
5.	<ul style="list-style-type: none"> <li>• Surface and Groundwater Resources</li> </ul>	<ul style="list-style-type: none"> <li>• Water supply source for the camp</li> <li>• Heavy vehicles and machinery</li> <li>• Drilling of shot holes</li> </ul>	<ul style="list-style-type: none"> <li>• Conflict with neighbouring communities if water source is shared</li> <li>• Compaction of near-surface aquifers such as springs, reducing yield</li> <li>• Downward draining of groundwater through drill holes, reducing yield at springs</li> </ul>
6.	<ul style="list-style-type: none"> <li>• Water Quality</li> </ul>	<ul style="list-style-type: none"> <li>• Liquid effluent discharges from sanitation systems at the campsite</li> <li>• Oil or chemical leaks from garage and storage areas, vehicles and machinery</li> <li>• Subsurface detonation of dynamite charges</li> </ul>	<ul style="list-style-type: none"> <li>• Contamination of water supply source for the camp</li> <li>• Contamination of underlying aquifers</li> </ul>
7.	<ul style="list-style-type: none"> <li>• Terrestrial Environment (Habitats, Flora, and Fauna)</li> </ul>	<ul style="list-style-type: none"> <li>• Vibroseis and associated equipment</li> <li>• Mulchers</li> <li>• Bulldozer</li> <li>• Transport vehicles</li> </ul>	<ul style="list-style-type: none"> <li>• Cutting of vegetation along cut lines</li> <li>• Disturbance of wildlife (physical presence and noise)</li> <li>• Introduced weeds and pests</li> </ul>
8.	<ul style="list-style-type: none"> <li>• Aquatic Environment (Habitats, Flora, and Fauna)</li> </ul>	<ul style="list-style-type: none"> <li>• Vibroseis and associated equipment</li> <li>• Vehicles crossing luggas/river</li> <li>• Oil, fuel or chemical leaks from vehicles and equipment</li> </ul>	<ul style="list-style-type: none"> <li>• Physical disturbance of habitats</li> <li>• Pollution of habitats</li> </ul>
9.	<ul style="list-style-type: none"> <li>• Land Resources and National Parks</li> </ul>	<ul style="list-style-type: none"> <li>• Vibroseis, mulchers and associated equipment</li> <li>• Dynamite shots</li> <li>• Vehicles</li> <li>• Presence of humans</li> </ul>	<ul style="list-style-type: none"> <li>• Cut lines affect pastoral resources</li> <li>• Disturbance of animals and resources in National Reserves</li> </ul>
10.	<ul style="list-style-type: none"> <li>• Archaeological, Historical and Cultural Sites</li> </ul>	<ul style="list-style-type: none"> <li>• Vibroseis and associated equipment</li> <li>• Vehicles</li> <li>• Dynamite shots</li> </ul>	<ul style="list-style-type: none"> <li>• Compaction by heavy vehicles and machinery may damage soils and rocks on cultural sites</li> <li>• Vibrations and drilling of shot holes may disturb graves and cultural sites</li> <li>• Social friction between local communities and seismic crew workers</li> </ul>
11.	<ul style="list-style-type: none"> <li>• Visual Aesthetics</li> </ul>	<ul style="list-style-type: none"> <li>• Campsite design</li> <li>• Cut lines</li> </ul>	<ul style="list-style-type: none"> <li>• Poor campsite design does not blend in with the environment</li> <li>• Cut line footprints and vegetation cover removal lower aesthetic value of landscape</li> </ul>
12.	<ul style="list-style-type: none"> <li>• Noise and Vibrations</li> </ul>	<ul style="list-style-type: none"> <li>• Vibroseis and associated equipment</li> <li>• Dynamite charges and associated equipment</li> <li>• Vehicles traversing the area</li> </ul>	<ul style="list-style-type: none"> <li>• Disturbance to humans, animals and livestock</li> <li>• Disturbance to workers</li> <li>• Health risks</li> </ul>
13.	<ul style="list-style-type: none"> <li>• Solid and Liquid Wastes</li> </ul>	<ul style="list-style-type: none"> <li>• Campsite</li> <li>• Workplaces in the field</li> </ul>	<ul style="list-style-type: none"> <li>• Pollution of surface soils, waters and groundwater</li> <li>• Offensive odours</li> <li>• Health risks</li> </ul>
14.	<ul style="list-style-type: none"> <li>• Social Characteristics</li> </ul>	<ul style="list-style-type: none"> <li>• Workforce influx</li> <li>• Activities along the seismic survey lines</li> </ul>	<ul style="list-style-type: none"> <li>• Possible increase in number of students dropping out of school in search of jobs</li> <li>• Erosion of culture and social values as a result of intercultural association.</li> <li>• May interfere with grazing lands and watering points</li> <li>• Friction between local communities and migrant workers</li> </ul>

15.	<ul style="list-style-type: none"> <li>• Economic Characteristics</li> </ul>	<ul style="list-style-type: none"> <li>• Employment opportunities</li> <li>• Tenders and supplies</li> </ul>	<ul style="list-style-type: none"> <li>• Improved livelihood</li> <li>• Improved short-term business opportunities for the locals</li> <li>• Potential CSR project benefits</li> <li>• Influx of cash into low-cash rural economies</li> </ul>
16.	<ul style="list-style-type: none"> <li>• Occupational Health and Safety</li> </ul>	<ul style="list-style-type: none"> <li>• Campsite and fieldwork environment</li> </ul>	<ul style="list-style-type: none"> <li>• Injuries to workers, visitors and area residents arising from project operations</li> <li>• Fire hazard</li> <li>• Other health risks</li> </ul>
17.	<ul style="list-style-type: none"> <li>• Security and Public Safety</li> </ul>	<ul style="list-style-type: none"> <li>• Workforce security needs</li> </ul>	<ul style="list-style-type: none"> <li>• Improvement in security due to security enhancement for project activities</li> </ul>

### 7.3 IMPACTS ASSESSMENT AND MITIGATION FOR THE SEISMIC SURVEY

#### 7.3.1 Physiography and Geology

Other than a narrow stretch of low-lying and generally flat land that marks the Turkwel River floodplain, running from south to north through the central part of the project area, as well as the northern sector that is characterised by the Turkana Plain, the area is generally hilly. It has low earthquake risk, but in the hilly southern sector, landslides may occur. For example, the Kenyan Red Cross Society (KRCS) reported that landslides killed eight children in Chesegon Division and three others (two of whom were children) in Ptirap sub-location, Pokot Central District on 8 November, 2008 (OCHA, 2008). Fifteen other children were injured and a total of 200 people were displaced in Chesegon division. Roads in the district were also damaged and the Wei Wei Bridge collapsed due to floodwaters (OCHA, 2008). Minor landslips may occur due to Vibroseis/dynamite use in the steep slopes of the hill ranges. The risk of subsidence due to passage of heavy vehicles is negligible due to the geology, but localised compaction of surface soils may occur in some places. There are few existing roads in the area, but their north-south orientation, running along the western and eastern margins of the lake, and the hills that mark the eastern and western boundaries of the Turkwel River basin will pose a challenge in access and crossing over (see Figure 5.1).

#### **Mitigation:**

- Use existing access roads to the extent possible;
- Pre-survey possible access routes, and use the selected routes rather than accessing work sites through free-ranging driving across the open country;
- Explosives (dynamites) should be used as source of acoustic energy instead of vibroseis in areas with highly dissected and incised surface (section 4.3.3 and 4.3.4);
- When laying cut lines, off-road driving should be discouraged to avoid creating unnecessary tracks and trampling of pasture;
- Minimise to the extent possible, the use of bulldozers to open up cut lines and access roads to minimise landscape scarring;
- Avoid cut lines on slopes steeper than 40° to minimise risk of landslips and rock topples;
- Optimise source energy to achieve the survey objectives to minimise risk of landslips and rock topples;
- Buffer zones should be maintained from areas posing landslide and topple hazards; and
- No cooking on site and no fires other than the designated camping areas; Smoking will only be permitted in designated areas; no litter will be left on site; there will be no

collection of vegetation or firewood, and no hunting and trapping of wildlife; and vehicle speed will not exceed 40km/h. with all vehicles fitted with vehicle tracking and monitoring systems.

The potential residual impacts would be related to landscape scarring along cut lines in the ranges, and displaced soils and boulders that may arise from landslips and rock topples related to use of the vibroseis and dynamite shots

### 7.3.2 Soils

There are several different types of soils in the project area, each with its own peculiar geological, textural and weathering/erosion-driven properties, as well as anthropogenic footprints such as compaction by grazing animals, that are relevant to a number of issues that would need to be considered when executing the project. These issues include: ecosystem services such as the role of soil in support of vegetation and higher food chain members; wind and water erosion, and; ponding and surface run-off potential. In the areas where the soils have high sand content, particularly the sedimentary plains (Ps28 unit) and piedmont plains (mapping units Y5 and Y10) and the seasonal alluvial drainage basins along the Turkwel River, compaction by vehicles and machinery will be slight. Soils of the bottomland, uplands, foot slopes and hills of the project area that are more susceptible to compaction due to soil degradation that is related to overgrazing, sodium content of surface soil, shallow depth and their higher clay contents, would likely be compacted to a significant extent. However, if those soils are adequately dry (soil moisture content below the plastic limit) when activities occur and vehicles minimize the number of times they drive across those soils, compaction should be minimal and soil productivity (as measured by a plant's ability to grow) should not be noticeably affected.

#### **Mitigation:**

- Machinery and equipment should use existing routes as much as is practicable to avoid compaction of the surface soil (section 4.4.5);
- Any excessive damage to drainage channels caused by seismic activities should be repaired;
- Turkwel River should be crossed only at the existing road crossing;
- Luggas should be crossed at road crossings, where such crossings exist, or in areas where the bank heights are less than 1m – banks at the lugga crossings should be mechanically restored;
- Vehicles should steer away from natural drains and waterways as is practicable, but a buffer zone of 20m should be maintained except at crossing points;
- Minimize vegetation and grassland clearance as much as possible when cutting the survey line transects (section 4.4.5);
- Seismic survey should aim to be carried out as far as possible during the dry seasons - vehicle activities should be minimised in wet conditions;
- Use only essential vehicles and low pressure/low impact tyres in areas with wet soils or that are susceptible to ponding or are prone to erosion;
- Ensure that all vehicles and machinery operating in the field and in the campsite are properly maintained so as not to have oil leaks that could contaminate the soils (section 4.3.7);
- Ensure that any in-field refuelling or maintenance is performed while using a drip tray with a spill-kit available;
- All fuels and other non-aqueous fluids to be stored in suitable bunded enclosures;
- Ensure that all drivers and technicians are familiar with drip-tray and spill-kit use through daily tool-box talks; and
- Installation and proper management of camp sanitation facilities.

The potential residual impacts would be enhanced gulleying and erosion due to altered runoff and drainage patterns at local scales, necessitating the implementation of mitigation measures to eliminate any long term negative impact.

### **7.3.3 Air Quality**

On meso- to micro-scales, air quality variation relates primarily to changes in the wind-speeds in the area, particularly in the sparsely vegetated and dry northern sector, and the associated particulate dust that it transports from one place to another. These winds can raise substantial quantities of dust. Dust raised by construction activities (e.g. preparation of seismic cut lines, and building of the base camp and access ways) as well as that raised by moving vehicles and equipment, will likely contribute to transient airborne dust. Further, the disturbed surface with fine textured soils as a result of site clearance for seismic survey transects would be susceptible to wind erosion. On a micro-scale, air quality may also be affected by exhaust emissions from vehicles and machinery, but this is also of a transient and insignificant nature. Sources of offensive but localised odours would include exhaust emissions from vehicles and other equipment, as well as poorly managed waste disposal and sanitary facilities at the camp site.

#### ***Mitigation:***

- Limit traffic speed and restrict movement of vehicles as is reasonable to minimize dust generation;
- Field vehicles, trucks and any other machinery should be switched off when not in use;
- Regular servicing of all trucks, service vehicles, and any other machinery powered using fossil fuels to ensure efficient combustion and minimisation of exhaust emissions (section 4.4.8);
- Use low sulphur fuels if available and where suitable;
- Employees working in dusty conditions must use appropriate PPE;
- If litter is to be burned, it should be done at a time of low wind movement, and preferably in areas shielded from wind by vegetation;
- Installation and proper management of camp sanitation facilities.

There shall not be any residual impacts.

### **7.3.4 Surface and Ground Water Resources**

Water is a key resource in the project area. It is sourced from shallow wells, shallow to deep boreholes, springs, rivers and luggas. It is patchily distributed and generally scarce, particularly in the central to northern parts of the project area. This scarcity has led to human-human and human-wildlife conflicts. Some areas, especially along the rivers (i.e. Turkwel, Kosipir and Wei Wei) and their environs, have adequate water that is used for domestic and agricultural purposes. The seismic crew will also need to access safe potable water. Effluents generated at the campsite(s) will also need to be managed so as not to contaminate any underlying shallow, unconfined aquifers or rivers and luggas. Shallow groundwater aquifers occur in the low-lying parts of the project area, and could potentially be compacted by Vibroseis and other equipment, thereby reducing yields. Drill holes can potentially affect the shallow groundwater flow near springs. They may, for example, penetrate underlying confining strata, which would allow groundwater to drain downward, rather than flow laterally to a spring. It is highly improbable that the drill holes could penetrate artesian aquifers as these are unknown in the area, and the shot holes will be very shallow.



**Mitigation:**

- A water supply borehole should be drilled to provide the water required for the project; this could be donated to the community on completion of the seismic survey;
- It is recommended that an efficient and monitored water-use policy be adopted by the project proponent at the camp site and other work areas (section 4.4.3);
- An efficient sanitation system should be put in place in the campsite(s) to handle effluents (section 4.3.8);
- Hazardous and toxic waste material should be managed according to OGP practices and in compliance with Kenyan legislation, specifically the Environment Management and Coordination (Waste Management) Regulations;
- Buffer zone distances between seismic lines and water sources will be established through extensive in-field ground vibration testing. Distances may vary between seismic source types, as per IAGC Guidelines.
- When water is encountered during shot hole drilling, Bentonite, or a tapered concrete (or other suitable material widely accepted in the industry), can be used to plug the hole up to 3m above the static water level or to a depth of 1m from the ground surface;
- Ensure that any in-field refuelling or maintenance is performed while using a drip tray with a spill-kit available;
- Ensure that all drivers and technicians are familiar with drip-tray and spill-kit use through daily tool-box talks.

Residual impacts on surface and groundwater resources are not expected if the mitigations outlined above are effected.

**7.3.5 Water Quality**

Liquid effluent discharges and oil or chemical leaks at the campsite, if not properly managed, can potentially lead to pollution of an underlying shallow groundwater source. Along the cut lines, subsurface detonation of charges could leave localized small residuals of gases and solids (e.g. water/stream carbon-dioxide gas, nitrogen gas, calcium carbonate solid, and sodium carbonate gas). The shot-hole method could also lead to clouding of spring waters for up to several weeks. Oil leaks from vehicles operating in the field and parked at the campsite can also potentially pollute underlying groundwater.

**Mitigation:**

- Refuelling areas should be underlain with spill-proof hard standing or bund, with spill-kits readily available and operatives trained in their use;
- All fuels and other non-aqueous fluids to be stored in suitable bunded enclosures;
- All refuelling operations to be carefully overseen and managed;
- Pits for disposal of domestic and sanitary effluents should be sited with knowledge of the geological and soil characteristics of the area;
- Buffer zone distances between seismic lines and water sources will be established through extensive in-field ground vibration testing. Distances may vary between seismic source types, as per IAGC Guidelines;
- Spill-kits to be carried with vib truck service vehicle, refuelling bowser vehicles, drill crews. All staff to be briefed on use of these;
- When water is encountered during shot hole drilling, Bentonite or a tapered concrete plug may be used to plug the hole up to 3m above the static water level or to a depth of 1m from the ground surface;

- Ensure that all vehicles and machinery operating in the field (and in the campsite) are properly maintained so as not to have any oil leaks that could contaminate the soils (section 4.3.7);
- Ensure that any in-field refuelling or maintenance is performed in a well-lit bunded area or while using a drip tray with a spill-kit available;
- Ensure that all drivers and technicians are familiar with drip-tray and spill-kit use through daily tool-box talks.

Residual impacts on water quality are not expected if the mitigations outlined above are effected.

### **7.3.6 Terrestrial Environment (Habitats, Flora, and Fauna)**

The region, though sparsely vegetated, has a number of varied habitats and two protected areas in the extreme south (Nasolot National Reserve and Turkana South National Reserve) (See Figure 5.6). Generally harsh climatic conditions (high temperatures and low rainfall), particularly in the central and northern parts of the project area, make these habitats sensitive to disturbance. The habitats do, however, exhibit a good capacity for regeneration, as some cut lines that were made in earlier decades for seismic survey are no longer expressed on the land surface. Domesticated animals are numerous in the area, and to a much lesser degree, there are wildlife primarily in and around the Turkana South and Nasolot National Reserves in the southern part of the project area.

With repeated vehicle passage and vibrator-pad compaction, as may occur in this project, some damage would occur to the vegetation. The small-scale and spatial arrangement of the project operations is such that habitat is not likely to become fragmented or isolated from other areas of habitat. The vehicles and equipment, if previously used in other areas with different, exotic vegetation types, may introduce new weeds and pests into the area. The Vibroseis vehicles may destroy bird nests found on the ground and in low growing shrubs and trees, and the disturbance may cause some birds to abandon their nests. Burrows that serve as refuge for reptiles, amphibians, and small mammals (particularly in the southern sector around Turkwel Gorge and the National Reserves where wildlife is abundant) may be compacted by the vehicles or the vibrating plate. While the seismic activities may result in some wildlife moving out of the area, the low percentage of land disturbed would affect only a small percentage of the population and their suitable habitat. The shot hole method would have little impact on the wildlife, except those individuals found within the immediate vicinity of the shot holes. Given the small percentage of land impacted (cut lines and access roads), the short duration of the project (three months maximum), its rolling-over nature (i.e. spending only a few hours at each survey locality), resulting in only localized and limited impact, any threats to endangered wildlife species are considered insignificant.

#### ***Mitigation:***

- The mitigations related to soils (see above) apply;
- Trees with trunk diameter greater than 20cm should not be cut;
- Seismic survey activities to be undertaken during daylight hours only;
- Liaise with the Kenya Wildlife Service (KWS) to ensure that wildlife disturbance and danger to the seismic team is mitigated in and around the National Reserves in the south. Any planned lines that are considered to be a threat to the ecosystem integrity will have to be relocated;
- KWS rangers will accompany seismic crews in sensitive or potentially dangerous areas;
- Hunting, fishing, trapping and gathering of food resources by workers, when on and off duty should be strictly prohibited. All workers to be briefed regularly on this issue;

- The risk of introduction of weed and pest species to the region via contaminated vehicles and equipment will be mitigated by the wash-down of all vehicles and ancillary equipment at a designated location prior to the commencement of the survey.
- Access to areas where wildlife is protected, permissions will have to be sought to gain access. Wildlife shall have the right of way when they are of such a size that they can be readily seen from vehicles. Hunting and feeding of wildlife shall be strictly prohibited. In wildlife areas, access roads will be used as much as possible. Employees should be made aware of the wildlife-sensitive locations.

The residual impact will be reduced vegetation cover along track lines; this will, however, regenerate in a few years. Given the small scale of the project, combined with implementation of the suggested mitigation measures, this impact is not considered significant.

### **7.3.7 Aquatic Environment (Habitats, Flora, and Fauna)**

The aquatic environment has not been well studied and its components are not well known, but within the spatial scale of the project area, it occupies a minor area because of its linear features. Turkwel river runs longitudinally through the block, dissecting it into two (see section 5.2.6.2), though for much of its length in the lower reaches after Turkwel Gorge Dam there are very few fauna due to the fact that it can dry out for up to 5 months in a year (*cf.* Morgan, 1974). The key anticipated impacts are expected to be clearance of riverine vegetation, and to a much lesser extent, noise and vibration impacts on aquatic wildlife when work is being undertaken close to the Turkwel River at and upstream of the Turkwel Gorge Dam. Necessary measures should be put in place i.e. survey of the area prior to line clearance to ensure that aquatic birds nests on the banks of the Turkwel River are not disturbed, and, in the southern sector around the Turkwel Gorge area, crocodile nesting sites are not disturbed.

#### ***Mitigation:***

- Mitigation for soils (section 7.3.2) vegetation (section 7.3.6) and noise and vibrations (section 7.3.11) apply;
- TKBV should employ low impact seismic techniques such as shot points where practical as discretion when accessing streams and rivers for minimal residual impact.
- Carry out vehicle cleaning to remove bio fouling prior to departure from areas with known or potential invasive species;

### **7.3.8 Land Resources and National Reserves**

Pasture and browse are the major land resource in the area and support the pastoral lifestyle of the local community. The seismic operations may impact on livestock pasture and browse area. The Nasolot and Turkana South National Reserves are tourism resources.

#### ***Mitigation:***

- As for sections 7.3.1 (Physiography and Geology), 7.3.2 (Soils), 7.3.7 (Terrestrial Environment) and 7.3.8 (Aquatic Environment) above.

### 7.3.9 Archaeological, Historical and Cultural Sites

Archaeological sites are not currently known in the project area, but the seismic survey team may come across an archaeological find during the course of their work, particularly within the Turkana Plain and in the expansive Turkwel River floodplain. Community cultural sites are dispersed within the region but tend to have very small area of coverage, e.g. meeting places, shrines and burial areas. Impacts to such sites can occur because of vehicles driving over the surface, compression from the Vibroseis pad on the surface, vibrations resulting from the Vibroseis testing or dynamite charges in shot holes, and the drilling of shot holes. Vibrating pads would only compress the soils up to a few inches, so archaeological and cultural material that is not very close to the soil surface will likely remain intact.

#### **Mitigation:**

- Consultations should be undertaken with local elders to help in identifying and avoiding any sensitive cultural sites during the survey in order to prevent conflict with the community;
- Use of shot points rather than Vibroseis is recommended for such areas;
- Seismic survey lines will not be planned to go through known cultural sites (section 4.4.4);
- Access routes and cut lines will be selected to provide sufficient offset to known cultural sites to avoid disturbing them: these offsets shall be determined in consultation with area leaders;
- All such sites will be flagged for avoidance (sections 4.3.2; 4.4.4);
- If archaeological materials are found during the operations, they should be left undisturbed, and the National Museums of Kenya personnel should be contacted to advise further on how to proceed;
- All project field workers must be informed, before commencement of operations, that any disturbance to, defacement of, or removal of archaeological, historical, or sacred material will not be permitted.

No residual impacts are expected.

### 7.3.10 Visual Aesthetics

It is anticipated that there will be some minor impacts on the aesthetics of the pristine environment. Interferences will result from buildings constructed within the base camps, as well as from the creation of geophysical survey traverse lines and access ways. Landscape scarring on rocky surfaces.

#### **Mitigation:**

- Use of modern line cutting technology, preferably *mulchers* (in areas with dense bushland) for clearing of the geophysical survey transects will ensure that minimal vegetation is removed, hence ensuring that re-vegetation will occur in a much shorter period since the seeds and branches will be left along the traverses and this will promote faster re-growth (section 4.4.6).
- Campsite design should take into consideration the aesthetics of the selected area.
- Minimise use of bulldozers on sensitive landscapes
- Use of shot holes on rocky surfaces

### 7.3.11 Noise and Vibrations

The use of heavy road construction equipment, Vibroseis acoustic energy sources, dynamite charging, and power augers for shallow drilling are potential sources of noise and vibrations that may affect the survey crew, neighbouring communities and their livestock, and wildlife. The base camp site can also be a source of noise pollution especially if generators are used for electricity generation.

Some noise sensitive areas (e.g. National Reserves, schools, hospitals and residences) are found in the project area. However, no significant impact is anticipated due to the localized and temporal nature of this project and its expected noise levels. The length of time the seismic crew spends in any one location is short, with up to 10 km per day of acquisition possible in good weather conditions. This will reduce the overall noise impacts on localised residential receptors to less than one day of actual disturbance.

#### ***Mitigation:***

- To reduce the expected transient impacts on wildlife, noise levels will need to be minimized to the extent possible, correct strength of dynamite charging and Vibroseis use applied to achieve the survey objectives, and human contact with wildlife should also be minimized in line with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, and the Wildlife Conservation and Management Act;
- All seismic operations should be carried out only during daylight hours;
- Ensure that Vibroseis and other vehicles have working silencers to muffle noise;
- Provide full personal protective gear to workers as appropriate (e.g. helmets and ear muffs/plugs) and as specified in the Occupational Safety and Health Act;
- Workers should be sensitized on hazards likely to be encountered in such a work environment, and trained accordingly;
- Buffer zone distances between receptors and seismic sources/vehicles will be established through extensive in-field ground vibration and noise testing. Distances may vary between seismic source types, as per IAGC Guidelines. Liaison will be maintained with the relevant Kenyan government authority in deciding these distances;
- Engage local leaders in sensitising the communities in the vicinity of the seismic operation areas about the project and its possible noise and vibration impacts;
- The communities should be informed in advance when a seismic survey operation is to be executed along a given seismic transect/location;
- Use generators with minimal noise levels (silent pack enclosures) at camp sites and effect a noise mitigation policy for all operations in accordance with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations.
- Use of personal protective equipment such as ear muffs, and setting up of buffer zones in areas of active seismic survey to keep away unauthorized personnel.

No residual impacts are expected if the mitigations outlined above are enforced.

### 7.3.12 Solid and Liquid Wastes

As a result of the proposed project, it is expected that waste will be generated by the survey crew e.g. cans, wrappings, paper, plastics. Plastic waste is of particular concern especially if ingested by livestock, and for its environmental pollution effect. Waste oils and petroleum used in vehicles and exploration machinery may spill or leak on/into the ground, hence



polluting the soil or water system within the project area. This may degrade water quality and affect livestock and domestic water users in the project area.

**Mitigation:**

- Waste materials (at the camp and in the field working areas) should be segregated into non-hazardous and hazardous waste, and consideration given to re-use, recycling, or disposal (sections 4.4.1, and 4.4.9) as appropriate;
- A waste management plan documenting the waste strategy, storage (including facilities and locations), handling procedures and means of disposal, should be developed and should include a clear waste-tracking mechanism to track waste consignments from the originating location to the final waste treatment and disposal location in compliance with the Environmental Management and Coordination (Waste Management) Regulations;
- Hygienic sanitation and disposal of grey and black water will be covered in the waste management plan in order to protect the general health of the workers and the general public;
- Ensure that solid waste is removed from site for recycling/disposal only by an authorised waste handler, ideally a handler licensed under the Waste Management Regulations, 2006;
- Fuel and other non-aqueous liquid storage areas should be banded;
- Servicing of equipment should be carried out in a designated garage area which has regularly maintained oil drainage traps and readily available spill-kits. Workers in this area will be regularly briefed on spill prevention.

### 7.3.13 Social Characteristics

The local communities are conservative with respect to their culture. Due to influx of many people in the area, these cultures may be compromised. Owing to poverty levels in the area, school drop-out rates may also increase.

**Mitigation:**

- Employ Community Liaison Officers to keep communities informed prior to project mobilisation and on an ongoing, continual basis to ensure sensitization of the community and stakeholders *vis a vis* the project objectives, activities and scheduling, potential impacts;
- The communities should be informed well in advance of the start of the seismic survey operation and prior to execution along a specific seismic transect/location using appropriate wide-penetration communication media;
- Awareness campaigns can be undertaken to inform/educate both the local communities and project employees;
- During the seismic operations, disruption of livelihood activities in the area (section 4.4.6) should be avoided where possible otherwise minimized.
- Provision to be made to compensate local property and landowners for any loss or damage caused by seismic operations. Compensation rates to be agreed with Government department before operations commence.

### 7.3.14 Economic Characteristics

The infrastructure, especially roads within the project area is poor, hence some cut lines may be useful to the local communities as access roads after seismic survey is done. The proposed project will offer limited, short-term, unskilled and semi-skilled employment

opportunities to the locals. This may result in influx of people from other areas, and could lead to recruitment-related conflicts if not properly handled.

***Mitigation:***

- Liaise with local community leaders during the recruitment process;
- Employment policies to be strategically managed to avoid inter-community conflict and similar problems caused by migrant labourers;
- Unskilled and semi-skilled manpower to be sourced locally as far as possible;
- Gender should be factored into the employment criteria;
- Sustained public awareness and sensitization about the proposed project should be continued throughout the project lifespan.
- Consideration to be made to educate local populace on cash management in a low-cash culture.

The residual impacts in this instance would mostly be positive, including short-term employment opportunities and infrastructure improvements if access roads are designed in such a manner that they would be useful to the communities post-project.

### **7.3.15 Occupational Health and Safety**

During the seismic survey, the workers, visitors and the local community may be exposed to occupational and health hazards. Accidents between vehicles or vehicles and humans or wildlife may occur. Workers could also be exposed to other risks in the field, such as landslips, rock falls and topples, fires, and attacks from criminal elements.

***Mitigation:***

- All operations will be conducted in compliance with Tullow's EHS policy, international best practices and Kenya Government requirements (as set out in the Occupational Health and Safety Act and the Public Health Act; see also section 4.2.5 of this report);
- Appropriate and well-stocked first aid kits and fire fighting equipment should be available to all crew, and specific crew members should be trained on first aid administration and handling of fire fighting equipment (section 4.3.7);
- Job-specific personal protective equipment to be provided to the workers, training should be given, and their use made mandatory in designated areas (section 4.3.7);
- Environmental safety and health regulations and policies/plans must be adhered to (see sections 4.2.6 (Health Policy), 4.3.5 (Energy Act), 4.3.6 (Public Health Act), 4.3.10 (Local Government Act), 4.3.11 (Physical Planning Act), and 4.4 – NEMA Regulations);
- A Base Camp Clinic is to be provided, manned by suitably qualified field medical staff, licensed as appropriate to operate in-country, equipped with equipment and medication as appropriate, including ambulance vehicle(s);
- Adequate warning or cautionary signage will be posted as required;
- All electrical equipment shall be properly installed, earthed and regularly inspected, and where practicable will comply with IEE 17<sup>th</sup> edition regulations;
- Only properly trained and authorised employees shall operate equipment or machinery;
- Tullow driving policy and all other project-specific driving policies and journey management plans to be strictly adhered to and enforced.
- Provision of an Emergency Response Plan, Evacuation Plan, Medevac Plan, Malaria Management Plan and a communicable diseases education programme to be put in place.

No residual impacts are expected in this case.

### 7.3.16 Security and Public Safety

Security is a major concern especially for people living in Naipa, and along Kaputir to Kainuk, and other areas that have ill-defined boundaries between communities, primarily due to cattle rustling. During the project course, security may escalate due to free movement of people. The increase in human activity, including vehicle and seismic exploration activity, could increase the potential for human-related ignition of wild fires, bird hunting and other antisocial activities like shooting.

#### ***Mitigation:***

- Ensure that all workers can be identified by staff uniform and badges where applicable;
- Adequate security measures should be provided, e.g. perimeter fencing, safe havens and security manning at the campsites and whilst on line utilising Administration Police (APs) and Kenya Police Reservists (KPRs);
- The company should liaise with the Provincial Administration, the Kenya Police, KWS, Kenya Police Reservists and other agencies to provide adequate security during the seismic survey operation;
- Barriers and guards will be installed as necessary to protect employees and visitors from physical hazards and criminal activity;
- Camp population will be forbidden from interacting with the local populace;
- Camp will be located at a significant distance from any local communities;
- Journey management policy and monitoring to be enforced.
- No cooking on site and no fires other than at base camp; smoking will only be permitted in designated areas; no litter will be left on site; there will be no collecting of vegetation or firewood, and no hunting and trapping of wildlife; and vehicle speed will not exceed 40 km/h, with all vehicles fitted with vehicle tracking and monitoring systems.

A positive residual impact is the possibility that the involvement of government agencies during the project operations may enhance long-term security initiatives from the concerned parties, hence improving the security situation in the area.

**Table 7.2: Existing environmental pressures and potential impacts of onshore (land) project operations on environmental and social factors in the project area (see Chapter 3, section 3.2 for impact assessment criteria and rating).**

Parameter assessed		Pressures/Impacts	Intensity	Extent	Duration	Probability	Status	Degree of confidence	Significance of Potential Impacts without mitigation	Significance of Potential Impacts with mitigation
Physiography and Geology	Baseline (Pre-project)	<ul style="list-style-type: none"> <li>- Reduced river flows</li> <li>- Increased sedimentation in rivers</li> </ul>	Medium	Regional	Long term	Highly probable	Negative	High	High	low
	Project Operations	<ul style="list-style-type: none"> <li>- Cut lines leave long-lasting residual impacts (tracks, and/or scarring on surface landscape)</li> <li>- Vibrators/bulldozers and dynamite use near steep slopes may lead to minor landslips and rock topples</li> <li>-</li> </ul>	Low	Site-specific	Long-term	Highly probable	Negative	High	Medium	low
Soils	Baseline (Pre-project)	<ul style="list-style-type: none"> <li>- Livestock and wildlife grazing and soil compaction</li> <li>- Wind and water erosion</li> </ul>	Medium	Regional	Short-term	Highly probable	Negative	High	High	low
	Project Operations	<ul style="list-style-type: none"> <li>- Compaction of soft sediments in water-logged areas along cut lines</li> <li>- Disturbance of soil along cut lines</li> <li>- Cut lines may</li> </ul>	Medium	Site-specific	Long-term	Highly Probable	Negative	High	Medium	low

Parameter assessed		Pressures/Impacts	Intensity	Extent	Duration	Probability	Status	Degree of confidence	Significance of Potential Impacts without mitigation	Significance of Potential Impacts with mitigation
		enhance gulleying and erosion (wind and water) - Rutting in loose soils - Contamination of soils								
Air quality	Baseline (Pre-project)	- Dust generated by wind and enhanced by low vegetation cover - Offensive odours from point sources e.g. pit latrines and garbage dumps	Low  Low	Regional  Site-specific	Short-term  Short-term	Definite  Probable	Neutral  Negative	High  High		
	Project Operations	- Pollution from exhaust emissions - Fugitive dust generation from traffic - Offensive odours - Health risks	Low  Low	Local  Site-specific	Short-term  Short-term	Definite  Probable	Negative  Negative	High  High	Low  Low	Low
Surface and groundwater	Baseline (Pre-project)	- Freshwater shortage - Damming of rivers - Uneven distribution of resource - High demand for water resources	High	Regional	Permanent	Highly probable	Negative	Medium		



Parameter assessed		Pressures/Impacts	Intensity	Extent	Duration	Probability	Status	Degree of confidence	Significance of Potential Impacts without mitigation	Significance of Potential Impacts with mitigation
	Project Operations	<ul style="list-style-type: none"> <li>- Conflict with neighbouring communities if water source is shared</li> <li>- Compaction of near-surface aquifers such as springs, reducing yield</li> <li>- Downward draining of groundwater through drill holes, reducing yield at springs</li> </ul>	<p>Negligible</p> <p>Medium</p>	Site-specific to local ditto	<p>Short-term</p> <p>Permanent</p>	<p>Improbable</p> <p>Probable</p>	<p>Negative</p> <p>Negative</p>	<p>Medium</p> <p>High</p>	<p>Low</p> <p>Low</p>	Low
Water Quality	Baseline (Pre-project)	<ul style="list-style-type: none"> <li>- High sediment loads in rivers</li> <li>- Point-source pollution of springs and wells</li> </ul>	Low	Site-specific to local	Permanent	Probable	Negative	Medium		
	Project Operations	<ul style="list-style-type: none"> <li>- Contamination of water supply source for the camp</li> <li>- Contamination of underlying aquifers</li> </ul>	Low	Site-specific to local	Short-term	Improbable	Negative	Medium	Medium	Low
Terrestrial environment	Baseline (Pre-project)	<ul style="list-style-type: none"> <li>- Land degradation from overgrazing</li> <li>- Desertification</li> <li>- Frequent fires</li> <li>- Few wildlife's in unprotected areas</li> </ul>	Low	Regional	Permanent	Probable	Negative	High	Medium	Low

Parameter assessed		Pressures/Impacts	Intensity	Extent	Duration	Probability	Status	Degree of confidence	Significance of Potential Impacts without mitigation	Significance of Potential Impacts with mitigation
	Project Operations	<ul style="list-style-type: none"> <li>- Cutting of vegetation along cut lines</li> <li>- Disturbance of wildlife (physical presence and noise)</li> <li>- Introduced weeds and pests</li> </ul>	Medium Low Low	Local Local Local	Long-term Short-term Permanent	Probable Probable Improbable	Negative Negative Negative	Medium Medium High	Medium Medium Low	Low Low Low
Land resources and National Reserves	Baseline (Pre-project)	- Overgrazing	Medium	Regional/Local	Long-term	Probable	Negative	Medium		
	Project Operations	<ul style="list-style-type: none"> <li>- Cut lines affect pastoral resources</li> <li>- Disturbance of animals in National Parks</li> </ul>	Negligible Low	Site-specific Local	Long-term Short-term	Improbable Probable	Neutral Negative	High Medium	Low Low	Low
Archaeological, Historical and Cultural Sites	Baseline (Pre-project)	- Erosion	Low	Local	Long-term	Probable	Negative	Medium		
	Project Operations	<ul style="list-style-type: none"> <li>- Compaction by heavy vehicles and machinery may damage fossils and/or cultural artefacts buried in shallow soils</li> <li>- Vibrations and drilling of shot holes may disturb cultural sites</li> </ul>	Low	Site-specific	Permanent	Probable	Negative	Medium	High	Low
Visual aesthetics	Baseline (Pre-project)	- Land degradation	Low	Local	Long-term	Probable	Negative	Medium	Low	Low

Parameter assessed		Pressures/Impacts	Intensity	Extent	Duration	Probability	Status	Degree of confidence	Significance of Potential Impacts without mitigation	Significance of Potential Impacts with mitigation
	Project Operations	<ul style="list-style-type: none"> <li>- Poor campsite design does not blend in with the environment</li> <li>- Cut line footprints and vegetation cover removal lower aesthetic value of landscape</li> </ul>	Low  Low	Local  Site-specific	Short-term  Long-term	Probable  Probable	Negative  Negative	High  Medium	Medium  Medium	Low
Noise and vibrations	Baseline (Pre-project)	<ul style="list-style-type: none"> <li>- Noise from strong winds</li> <li>- Anthropogenic (but not excessive) noise localised in small towns and centres</li> </ul>	Low	Local	Permanent	Definite	Neutral	High		
	Project Operations	<ul style="list-style-type: none"> <li>- Disturbance to humans, animals and livestock</li> <li>- Disturbance to workers</li> <li>- Health risks</li> </ul>	Low	Local	Short-term	Definite	Negative	High	Medium	Low
Liquid and Solid Wastes	Baseline (Pre-project)	<ul style="list-style-type: none"> <li>- Poor liquid and solid waste management in town centres</li> </ul>	Low	Local	Short- to long-term	Probable	Negative	High		
	Project Operations	<ul style="list-style-type: none"> <li>- Pollution of surface soils, waters and groundwater's</li> <li>- Offensive odours</li> <li>- Health risks</li> </ul>	Low	Local	Short-term	Probable	Negative	Medium	Medium	Low

Parameter assessed		Pressures/Impacts	Intensity	Extent	Duration	Probability	Status	Degree of confidence	Significance of Potential Impacts without mitigation	Significance of Potential Impacts with mitigation
Social Characteristics	Baseline (Pre-project)	<ul style="list-style-type: none"> <li>- Low education levels</li> <li>- Low literacy levels</li> <li>- Few health facilities (inadequate, understaffed and under-equipped)</li> </ul>	High	Regional	Long-term	Definite	Negative	High		
	Project Operations	<ul style="list-style-type: none"> <li>- Possible increase in crime and sexual immoralities</li> <li>- Possible increase in number of students dropping out of school in search of jobs</li> <li>- Erosion of culture and social values as a result of intercultural association</li> <li>- May interfere with grazing lands and watering points</li> </ul>	Low	Local	Short-term	Probable	Negative	Medium	Medium	Low
Economic factors	Baseline (Pre-project)	<ul style="list-style-type: none"> <li>- Few job opportunities</li> <li>- Poor access to markets</li> <li>- Slow economic growth rate</li> </ul>	High	Regional	Long-term	Definite	Negative	High	Medium	Low
	Project Operations	<ul style="list-style-type: none"> <li>- Improved livelihood</li> <li>- Improved short-term business opportunities for the locals</li> </ul>	Medium	Regional	Short-term  Long-term	Probable	Positive	High	Medium	Low

Parameter assessed		Pressures/Impacts	Intensity	Extent	Duration	Probability	Status	Degree of confidence	Significance of Potential Impacts without mitigation	Significance of Potential Impacts with mitigation
		- Potential CSR project benefits								
Occupational Health and Safety	Baseline (Pre-project)	- Low occupational health and safety issues	Low	Local	Short-term	Probable	Negative	High		
	Project Operations	- Injuries to workers, visitors and area residents arising from project operations - Fire hazard - Other health risks	Low	Site-specific	Short-term	Improbable	Negative	High	High	Low
Security and public safety	Baseline (Pre-project)	- Frequent cattle rustling - Illegal guns - Resource conflicts	High	Regional	Long-term	Highly probable	Negative	High		
	Project Operations	- Improvement in security due to security enhancement for project activities	High	Local	Short-term	Probable	Positive	Medium	Low	Nil



## 7.4 CUMULATIVE IMPACTS IN THE PROJECT AREA

Cumulative impacts are those impacts which result from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions. The impact on geology and soil resources can be accurately characterised and for the most part mitigated through the proposed line preparation activity using bulldozers and mulchers where necessary, which help to preserve their stability, and significantly raise the probability of regenerating the indigenous vegetation *in situ* from the existing seed base. In addition, potentially enhanced erosion from cut lines and access roads construction at site-specific areas such as where pre-existing gully formation has been determined can be mitigated by good cut line and access road design so that these constructs will not interact cumulatively with natural processes to enhance erosion.

The cumulative impacts on the biodiversity of the area are considered insignificant. The temporary modification of, at most, 0.05% of the land area (see section 5.2.9) to permit the conduct of the seismic survey is considered a minor impact due to the commonality and widespread nature of the vegetation across the region. The vegetation is recognized as being sensitive to disturbance due to the harsh climatic setting and poor soils. The direct impact of the activity on threatened species of fauna is considered insignificant as the wildlife species identified have large and protected ranges in the Nasolot National Park and South Turkana National Reserve, both of which lie mostly outside the southern sector of the project area. The scale of fugitive particulate material generation and their impacts on the surrounding environment is generally negligible, particularly because the naturally strong winds have a much greater impact in this regard. Adequate mitigation measures are, however, available during the operations phase to limit the generation of dust in the localised area and where the activity creates greater than normal levels of traffic.

Positive cumulative benefits for the local business community are an expected result of the proposed activity with the planning and construction phases utilising a range of local professional service providers. Semi-skilled workers who may be employed in the project will likely acquire new and lifelong skills that may prove useful in other sectors of the Kenyan economy. It is not expected that communities will be moved from the areas they are staying and thus no long term/ indirect impacts.

## 7.5 SIGNIFICANCE OF IMPACTS

The seismic survey will utilise state-of-the-art equipment and experienced personnel to carry out the work. They will also adhere to the international best practices regulations of OGP and IAGC and the applicable national legislation and regulations. As mentioned earlier, seismic survey operations are regarded, from an industry standpoint, as being of a small scale in both effort and the time to be taken to complete. In addition the majority of operations will be conducted a long distance away from any habitation, town or workplace so that the inhabitants will be largely insulated. The short-term duration (3 months) of seismic survey activity and of impacts will result in negligible cumulative impacts for most environmental and social factors, and no long-term cumulative impacts following cessation of the proposed seismic survey project. Overall, the impacts of the proposed project are classified as “low” (see section 3.5). The relationship between the significance rating and decision-making is also classified as “low” (see section 3.5), provided that the recommended measures to mitigate the impacts are implemented.

## **CHAPTER 8:**

### **ENVIRONMENTAL MANAGEMENT PLAN**

#### **8.1 INTRODUCTION**

The environmental and social aspects identified in this impact study concerns in the EIA must be properly managed. The tool for achieving this is the incorporation of an Environmental Management Plan (EMP) into the EIA to ensure adherence and future compliance with legislation, good environmental performance, and integration of environmental issues into the project decision. The EMP provides the means of assessing the accuracy of the predicted project impacts and the monitoring of the effectiveness of the proposed mitigation measures contained in the EIA study report. The EMP should therefore indicate how the environmental concerns highlighted in the EIA would be managed. TKBV will monitor the implementation of key contractor parties and assess compliance with the provisions of the EMP through its contractual mechanisms and management.

TKBV is committed to provide resources essential to the implementation of the EMP. The EMP outlined below provides all the details of project activities, impacts, mitigation measures, time schedules, responsibilities and commitments proposed to minimize environmental and social impacts of the project, and includes monitoring and evaluation for the implementation, operational and decommissioning phases of the project.

TKBV is also committed to identifying and mitigating against any environmental and/or social aspects which may arise during the project implementation which may have not been identified during the study.

#### **8.2 OBJECTIVES OF THE EMP**

The objectives of the EMP are to:

- Adhere and address necessary legal frameworks and other requirements;
- Promote environmental management and communicate the aims and goals of the project EMP to all stakeholders;
- Incorporate environmental management into project design and operating procedures;
- Ensure all workers, contractors, sub-contractors and others involved in the project meet all legal and institutional requirements with regard to environmental management;
- Address issues and concerns raised in the project stakeholders' consultation process;
- Serve as an action plan for environmental management;
- Provide a framework for implementing commitments of the project (i.e. mitigation measures identified in the EIA);
- Prepare and maintain records of project environmental performance (i.e. monitoring, audits and compliance tracking); and
- Prepare an environmental monitoring plan whose aim is to ensure that the negative environmental impacts identified in this Chapter 7 of this EIA are effectively mitigated by way of design, construction, operational and decommissioning stages of the project.

### 8.3 PROJECT DESCRIPTION

TKBV will acquire 1055 km of 2D seismic data over a projected time period of eight to twelve weeks, beginning in October 2011. Line clearance along the pre-determined and pre-surveyed transects on land will be done by use of bulldozers and mulchers, and where access roads are required, by bulldozers. Support vehicles such as for personnel movement, carrying of data recording equipment, etc., will be available. The workforce, who will reside in a fully equipped base camp, will be between 100 and 150 in number. The health and safety of the crew and the general public at large will be ensured by the company complying both with the relevant national legislation, its own in-house environmental health and safety (EHS) policies which embrace the international best practices for such activities, and this EMP. A close working relationship will be fostered with the local communities, and as far as is practicable, unskilled and semi-skilled workers shall be recruited locally.

### 8.4 APPLICABLE LEGISLATION AND REGULATIONS

The spectrum of legislation and regulations that apply to the seismic survey project has been detailed in Chapter 4. Some of the key legislation that relate to the activity are the:

- Environmental Management and Co-ordination Act, 1999 and associated regulations and guidelines;
- Petroleum (Exploration and Production) Act, Cap. 308;
- Energy Act, No. 12 of 2006;
- Explosives Act, Cap. 115;
- Wildlife (Conservation and Management) Act, Cap. 376;
- National Museums and Heritage Act, Cap. 216;
- Water Act, Cap. 372;
- Occupational Safety and Health Act, No. 15 of 2007.

### 8.5 TULLOW POLICIES AND PROCEDURES

Tullow has two key policies that relate to this activity, namely, the Environmental, Health and Safety (EHS) Policy, and the Corporate Social Responsibility Policy (CSR). Through its EHS policy, Tullow commits to high standards of environmental, health and safety, and aims to conduct its business operations to the best industry standards under its CSR policy as described in chapter 2 (section 2.4.7).

### 8.6 ROLES, RESPONSIBILITIES AND TRAINING

TKBV will be responsible for the overall implementation, monitoring and quality assurance/quality control of this EMP. It will be responsible for ensuring that the policies, management plans and actions to be implemented to avoid, reduce, mitigate, or compensate for adverse environmental and social impacts are adhered to. TKBV shall develop a clear command chain framework for employee responsibilities, reporting and incident management, and shall ensure that all employees understand it.

TKBV will sub-contract the project to a seismic survey company to undertake the survey. In such a case, the contractor will be responsible for the implementation and monitoring of the EMP in their related work contract activity (and this condition should be built into the terms of reference for tendered work and the contract document). The contractor will also be responsible

for the occupational health and safety of the workers and others who may be carrying out both related and un-related activities within and around the work sites. TKBV will be responsible for periodic environmental inspections of the work and camp sites in general. The contractors will also be responsible for implementing corrective actions that may be required by TKBV as a result of these inspections.

TKBV will train its employees in order to equip them to carry out their duties under the scope of the EMP. Contractors will likewise be required to do the same for their employees and in relation to the work component that they have been given to carry out (see the EMP below). The workers shall be regularly informed on, and assessed for, their understanding of the various policies and plans that relate to their work environment. TKBV will constitute a competent and effective workforce, taking into account the skills required for each work component, and giving priority to local workers for employment opportunities in the semi-skilled and unskilled work categories. Suitable training and skill transfer will be provided, where required.

Specific training requirements are mentioned under the relevant sections of the EMP below.

## **8.7 COMMUNICATION WITH STAKEHOLDERS AND GRIEVANCE MECHANISM**

TKBV will develop and maintain a formal procedure for communication with various stakeholders to inform on the various stages of project activities, as well as to receive their views and concerns, if any. TKBV should maintain a written register of its interactions and discussions with the various stakeholders so that issues that require to be followed up are clear and well-understood, and the outputs can be assessed.

TKBV will also establish a grievance mechanism to handle complaints from the stakeholders/residents of the area, as well as for its own and contracted workers. This mechanism will also include procedures for assessing any project-related damages to persons and properties and levels of compensation. Such a mechanism will be best established in consultation with officials from Government (Ministry of Energy, Community Leaders, and Stakeholder Group Representatives).

## **8.8 AUDITING**

It is a requirement by law that any project activity being undertaken be audited after every year. The seismic survey is, however, of a much shorter duration. Auditing will, therefore, be done upon completion of the project activities. The auditing to be undertaken at the end of the project is to ensure that the project adhered to the EMP as outline in this project report and that corrective measures were put in place in cases where impacts were identified. If the audit findings indicate that there are impacts that were not corrected, then the proponent will be required by NEMA to undertake such corrective measures before the Authority signs off the project.

Besides the regulatory framework, TKBV will conduct regular internal audits covering all aspects of the EMP during the course of the project operations. The audits shall be performed by qualified staff and communicated to TKBV's relevant departments and NEMA.

Qualified staff' would be a local or foreign EIA individual or a firm of experts registered as such with the National Environment Management Authority under Regulation 14 of the Environmental (Impact Assessment and Audit) Regulations, 2003. However, under Regulation 34, if the project proponent's EIA report has been approved by the Authority, or after an initial audit of an ongoing

project has been done, that proponent may thereafter self-audit regularly, ensuring that the criteria used to audit is based on the EMP developed during the EIA process or after the initial audit. The audit report is submitted to the Authority. The Authority is responsible for carrying out environmental audits and monitoring of these activities through an environmental inspector appointed under the Act (EMCA, section 68)

## **8.9 THE ENVIRONMENTAL (AND SOCIAL) MANAGEMENT PLAN (EMP) FOR THE SEISMIC SURVEY**

The EMP for the onshore survey addresses the following components that relate to the seismic survey:

- Physiography and Geology
- Soils
- Air Quality
- Surface and Groundwater Resources
- Water Quality
- Terrestrial Environment (Habitats, Flora, and Fauna)
- Land Resources and National Parks
- Archaeological, Historical and Cultural Sites
- Visual Aesthetics
- Noise and Vibrations
- Solid and Liquid Wastes
- Social Characteristics
- Economic Characteristics
- Occupational Health and Safety
- Security and Public Safety

The structure of the Environmental Management Plan adopted for each of the environmental and social components addressed in it (below) is as follows:

1. Potential Impacts and Mitigations – These outline the impacts and mitigations that have been identified and that are peculiar to the project area (see Chapter 7);
2. Identification of Desired Outcomes, Objective Indicators, and Monitoring – The Desired Outcomes reflect what the project proponent and stakeholders would like to see once the operation has been completed. The Objective Indicators indicate how the Desired Outcomes can be measured, and their success determined (either qualitatively, quantitatively, or both). The Monitoring aspect is based on assessment of project operations *vis à vis* the Objective Indicators and the Desired Outcome;
3. Responsibilities and Management.

In each and every component of the EMP, the Tullow EHS and CSR policies that are outlined in Chapter 4 apply. Other additional relevant plans (whose frameworks are outlined in later sections of this EMP and that TKBV will need to tailor to fit into its work ethic and culture) are indicated under the applicable EMP component(s).

### **8.9.1 Physiography and Geology**

The impact sources from the project operations will include the Vibroseis and associated equipment, bulldozer and dynamite charges.



Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>▪ Cut lines leave long-lasting residual impacts (tracks, and/or scarring on surface rocks)</li> <li>▪ Vibrators/bulldozers and dynamite use near steep slopes may lead to minor landslips and rock topples</li> </ul>	<ul style="list-style-type: none"> <li>▪ Use existing access roads to the extent possible;</li> <li>▪ Pre-survey possible access routes, and use the selected routes rather than accessing work sites through free-ranging driving across the open country</li> <li>▪ Explosives (dynamite) should be used as source instead of Vibroseis in hilly areas with steep slopes, and other areas with highly incised and gullied surfaces (sections 4.3.3 and 4.3.4);</li> <li>▪ When laying cut lines, off-road driving should be discouraged to avoid creating unnecessary tracks and trampling of pasture;</li> <li>▪ Minimise, to the extent possible, the use of bulldozers to open up cut lines and access roads to minimise rocky landscape scarring;</li> <li>▪ Avoid cut lines on slopes steeper than 40° to minimise risk of landslips and rock topples;</li> <li>▪ Optimise source energy to achieve the survey objectives to minimise risk of landslips and rock topples;</li> <li>▪ Buffer zones should be established and maintained from areas posing landslide and topple hazards.</li> <li>▪ No cooking on site and no fires other than at camp site; smoking will only be permitted in designated areas; no litter will be left on site; there will be no collecting of vegetation or firewood, and no hunting and trapping of wildlife; and vehicle speed will not exceed 40 km an hour, with all vehicles fitted with vehicle tracking and monitoring systems.</li> </ul>

### ***Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation***

Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>▪ Residual impacts of cut lines minimized to the extent possible</li> <li>▪ Landslips and rock topples do not occur</li> </ul>	<ul style="list-style-type: none"> <li>▪ 100% of seismic cut lines pre-surveyed on the ground</li> <li>▪ Actions taken to minimise cut line impacts are recorded</li> <li>▪ No project-related landslips or rock topples recorded</li> </ul>	<ul style="list-style-type: none"> <li>▪ During seismic operations</li> </ul>	<ul style="list-style-type: none"> <li>▪ The Seismic contractor will be responsible for the day-to-day monitoring and management, and will report to the Tullow Oil EHS Supervisor and the TKBV EHS Manager on a daily and weekly basis, or immediately in case of an incident occurring.</li> </ul>	Low

The following will be observed in the field: there will be no cooking on site and no fires other than at campsite; smoking will only be permitted in designated areas; no litter will be left on site; there will be no collecting of vegetation or firewood, and no hunting and trapping of wildlife; and vehicle speed will not exceed 40 km an hour, with all vehicles fitted with vehicle tracking and monitoring systems.

## 8.9.2 Soils

The impact sources from the project operations will include Vibroseis and associated equipment, bulldozer, and transport vehicles. Other sources will be oil leaks from vehicles, machinery, garage and storage areas.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>Compaction of degraded soils along cutlines</li> <li>Disturbance of soil along cut lines</li> <li>Cut lines may enhance gulleying and erosion (wind and water)</li> <li>Rutting in loose soils</li> <li>Contamination of soils</li> </ul>	<ul style="list-style-type: none"> <li>Machinery and equipment should use existing routes as much as is practicable to avoid compaction of the surface soil (section 4.4.5);</li> <li>Construct drainage channels on cut lines where natural drainage may be affected;</li> <li>Turkwel River should be crossed only at the existing road crossing;</li> <li>Luggas should be crossed at road crossings, where such crossings exist, or in areas where the bank heights are less than 1m – banks at the lugga crossings should be mechanically restored where seismic activities have affected them;</li> <li>Vehicles should steer away from natural drains and waterways as is practicable, but a buffer zone should be maintained except at crossing points;</li> <li>Minimize vegetation and grassland clearance as much as possible when cutting the survey line transects (section 4.4.5);</li> <li>Seismic survey should aim to be carried out as far as possible during dry periods;</li> <li>Use only essential vehicles and low pressure/low impact tyres in areas with wet soils or that are susceptible to ponding or are prone to erosion;</li> <li>Ensure that all vehicles and machinery operating in the field and in the campsite are properly maintained so as not to have oil leaks that could contaminate the soils (section 4.3.7);</li> <li>Ensure that any in-field refuelling or maintenance is performed while using a drip tray with a spill-kit available;</li> <li>All fuels and other non-aqueous fluids to be stored in suitable bunded enclosures;</li> <li>Ensure that all drivers and technicians are familiar with drip-tray and spill-kit use through daily tool-box talks; and</li> <li>Installation and proper management of camp sanitation facilities.</li> <li>Line surveyors to keep a record of any and all hazards encountered eg wet/soft ground, and to inform seismic operatives of these.</li> </ul>

<b><i>Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation</i></b>				
Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>Minimal, (if any) , compaction of soft sediments where applicable</li> <li>Minimal disturbance of soils along cut</li> </ul>	<ul style="list-style-type: none"> <li>Maintain inventory on length of wet/dry patches encountered along the survey routes</li> </ul>	<ul style="list-style-type: none"> <li>Continuous during survey</li> <li>Continuous during survey,</li> <li>One time assessment and site</li> </ul>	<ul style="list-style-type: none"> <li>Seismic contractor will be responsible for the day-to-day monitoring and management, and will report to the TKBV EHS supervisor and the TKBV EHS Manager on a daily and weekly basis, or immediately in case of an</li> </ul>	Low

lines	<ul style="list-style-type: none"> <li>Zero spillage of oils/chemicals. Incidents of spillage type and amount recorded and georeferenced</li> </ul>	selection <ul style="list-style-type: none"> <li>All incidents to be reported immediately to the Seismic QC Representative</li> </ul>	incident occurring.	
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### 8.9.3 Air Quality

The impact sources from the project operations will include vehicles and machinery, sanitary systems and waste disposal points.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>Pollution from exhaust emissions;</li> <li>Fugitive dust-generation from traffic;</li> <li>Offensive odours;</li> <li>Health risks.</li> </ul>	<ul style="list-style-type: none"> <li>Limit traffic speed and restrict movement of vehicles as is reasonable to minimize dust generation;</li> <li>Field vehicles, trucks and any other machinery should be switched off when not in use;</li> <li>Regular servicing of all trucks, service vehicles, and any other machinery powered using fossil fuels to ensure efficient combustion and minimisation of exhaust emissions (section 4.4.8);</li> <li>Use low sulphur fuels if available and where suitable;</li> <li>Employees working in dusty conditions must use appropriate PPE;</li> <li>If litter is to be burned, it should be done at a time of low wind movement, and preferably in areas shielded from wind by vegetation;</li> <li>Installation and proper management of camp sanitation facilities.</li> </ul>

<i>Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation</i>				
Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>Minimal pollution from exhaust emissions</li> <li>Minimal dust generation from traffic</li> <li>No offensive odours</li> <li>No health risks</li> </ul>	<ul style="list-style-type: none"> <li>Use of low sulphur versus other fuels wherever possible</li> <li>Adherence to equipment maintenance schedule</li> <li>Set speed limits are not exceeded (record exceedence incidents)</li> <li>No offensive odours recorded</li> </ul>	<ul style="list-style-type: none"> <li>Malfunctioning equipment removed immediately from operations for repair</li> <li>Speed limit violations based on speed-tracking devices in vehicles, monitored at base camp</li> <li>Regular inspection of sanitary</li> </ul>	<ul style="list-style-type: none"> <li>The Seismic contractor will be responsible for the day-to-day monitoring and management of air quality issues in the field, and around the campsite. The EHS representative will liaise with the Seismic QC representative on site on any issues arising and will report to the Tullow Oil Seismic Operations Supervisor and the TKBV EHS Manager on a daily and weekly basis, and will immediately report on health risk incidents.</li> </ul>	Low

	<ul style="list-style-type: none"> <li>No violation of OHS requirements for dust impact mitigation (violations recorded).</li> </ul>	facilities and waste disposal points <ul style="list-style-type: none"> <li>Regular checks on use of PPE</li> </ul>		
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#### 8.9.4 Surface and Groundwater Resources

The impact sources from the project operations will include water supply source for the camp, heavy vehicles and machinery, and drilling of shot holes.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>Conflict with neighbouring communities if water source is shared</li> <li>Compaction of near-surface aquifers such as springs, reducing yield</li> <li>Downward draining of groundwater through drill holes, reducing yield at springs</li> </ul>	<ul style="list-style-type: none"> <li>A water supply borehole should be drilled to provide the water required for the project; this could be donated to the community on completion of the seismic survey;</li> <li>It is recommended that an efficient water-use policy be adopted by the project proponent at the camp site and other work areas (section 4.4.3);</li> <li>An efficient sanitation system should be put in place in the campsite(s) to handle effluents (section.4.3.8);</li> <li>Hazardous and toxic waste material should be managed according to international protocols and best practices and in comppliance with Kenyan legislation, specifically the Environment Management and Coordination (Waste Management) Regulations;</li> <li>Buffer zone distances between seismic lines and water sources will be established through extensive in-field ground vibration testing. Distances may vary between seismic source types, as per IAGC Guidelines.</li> <li>When water is encountered during shot hole drilling, bentonite, or a tapered concrete (or other suitable material widely accepted in the industry), can be used to plug the hole up to 3m above the static water level or to a depth of 1m from the ground surface;</li> <li>Ensure that any in-field refuelling or maintenance is performed while using a drip tray with a spill-kit available;</li> <li>Ensure that all drivers and technicians are familiar with drip-tray and spill-kit use through daily tool-box talks.</li> </ul>

<b><i>Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation</i></b>				
<b>Desired Outcomes</b>	<b>Objective Indicators</b>	<b>Monitoring</b>	<b>Responsibility and Management</b>	<b>Risk with mitigation (High, Medium or Low)</b>
<ul style="list-style-type: none"> <li>▪ No conflict over water use with neighbouring communities</li> <li>▪ No compaction of near surface aquifers</li> <li>▪ No downward draining of groundwater through drill holes</li> </ul>	<ul style="list-style-type: none"> <li>▪ TKBV has its own water borehole or other independent water source</li> <li>▪ Identification of nearby springs and wells along cut lines during line survey exercise</li> <li>▪ No violation of buffer zone limits around groundwater sources</li> <li>▪ Identification of nearby springs and wells along cut lines during line survey exercise</li> <li>▪ No violation of buffer zone limits around groundwater sources</li> <li>▪ Inventory of drill hole plugging maintained</li> </ul>	<ul style="list-style-type: none"> <li>▪ Not applicable</li> <li>▪ Continuous, during line survey</li> <li>▪ Compliance with buffer zone requirements</li> <li>▪ Continuous, during line survey</li> <li>▪ Compliance with buffer zone requirements</li> <li>▪ Per drill hole site</li> </ul>	<ul style="list-style-type: none"> <li>▪ The seismic contractor will be responsible for the day-to-day monitoring and management of surface and groundwater resource issues in the field, and around the campsite. The EHS representative will liaise with the Seismic QC representative on any issues arising and will report to the Tullow Oil Seismic Operations Supervisor and the TKBV EHS Manager on a daily and weekly basis, and will immediately report on incidents of concern.</li> <li>▪ TKBV will seek authority from the local council to drill a water borehole. Once approval is obtained, site selection for the borehole will be done with inputs from a registered hydrogeologist. The hydrogeological report will be done in accordance with the legislation and regulations that relate to the Water Act 2002, and will be submitted to the Water Resources Management Authority (WRMA) sub-regional office in Nakuru. WRMA will then approve the report and issue a drilling permit.</li> </ul>	Low

### 8.9.5 Water Quality

The impact sources from the project operations will include: liquid effluent discharges from sanitation systems at the campsite; oil or chemical leaks from garage and storage areas; vehicles and machinery operating in the camp and field; and subsurface detonation of dynamite charges during the field survey.



Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>Contamination of water supply source for the camp</li> <li>Contamination of underlying aquifers</li> </ul>	<ul style="list-style-type: none"> <li>Refuelling areas must be underlain with spill-proof hard standing or bund, with spill-kits readily available and operatives trained in their use;</li> <li>All fuels and other non-aqueous fluids to be stored in suitable bunded enclosures;</li> <li>All refuelling operations to be carefully overseen and managed;</li> <li>Pits for disposal of domestic and sanitary effluents should be sited with knowledge of the geological and soil characteristics of the area;</li> <li>Buffer zone distances between seismic lines and water sources will be established through extensive in-field ground vibration testing. Distances may vary between seismic source types, as per IAGC Guidelines;</li> <li>Spill-kits to be carried with vibro truck service vehicle, refuelling bowser vehicles, drill crews. All staff to be briefed on use of these;</li> <li>When water is encountered during shot hole drilling, bentonite or a tapered concrete plug may be used to plug the hole up to 3m above the static water level or to a depth of 1m from the ground surface;</li> <li>Ensure that all vehicles and machinery operating in the field (and in the campsite) are properly maintained so as not to have any oil leaks that could contaminate the soils (section 4.3.7);</li> <li>Ensure that any in-field refuelling or maintenance is performed in a bunded area or while using a drip tray with a spill-kit available;</li> <li>Ensure that all drivers and technicians are familiar with drip-tray and spill-kit use through daily tool-box talks.</li> </ul>

***Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation***

Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>No contamination of water supply source for the camp</li> <li>No contamination of underlying aquifers in the project area</li> </ul>	<ul style="list-style-type: none"> <li>Camp water supply source is fit for human consumption</li> <li>Camp water supply source is protected</li> <li>Zero spillage of chemicals and hazardous material on soils that may lead to surface/ groundwater pollution</li> <li>Waste pits and landfills are professionally sited</li> <li>Buffer zones are observed</li> </ul>	<ul style="list-style-type: none"> <li>Physico-chemical and microbiological testing regularly.</li> <li>Casing and cementing of borehole and wellhead area</li> <li>Protocols for and conditions of oils and chemicals storage at the camp are adhered to</li> <li>Compliance with buffer zone requirements</li> </ul>	<ul style="list-style-type: none"> <li>The Seismic contractor will be responsible for regular monitoring and management of surface and groundwater resource issues in the field, and around the campsite. The EHS representative will liaise with the Seismic QC Representative on any issues arising and will report to the Tullow Oil Seismic Operations Supervisor and the TKBV EHS Manager on a daily and weekly basis, and will immediately report on incidents of concern.</li> </ul>	Low

### 8.9.6 Terrestrial Environment (Habitats, Flora, and Fauna)

The impact sources from the project operations will include: Vibroseis and associated equipment, mulchers, bulldozer and transport vehicles, and physical presence of the workforce.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>▪ Cutting of vegetation along cut lines</li> <li>▪ Disturbance of wildlife (physical presence and noise)</li> <li>▪ Introduced weeds and pests</li> </ul>	<ul style="list-style-type: none"> <li>▪ The mitigations related to soils (see above) apply;</li> <li>▪ Trees with trunk diameter greater than 20cm should not be cut;</li> <li>▪ Seismic survey activities to be undertaken during daylight hours only;</li> <li>▪ Liaise with the Kenya Wildlife Service (KWS) to ensure that wildlife disturbance and danger to the seismic team is mitigated in and around the National Reserves in the south. Any planned lines that are considered to be a threat will be relocated;</li> <li>▪ Hunting, fishing, trapping and gathering of food resources by workers, when on and off duty should be strictly prohibited. All workers to be briefed regularly on this issue;</li> <li>▪ The risk of introduction of weed and pests species to the region via contaminated vehicles and equipment will be mitigated by the wash-down of all vehicles and ancillary equipment at a designated location prior to the commencement of the survey.</li> </ul>

#### *Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation*

Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>▪ Minimal cutting of vegetation along cut line</li> <li>▪ Minimal disturbance of wildlife</li> <li>▪ No weeds or pests introduced into the area</li> </ul>	<ul style="list-style-type: none"> <li>▪ Length of line where no cutting is required versus length of line where mulcher is used</li> <li>▪ Number of wildlife encounters and actions taken recorded</li> <li>▪ All equipment and vehicles are washed down and bio fouling removed before being taken to the project area</li> </ul>	<ul style="list-style-type: none"> <li>▪ Continuous, during line preparation</li> <li>▪ Continuous, during line preparation</li> <li>▪ Daily</li> <li>▪ Inspection and certification of the cleaning action</li> </ul>	<ul style="list-style-type: none"> <li>▪ Close liaison will be maintained with the Kenyan Wildlife Service who can advise the Seismic QC Representative on a day-to-day basis. Access to areas where wildlife is protected, permissions will have to be sought to gain access. Wildlife shall have the right of way when they are of such a size that they can be readily seen from vehicles. Hunting and feeding of wildlife shall be strictly prohibited. In wildlife areas, access roads will be used as much as possible. Employees should be made aware of the wildlife-sensitive locations.</li> </ul>	Low

### 8.9.7 Aquatic Environment (Habitats, Flora, and Fauna)

The impact sources from the project operations will include Vibroseis and associated equipment, bulldozer, and transport vehicles, particularly at river/lugga crossings and work taking place close to the rivers and luggas. Other sources will be oil or chemical leaks from vehicles, machinery, garage and storage areas, and use of a non-sanitised vehicles and equipment that have previously been used in a different environment.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>Disturbance of aquatic animals and habitats</li> <li>Physical interference with crocodile and bird-breeding sites</li> <li>Pollution of habitats</li> <li>Introduction of exotic aquatic species</li> </ul>	<ul style="list-style-type: none"> <li>Mitigation for soils (section 7.3.2) vegetation (section 7.3.6) and noise and vibrations (section 7.3.11) apply;</li> <li>Carry out vehicle cleaning to remove biofouling prior to departure from areas with known or potential invasive species.</li> </ul>

<i>Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation</i>				
Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>No disturbance of aquatic animals and benthic habitats</li> <li>No interference with breeding sites and birds nests</li> <li>No pollution of habitats</li> <li>No exotic aquatic species introduced</li> </ul>	<ul style="list-style-type: none"> <li>Noise and vibration levels optimised</li> <li>Rivers/luggas crossed at designated points</li> <li>No breeding sites and birds nests are interfered with</li> <li>Vehicles and equipment are cleaned prior to commencement of operations as indicated in mitigations above</li> </ul>	<ul style="list-style-type: none"> <li>Monitoring to minimise disturbance</li> <li>Inspections during work, continuous monitoring</li> <li>Monitoring to ensure that such sites are avoided</li> <li>Ensure that vehicles/equipment are in proper working condition</li> <li>Inspection to certify that vehicles and equipment are properly cleaned</li> </ul>	<ul style="list-style-type: none"> <li>The Seismic contractor shall be responsible for ensuring that the aquatic environment is not, or only minimally, disturbed. He/she shall be responsible for ensuring that all the mitigation measures specified above are implemented. An EHS officer shall be responsible for ensuring that occupational health and safety protocols are strictly implemented and reported to TKBV.</li> </ul>	Low

### 8.9.8 Land Resources and National Reserves

The impact sources from the project operations will include: Vibroseis, mulchers and associated equipment, dynamite shots, vehicles, and presence of humans.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>▪ Cut lines affect pastoral resources</li> <li>▪ Disturbance of animals in National Parks</li> </ul>	<ul style="list-style-type: none"> <li>▪ As for sections 8.9.1 (Physiography and Geology), 8.9.2 (Soils), 8.9.6 (Terrestrial Environment) and 8.9.7 (Aquatic Environment) above.</li> </ul>

<b><i>Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation</i></b>				
Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>▪ Animal encounters minimised</li> <li>▪ Pastoralist activities are only minimally disrupted</li> <li>▪ Other desired outcomes relate to the following sections: Soils (8.9.2), Terrestrial Environment (8.9.6)</li> </ul>	<ul style="list-style-type: none"> <li>▪ No animal encounters recorded</li> <li>▪ No complaints from pastoralists</li> <li>▪ Objective indicators for Soils and Terrestrial Environment are met</li> </ul>	<ul style="list-style-type: none"> <li>▪ Monitoring of animal presence along survey routes</li> <li>▪ Information outflow to the affected communities on seismic line survey schedules and exclusion time periods</li> <li>▪ Adhering to the use of existing routes and road network</li> <li>▪ Enforcing policy against hunting and gathering through training and direct supervision where applicable</li> </ul>	<ul style="list-style-type: none"> <li>▪ Supervisors should ensure that (i) unnecessary incursions into park areas are avoided and (ii) hunting animals and gathering of indigenous roots/berries or other edible plant material while undertaking the project should be prohibited. An effective liaison with the Kenya Wildlife Service field staff will be established, and will involve KWS personnel in the areas within the jurisdiction of the institution, but can be extended outside this scope. The Seismic QC Representative will be in charge of this. All workers will be regularly briefed on this issue.</li> </ul>	Low

### 8.9.9 Archaeological, Historical and Cultural Sites

The impact sources from the project operations will include: Vibroseis and associated equipment, vehicles and dynamite shots.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>Compaction by heavy vehicles and machinery may damage soils and rocks in cultural sites</li> <li>Vibrations and drilling of shot holes may disturb/break up rocks and material at sacred/burial sites</li> </ul>	<ul style="list-style-type: none"> <li>Use of shot points rather than Vibroseis is recommended for such areas;</li> <li>Seismic survey lines will not be planned to go through known cultural sites (section 4.4.4);</li> <li>Consultations should be undertaken with local elders to help in identifying and avoiding any sensitive cultural sites during the survey in order to prevent conflict with the community;</li> <li>Access routes and cut lines will be selected to provide sufficient offset to known cultural sites to avoid disturbing them: these offsets shall be determined in consultation with area leaders;</li> <li>All such sites will be flagged for avoidance (sections 4.3.2; 4.4.4);</li> <li>If archaeological materials are found during the operations, the location will be noted, they should be left undisturbed, and the National Museums of Kenya personnel should be contacted to advise further on how to proceed;</li> <li>All project field workers must be informed, before commencement of operations, that any disturbance to, defacement of, or removal of archaeological, historical, or sacred material will not be permitted.</li> </ul>

<b><i>Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation</i></b>				
Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>Negligible interference, if any, with the archaeological, historical and cultural sites</li> <li>Desired Outcomes for Soils (section 8.9.2) apply</li> </ul>	<ul style="list-style-type: none"> <li>No violations of buffer zone restrictions</li> <li>The sites are flagged for avoidance</li> <li>Archaeologist from NMK on site with the field team when carrying out work in archaeological areas, starting from the line survey phase.</li> <li>Objective indicators for section 8.9.2 are met</li> </ul>	<ul style="list-style-type: none"> <li>Buffer zones are adhered to</li> <li>Flagging is done and cleared once the work is completed</li> <li>Archaeological sites are not interfered with</li> </ul>	<ul style="list-style-type: none"> <li>The Seismic contractor shall liaise with community leaders on the identification and flagging of culturally sensitive areas. Such persons with good knowledge of the sites may need to accompany the seismic team to identify the various sites. The Seismic QC Representative shall be responsible for ensuring that such sites are not disturbed, and that all the workers are aware of the locations of the site. Although the area is not known for archaeological artifacts or features, if such artifacts or features are discovered during the line surveys, then they shall be left undisturbed, and the relevant authorities notified to provide further guidance on the matter. An internal awareness education and training programme will be conducted to provide personnel and contractors with knowledge and an understanding of the importance of archaeological and cultural resources.</li> </ul>	



### 8.9.10 Visual Aesthetics

The impact sources from the project operations will include campsite design and cut lines.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>Poor campsite design does not blend in with the environment</li> <li>Cut line footprints and vegetation cover removal lower aesthetic value of landscape</li> </ul>	<ul style="list-style-type: none"> <li>Use of modern line cutting technology, preferably <i>mulchers</i> for clearing of the geophysical survey transects will ensure that minimal vegetation is removed, hence ensuring that re-vegetation will occur in a much shorter period since the seeds and branches will be left along the traverses and this will promote faster re-growth (section 4.4.6).</li> <li>Campsite design should take into consideration the aesthetics of the selected area.</li> </ul>

### *Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation*

Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>Campsite blends well with environment</li> <li>Visual aesthetics maintained by minimising cut line footprints and vegetation removal</li> </ul>	<ul style="list-style-type: none"> <li>Camp design is aesthetic and good housekeeping practices are maintained</li> <li>Residual impacts of cut lines minimized in extent (sections 8.9.1, 8.9.2 and 8.9.6 apply)</li> </ul>	<ul style="list-style-type: none"> <li>Camp constructed according to design</li> <li>Physiography and Geology, Soils and Vegetation sections apply (sections 8.9.1, 8.9.2 and 8.9.6)</li> </ul>	<ul style="list-style-type: none"> <li>Maintenance of visual aesthetics will be the responsibility of the Seismic QC Representative</li> </ul>	Low

### 8.9.11 Noise and Vibrations

The impact sources from the project operations will include: Vibroseis and associated equipment, dynamite charges, and associated equipment and vehicles traversing the area.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>Disturbance to humans, animals and livestock</li> <li>Disturbance to workers</li> <li>Health risks</li> </ul>	<ul style="list-style-type: none"> <li>To reduce the expected transient impacts on wildlife, noise levels will need to be minimized to the extent possible, correct strength of dynamite charging and Vibroseis use applied to achieve the survey objectives, and human contact with wildlife should also be minimized in line with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, and the Wildlife Conservation and Management Act;</li> </ul>

	<ul style="list-style-type: none"> <li>▪ All seismic operations should be carried out only during daylight hours;</li> <li>▪ Ensure that Vibroseis and other vehicles have working silencers to attenuate noise;</li> <li>▪ Provide full personal protective gear to workers as appropriate (e.g. helmets and ear muffs/plugs) and as specified in the Occupational Safety and Health Act;</li> <li>▪ Workers should be sensitized on hazards likely to be encountered in such a work environment, and trained accordingly;</li> <li>▪ Buffer zones, distances between receptors and seismic sources/vehicles will be established through extensive in-field ground vibration and noise testing. Distances may vary between seismic source types, as per IAGC Guidelines. Liaison will be maintained with the relevant Kenyan government authority in deciding these distances;</li> <li>▪ Engage local leaders in sensitising the communities in the vicinity of the seismic operation areas about the project and its possible noise and vibration impacts;</li> <li>▪ The communities should be informed in advance when a seismic survey operation is to be executed along a given seismic transect/location;</li> <li>▪ Use generators with minimal noise production at camp sites and effect a noise mitigation policy for all operations in accordance with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations.</li> </ul>
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<b><i>Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation</i></b>				
<b>Desired Outcomes</b>	<b>Objective Indicators</b>	<b>Monitoring</b>	<b>Responsibility and Management</b>	<b>Risk with mitigation (High, Medium or Low)</b>
<ul style="list-style-type: none"> <li>▪ Ambient noise and vibration levels maintained</li> </ul>	<ul style="list-style-type: none"> <li>▪ Seismic data acquisition design plans optimised for reduction of noise and vibrations from Vibroseis and dynamite charges</li> <li>▪ Equipment installed to monitor noise (e.g. dosimeter)</li> <li>▪ Regularly serviced and efficient vehicle engines</li> <li>▪ "Quiet" machinery e.g. generators, purchased</li> </ul>	<ul style="list-style-type: none"> <li>▪ Review of design parameters, as needed</li> <li>▪ Monitor ground and noise vibration during parameter testing phase</li> <li>▪ Monitor installed equipment</li> <li>▪ Servicing work and schedules</li> <li>▪ Requirement embedded in tendering of equipment documents, inspect as needed</li> </ul>	<ul style="list-style-type: none"> <li>▪ The seismic contactor will be responsible for ensuring the monitoring and mitigation of noise and vibrations. During camp construction, noisy activities should be undertaken during normal working hours. The OHS policy regarding use of PPE should be adhered to by the workers. Trucking operations should be avoided at night.</li> </ul>	Low

### 8.9.12 Solid and Liquid Wastes

The impact sources from the project operations will include: campsite and workplaces in the field.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>■ Pollution of surface soils, water and groundwater</li> <li>■ Offensive odours</li> <li>■ Health risks</li> </ul>	<ul style="list-style-type: none"> <li>■ Waste materials (at the camp and in the field working areas) should be segregated into non-hazardous and hazardous waste, and consideration given to re-use, recycling, or disposal (section 4.4.1) as appropriate;</li> <li>■ A waste management plan documenting the waste strategy, storage (including facilities and locations), handling procedures and means of disposal should be developed and should include a clear waste-tracking mechanism to track waste consignments from the originating location to the final waste treatment and disposal location in compliance with the Environmental Management and Coordination (Waste Management) Regulations;</li> <li>■ Hygienic sanitation and disposal of grey and blackwater will be covered in the waste management plan in order to protect the general health of the workers and the general public;</li> <li>■ Ensure that solid waste is removed from site for recycling/disposal only by an authorised waste handler, ideally a handler licensed under the Waste Management Regulations, 2006;</li> <li>■ Fuel and other non-aqueous liquid storage areas should be bunded;</li> <li>■ Servicing of equipment should be carried out in a designated garage area which has regularly maintained oil drainage traps and readily available spill-kits. Workers in this area will be regularly briefed on spill prevention.</li> </ul>

### ***Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation***

Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>■ No pollution of surface soils, water and groundwater</li> <li>■ No offensive odours</li> <li>■ No health risks</li> </ul>	<ul style="list-style-type: none"> <li>■ No leakages of oils, chemicals or sewage and other domestic effluents reported</li> <li>■ Sanitary systems are working and no breakdowns reported</li> <li>■ Hazardous wastes (e.g. medical and chemical wastes) are properly disposed of</li> <li>■ Appropriate use of personal protective equipment when and where mandatory</li> </ul>	<ul style="list-style-type: none"> <li>■ Storage rooms are secure and accessed only by authorised personnel, daily</li> <li>■ Work areas are secure and accessed only by authorised personnel, daily</li> <li>■ Material storage containers checked for leaks daily</li> <li>■ Daily visual checks on sanitary systems</li> <li>■ Adherence to OHS policy and use of PPEs</li> </ul>	<ul style="list-style-type: none"> <li>■ The Seismic contractor will be responsible for management of solid and liquid waste at the camp sites and field working areas. Systems for treating solid and liquid wastes generated in the course of rolling out the project should be properly selected, installed, managed and decommissioned according to national legislation, regulations, and international best practices in order to minimise or eliminate their potential environmental impacts. A Hazardous Materials Management Plan (HMMP) will be developed for the project (see section 8.11.3) Safety of the workers and the surrounding communities will be taken into account for all stages of materials handling during all project phases. The EHS officer shall consult with the local authorities in Lodwar to determine where and how the different types of wastes that will be generated during the project can be disposed of.</li> </ul>	Low

### 8.9.13 Social Characteristics

The impact sources from the project operations will include: workforce influx and activities along the seismic survey lines.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>▪ Possible increase in crime rate and prostitution</li> <li>▪ Possible increase in school drop-out by individuals searching for jobs</li> <li>▪ Erosion of culture and social values as a result of intermingling with workers</li> <li>▪ May interfere with grazing lands and watering points</li> </ul>	<ul style="list-style-type: none"> <li>▪ Employ Community Liaison Officers to keep communities informed prior to project mobilisation and on an ongoing, continual basis to ensure sensitization of the community and stakeholders <i>vis a vis</i> the project objectives, activities and scheduling, potential impacts;</li> <li>▪ The communities should be informed well in advance of the start of the seismic survey operation and prior to execution along a specific seismic transect/location using appropriate wide-penetration communication media;</li> <li>▪ Awareness campaigns can be undertaken to inform/educate both the local communities and project employees;</li> <li>▪ During the seismic operations, disruption of livelihood activities in the area (sections 4.3.6, and 4.4.6) should be avoided where possible, otherwise minimized.</li> <li>▪ Provision to be made to compensate local property and landowners for any loss or damage caused by seismic operations. Compensation rates to be agreed with Government department before operations commence.</li> </ul>

### *Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation*

Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>▪ Decrease in crime rates and no school drop-outs</li> <li>▪ Preservation of cultural and social values</li> <li>▪ Protection of grazing lands and watering points</li> </ul>	<ul style="list-style-type: none"> <li>▪ No violations of Tullow CSR policy</li> <li>▪ No complaints from the locals on cultural or social values concerns relating to the workers</li> <li>▪ Relates to Soils (8.9.2) and Surface and Groundwater Resources (8.9.4) sections</li> </ul>	<ul style="list-style-type: none"> <li>▪ Awareness of Tullow CSR policies by workforce</li> <li>▪ Grievance mechanism in place and implemented</li> <li>▪ Related monitoring aspects are being undertaken</li> </ul>	<ul style="list-style-type: none"> <li>▪ The Seismic contractor Community Liaison Team should ensure community involvement in establishment of recruitment and tender committees to check on recruitment procedures, gender balance and potential conflict areas. One officer should be selected to coordinate the implementation of the grievance mechanism.</li> </ul>	Low

### 8.9.14 Economic Characteristics

The impact sources from the project operations will include: employment opportunities, tenders, and supplies.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>Improved livelihood</li> <li>Improved short-term business opportunities for the locals</li> <li>CSR project benefits</li> </ul>	<ul style="list-style-type: none"> <li>Liaise with local community leaders during the recruitment process;</li> <li>Employment policies to be strategically managed to avoid inter-community conflict and similar problems caused by migrant labourers;</li> <li>Unskilled and semi-skilled manpower to be sourced locally as far as possible;</li> <li>Gender should be factored into the employment criteria;</li> <li>Sustained public awareness and sensitization about the proposed project should be continued throughout the project lifespan.</li> </ul>

### *Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation*

Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>Improved economy and living standards</li> </ul>	<ul style="list-style-type: none"> <li>Number of locals recruited</li> <li>Number and type of CSR projects that TKBV commits to</li> <li>Establishment of recruitment and tender committees</li> </ul>	<ul style="list-style-type: none"> <li>As needed</li> </ul>	<ul style="list-style-type: none"> <li>The Seismic contractor Community Liaison Team should ensure community involvement in establishment of recruitment and tender committees to check on recruitment procedures, gender balance and potential conflict areas. One officer should be selected to coordinate the implementation of the grievance mechanism, which would be set up and managed by TKBV. TKBV would also determine fair levels of compensation (if the need arises) in consultation with relevant Government agencies (e.g. Ministry of Energy, and KWS)</li> </ul>	

### 8.9.15 Occupational Health and Safety

The impact sources from the project operations will include the campsite and fieldwork environments.



Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>▪ Injuries to workers, visitors and area residents arising from project operations</li> <li>▪ Fire hazard</li> <li>▪ Other health risks</li> </ul>	<ul style="list-style-type: none"> <li>▪ All operations will be conducted in compliance with Tullow's EHS policy, international best practices and Kenya Government requirements (as set out in the Occupational Health and Safety Act and the Public Health Act; see also section 4.2.6 of this report);</li> <li>▪ Appropriate and well-stocked first aid kits and fire fighting equipment should be available to all crew, and specific crew members should be trained on first aid administration and handling of fire fighting equipment (section 4.3.7);</li> <li>▪ Job-specific personal protective equipment to be provided to the workers, training should be given, and their use made mandatory in designated areas (section 4.3.7);</li> <li>▪ Environmental safety and health regulations and policies/plans must be adhered to (see sections 4.2.6 (Health Policy), 4.3.5 (Energy Act), 4.3.6 (Public Health Act), 4.3.10 (Local Government Act), 4.3.11 (Physical Planning Act), and 4.4 – NEMA Regulations);</li> <li>▪ A Base Camp Clinic is to be provided, manned by suitably qualified field medical staff, licensed as appropriate to operate in-country, equipped with equipment and medication as appropriate, including ambulances;</li> <li>▪ Adequate warning or cautionary signage will be posted as required;</li> <li>▪ All electrical equipment shall be properly installed, earthed and regularly inspected and where practicable will comply with IEE 17<sup>th</sup> edition regulations;</li> <li>▪ Only properly trained and authorised employees shall operate equipment or machinery;</li> <li>▪ Tullow driving policy and all other project-specific driving policies and journey management plans to be strictly adhered to and enforced.</li> </ul>

<b><i>Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation</i></b>				
Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>▪ Prevent workers and/or visitors from possible injuries/harm and health-related risks</li> </ul>	<ul style="list-style-type: none"> <li>▪ 100% use of personal protective equipment (PPE) when and where required</li> <li>▪ Caution signage placed visibly in required places</li> <li>▪ Training and drills on health and safety in the workplace, including fire-fighting</li> </ul>	<ul style="list-style-type: none"> <li>▪ Continuous monitoring and recording of incidences under each work component section</li> </ul>	<ul style="list-style-type: none"> <li>▪ The Seismic contractor EHS Representative should ensure all the protocols relating to environmental health and safety, and occupational health and safety policies are adhered to. Frequent training programs on first aid, fire-drills and other related health issues should be a prerequisite. The field team will be self-contained and will carry its own water to the work sites.</li> </ul>	Low

### 8.9.16 Security and Public Safety

The impact sources from the project operations will be related to the workforce security needs.

Potential Impacts	Mitigation
<ul style="list-style-type: none"> <li>Improvement in security due to security enhancement for project activities</li> </ul>	<ul style="list-style-type: none"> <li>Ensure that all workers can be identified by staff uniform and badges where applicable;</li> <li>Adequate security measures should be provided, e.g. perimeter fencing, safe havens and security manning at the campsites and whilst on line utilising Administration Police (APs) and Kenya Police Reservists (KPRs);</li> <li>The company should liaise with the Provincial Administration, the Kenya Police, KWS, Kenya Police Reservists and other agencies to provide adequate security during the seismic survey operation;</li> <li>Barriers and guards will be installed as necessary to protect employees and visitors from physical hazards and criminal activity;</li> <li>Camp population will be forbidden from interacting with local populace;</li> <li>Journey management policy and monitoring to be enforced.</li> </ul>

<i>Desired Outcomes, Objective Indicators and Monitoring and risk after mitigation</i>				
Desired Outcomes	Objective Indicators	Monitoring	Responsibility and Management	Risk with mitigation (High, Medium or Low)
<ul style="list-style-type: none"> <li>No security-related incidents</li> <li>Adequate security for the workforce</li> </ul>	<ul style="list-style-type: none"> <li>Number of security-related incidents recorded</li> </ul>	<ul style="list-style-type: none"> <li>Continuous monitoring and recording of incidences</li> </ul>	<ul style="list-style-type: none"> <li>The involvement of government agencies during the project operations may enhance long-term security initiatives from the concerned parties, hence improving the security situation in the area. Security issues should be the overall responsibility of the Country Manager.</li> </ul>	Low

## 8.10 OTHER GENERAL REQUIREMENTS AND TRAINING ISSUES

### 8.10.1 Occupational Health and Safety Plan

TKBV in conjunction with the Seismic Contractor will develop an Occupational Health and Safety Plan (OHSP), based on Tullow's EHS and CSR policies, prior to commencement of the project operations. The OHSP will uphold TKBV's commitment to a safe environment for employees, contractors and visitors. The plan will also address all applicable legal requirements relating to health and safety. The OHSP will set out the framework under which health and safety on the project site, and to and from the site, will be managed. The roles and responsibilities of the company, manager, supervisors and workers will be set out under this plan.

A health and safety training program will also be implemented at the site. The objectives of this training program will be to:

- provide appropriate orientation and support to all employees, contractors and visitors on site so that they can act in an appropriately safe manner;
- provide ongoing training to workers;
- Inform at-risk workers to help attain a positive and safe work environment.

## 8.10.2 Vehicle Traffic Management

All vehicular movement and driving will be undertaken as per Tullow Oil's Driving Policy for Land Transportation. Priority will be given to careful Journey Management Planning.

# Driving policy – Land transportation

As part of its commitment to high standards of Environment, Health and Safety, Tullow has stipulated the following minimum requirements for vehicle use and general Land Transportation.

These minimum requirements are applicable to all company vehicles, employees and contractors of Tullow Oil while on company business and may be exceeded by detailed local procedures.

- Safe/Defensive driver training is to be provided for drivers (those employed as drivers) of Tullow vehicles;
- Speed limits and all applicable local laws are to be adhered to;
- The use of hand held mobile phones/Blackberries while driving is prohibited;
- Smoking is prohibited in all Tullow vehicles;
- All 4 x 4 and other heavy vehicles should be fitted with reverse alarms/warning lights;
- Travelling in rear freight compartments (open or enclosed without seating or seat belts) of 4 x 4 field vehicles is not allowed;
- Driving hours should be aligned with the OGP publication "Land transportation safety recommended practice – Journey Management";

Requirement	Recommended practice
Maximum driving time between breaks and minimum break time	4.5 hours followed by a 30 minute break. However it is strongly recommended to have a 15 minute break every two (2) hours, or more frequent breaks during periods of circadian lows.
Maximum duty hours within a rolling 24 hour period	16 hours (i.e. employee cannot drive after 16 duty hours). This shall include driving, loading, unloading, waiting, rest breaks, and any other work (including air travel)
Maximum driving hours within a rolling 24 hour period	Ten (10) hours total excluding commuting time. Eleven (11) hours including any commuting time
Maximum duty hours in a rolling 7 day and 14 day period	14 day period: 120 hours, subject to an 80 hour/7 day maximum, and an average of 60 hours per week over an extended period
Off duty period in a rolling 7 day period	Minimum of a continuous 24 hour break prior to driving again

- Regular breaks are to be taken on long journeys, recommend a 15 minute break every 2 hours;
- Tullow vehicles should contain as a minimum the following equipment: First aid kit, Communication devices, Fire extinguisher, Drinking water, Warning triangle (for breakdowns), Torch, Basic Tool Kit (to include spare bulbs/fuses), (Extra fuel for remote locations).
- Three point seat belts are to be installed for all driver and passenger seats in Tullow vehicles and must be worn at all times;
- Drivers must be appropriately licensed, approved, and be fit to drive;
- Drivers must not drive under the influence of drugs, alcohol or medication that could affect their ability to drive.
- Vehicles should be fit for purpose and maintained in a safe working order in line with the manufacturers' specifications and local legal requirements.

### Further requirements for developing countries:

- People intending to drive in developing countries should liaise with the Country Manager and/or EHS Advisor as in each case there will be specific requirements and hazards that they should be aware of;
- No night driving outside of city limits is allowed unless in an emergency or with prior approval by Country Manager or their nominated Incident Responsible Person;
- In-Vehicle Monitoring Systems (such as "Drive Rights units") and/or GPS tracking systems should be fitted where possible;
- Journey Management procedures reflecting local driving conditions and identified risks shall be in place that complies with the OGP publication "Land transportation safety recommended practice – Journey Management";

Any incidents in which a breach of the local procedures or this policy has occurred should be reported as near misses in investigated accordance with the Accident and Incident Investigation and Reporting Procedure. Violation of the policy will be investigated and may result in disciplinary action.



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### 8.10.3 Waste Management Plan

A Waste Management Plan (WMP) will be developed for the project. It will identify all waste streams, including potentially hazardous materials to be used and provide a system for monitoring them. Transportation, storage, use and ultimate disposal will be considered. Safety of the workers and the surrounding communities will be taken into account for all stages of materials handling during all project phases.

Hazardous materials and wastes require special handling and training procedures. All employees will be provided with basic training so that, at a minimum, they can: identify hazardous materials; know how to obtain appropriate information on special handling procedures required; know what precautions and protective equipment are required; know how to label and package hazardous materials and wastes; know where and how hazardous wastes are to be stored; and know how wastes are to be disposed of. Employees who are tasked with receiving, off-loading and storing potentially hazardous materials or involved in the storage and shipment off-site of hazardous wastes should receive hazardous materials handling training.

### 8.10.4 Spills Prevention and Response Plan

Before the project commences, a Spill Prevention and Response Plan (SPRP) will be developed for use by TKBV and contracted personnel in the event of a deleterious material spill. The objective of the spill response measures will be to ensure that where accidental spills occur, all available resources are used appropriately to minimize the extent and severity of effect on the environment. All spills occurring on the project site will be responded to in a way that will uphold the following priorities: protection of human life and health; protection of the environment; protection of property; and minimized disruption to operational activities. At all times, applicable regulations will be used to guide response and cleanup activities.

At locations where the potential for spillage of hazardous material is highest, such as at fuelling points, spill control and containment means will be incorporated into the infrastructure during construction. The storage of materials will be tied in with the HMMP.

Spill response kits appropriate to the types and volumes of materials that will be used during the project operations will be specified, including the types of equipment that will handle or transport contaminant materials (including fuel). Spill response kits will be located at appropriate material handling and storage locations. The contents of the kits will be based on the potential risk associated with the material, volume of material, and environmental sensitivity of the area. General kit contents could include: oil absorbent pads; absorbent socks; granular absorbents; and protective equipment such as gloves, goggles and protective suits. All kits will be stored in a visible location, and in appropriate weather-resistant containers. Regular inspections of the kits will be performed to ensure that kits are complete and all materials remain functional.

All TKBV employees and contractors will undergo, as part of their orientation to the site, a training program on spill-prevention and hazard-identification, as well as spill-response, containment and reporting procedures. Other aspects of the training will include education on the:

- SPRP
- Applicable legislation
- Potentially affected environmental receptors (e.g. soil, surface and groundwater)
- Field application of appropriate spill-response techniques.

### **8.10.5 Emergency Response Plan (ERP)**

A more general plan that will deal with emergencies such as those related to accidents and personal injury, medical evacuations, fires, and escalating insecurity shall be put in place before the commencement of project operations. Issues to be addressed would include the capacity for response and management, and the support agencies that can be called in to assist (e.g. Kenya Police, Hospital staff, KWS, etc). A detailed and project specific Emergency Response Plan will be developed in conjunction with the Seismic Contractor.

### **8.10.6 Environmental Awareness Plan**

On appointment, all contracting companies and employees will receive a copy of the EMP and will be trained in the relevant categories of the EMP that are outlined in sections 8.9 and 8.10 above. In addition, a detailed environmental awareness plan will be developed prior to commencement of the seismic survey activities. The plan will address the following items:

- Basic workforce environmental awareness;
- Sensitivity of the site
- Personnel environmental training needs; and
- Resources available for use in personnel environmental awareness training
- Daily toolbox talks will be held to sensitise the workforce on environmental issues of concern.

Ongoing monitoring and auditing will also assist in continually improving the environmental awareness of the project team. TKBV will also target the community leaders and government administrators for awareness-building on the project components. These leaders and administrators would, thereafter, be able to explain the project components, the environmental issues, and mitigation measures that are being undertaken, to the community at large.

### **8.10.7 Campsite Decommissioning Plan**

The campsite decommissioning plan will follow the same sequence of project decommissioning as activities as described in chapter 2:

- Workers lay-off and compensation;
- Equipment demobilization (such as containers, vehicles, accommodation facilities)
- Dismantling of camp facilities;
- Cleaning the camps and disposal of solid, liquid and hazardous waste;
- Restoration of waste pits, cesspools and the whole camp site;
- Restoration of cut lines, shot hole repairs, removal of any debris and recovery and destruction of dead charges within the project area; and
- Audit and sign off.

The decommissioning will cover the base camp and any fly camps or any other facility that shall be erected. The decommissioning will lay emphasis on:

- Examining the conformity to the EMP's developed during the EIA for the seismic survey project;
- Preparation of a decommissioning strategy and EMP before decommissioning begins;
- Awareness creation;
- Ecological, socio-cultural and economic survey of camp sites and impacts;

- Conforming to national legislation and regulatory requirements and international best practices.

The decommission will be carried out as soon as is practicable after the end of the seismic survey, hence the specifics of it, which will depend largely on what was actually constructed on the ground, will need to be formulated well in advance.

#### **8.11 COST OF THE PROJECT**

The cost of the seismic program is estimated at USD. 6,704,178 (Ksh. 60,3376,020 ) and would be undertaken in a period of three to four months.



## **CHAPTER 9:**

### **CONCLUSIONS AND RECOMMENDATIONS**

#### **9.1 SUMMARY OF THE PROJECT COMPONENTS**

Tullow Oil is an International Oil and Gas exploration company with interests in many parts of the African continent including Kenya, Uganda and Ghana. The company signed a Production Sharing Contract (PSC) with the Government of Kenya in 2011 and obtained an Exclusive Prospecting Right (EPR) for Block 13T (surface area of 8,429 km<sup>2</sup>), which covers Central Pokot, Turkana South, Loima and parts of Turkana Central Districts. The company now intends to undertake a seismic survey for the purpose of evaluating the hydrocarbons prospects safely, evaluate the prospects without adverse impact to the environment, and determine the hydrocarbon potential of the designated prospect.

The proposed seismic survey will use environmentally friendly state-of-the-art technology, and comply with the Environmental Management Plan detailed herein, as well as national legislation and regulations and industry international best practices. There are possible impacts from the proposed seismic operation that have been identified and appropriate mitigation measures instituted to protect the biophysical and socio-economic environments. Tullow Oil is cognizant of the need for a proactive environmental and social approach. Members of the public interviewed had a positive view of the proposed project.

Positive cumulative benefits for the local business community are an expected result of the proposed activity with the planning and construction phases utilising a range of local professional service providers. Semi-skilled workers who may be employed in the project will likely acquire new and lifelong skills that may prove useful in other sectors of the Kenyan economy.

Overall, the impacts of the proposed project as classified as “low” (see section 3.5). The relationship between the significance rating and decision-making is also classified as “low” (see section 3.5), provided that the recommended measures to mitigate the impacts are implemented. The mitigation measures suggested in this report and the environment management plan developed will ensure that the project is technically, environmentally and socially sound and acceptable.

#### **9.2 RECOMMENDATIONS**

From an environmental point of view, it can be concluded that the project is viable and will not adversely affect the environment if the EMP outlined in this document is strictly adhered to. Some of the key recommendations are summarized here-below:

- To reduce the expected transient impacts on wildlife, noise levels will need to be minimized to the extent possible, correct strength of dynamite charging and Vibroseis use applied to achieve the survey objectives, and human contact with wildlife should also be minimized in line with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, and the Wildlife Conservation and Management Act;

- Liaise with the Kenya Wildlife Service (KWS) to ensure that wildlife disturbance and danger to the seismic team is mitigated in and around the National Reserves in the south. Any planned lines that are considered to be a threat will be relocated;
- Minimize vegetation and grassland clearance as much as possible when cutting the survey line transects;
- Trees with trunk diameter greater than 20cm should not be cut;
- Use of modern line cutting technology, preferably *mulchers* in some areas for clearing of the geophysical survey transects will ensure that minimal vegetation is removed, hence ensuring that re-vegetation will occur in a much shorter period since the seeds and branches will be left along the traverses and this will promote faster re-growth;
- Use existing access roads to the extent possible, limit traffic speed, and restrict movement of vehicles as is reasonable to minimize dust generation;
- Rivers/luggas should be crossed at road crossings, where such crossings exist, or in areas where the bank heights are less than 1m – banks at the lugga crossings should be mechanically restored;
- Access routes and cut lines will be selected to provide sufficient offset to known cultural sites to avoid disturbing them: these offsets shall be determined in consultation with area leaders;
- Seismic survey activities to be undertaken during daylight hours only;
- A waste management plan documenting the waste strategy, storage (including facilities and locations), handling procedures and means of disposal should be developed and should include a clear waste-tracking mechanism to track waste consignments from the originating location to the final waste treatment and disposal location in compliance with the Environmental Management and Coordination (Waste Management) Regulations;
- The company should consider drilling its own water supply borehole for the camp to avoid water resource conflicts with the communities;
- Employees should be provided with and use personal protective equipment at all times;
- Employ Community Liaison Officers to keep communities informed prior to project mobilisation and on an ongoing, continual basis to ensure sensitization of the community and stakeholders *vis a vis* the project objectives, activities and scheduling, potential impacts;
- Liaise with local community leaders during the recruitment process;
- All operations will be conducted in compliance with Tullow's EHS policy, international best practices and Kenya Government requirements (as set out in the Occupational Health and Safety Act and the Public Health Act); and
- The company should liaise with the Provincial Administration, the Kenya Police, KWS, Kenya Police Reservists and other agencies to provide adequate security during the seismic survey operation.

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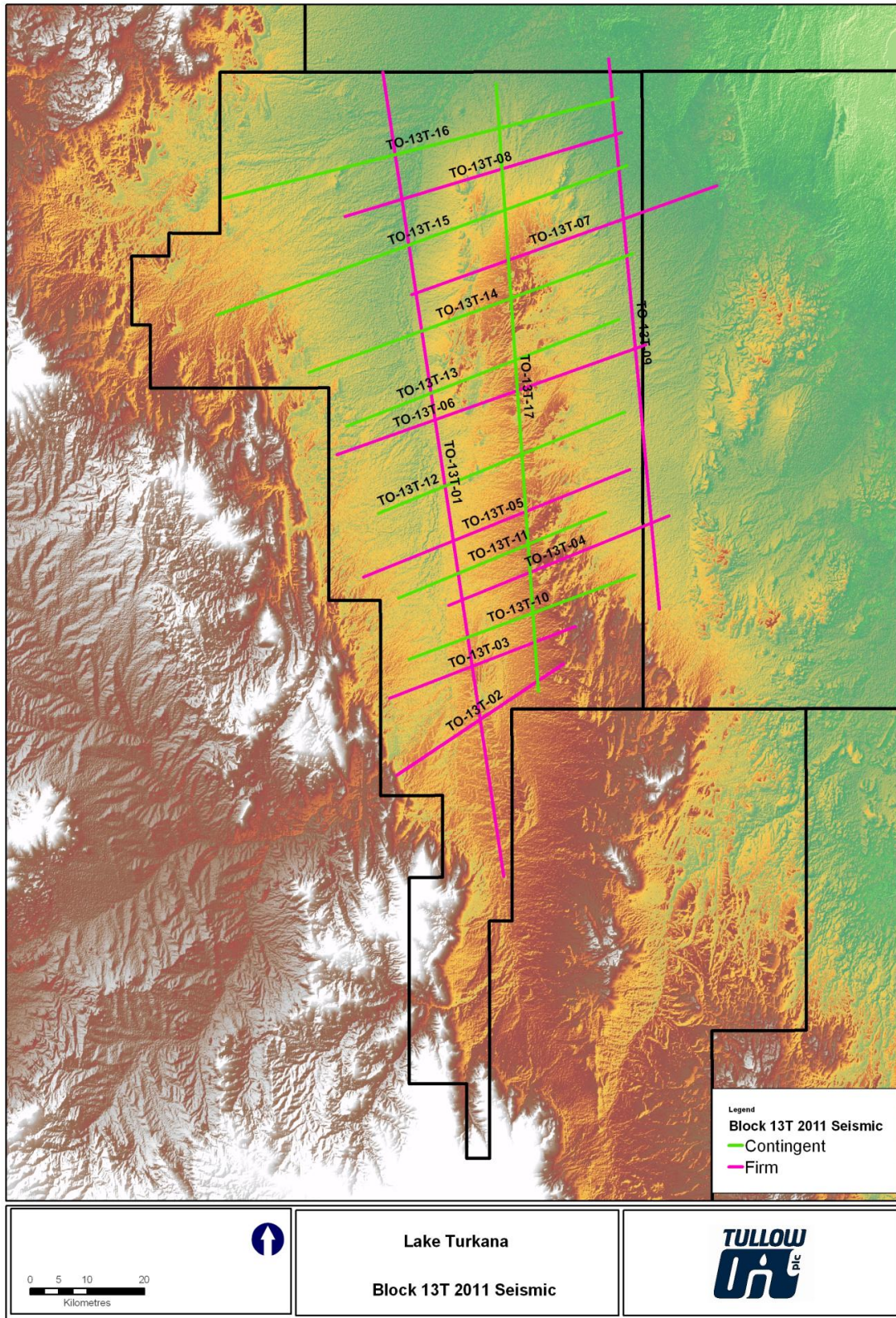
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## **APPENDICES:**

1. Provisional line coordinates for the seismic program
2. Minutes of the meeting
3. Copies of laboratory results
4. Certificates
5. Pin number
6. Other relevant documents



## APPENDIX 1: PROVISIONAL 2011 SEISMIC PROGRAMME LINE COORDINATES





## BLOCK 13T

WGS84 Zone 36N

Line name	location	Km	X	Y	X	Y
TO-13T-01	onshore	141.1109625	759838	331495	781047	191987
TO-13T-02	onshore	35.04163531	762299	209504	791505	228867
TO-13T-03	onshore	34.7394961	761069	222869	793504	235311
TO-13T-04	onshore	41.59044233	771358	239002	809945	254520
TO-13T-05	onshore	50.15780988	756455	243923	803039	262517
TO-13T-06	Onshore	57.2325801	751841	265116	805808	284172
TO-13T-07	onshore	56.59608555	764898	292938	818250	311824
TO-13T-08	onshore	50.58140889	753225	306457	801655	321052
TO-13T-09	onshore	95.82865136	799348	333801	808253	238387
TO-13T-10	onshore	42.13359289	764437	229636	803962	244231
TO-13T-11	onshore	39.22164975	762607	240232	798887	255135
TO-13T-12	onshore	46.47591449	759069	254981	802117	272499
TO-13T-13	onshore	51.15963015	753533	270038	801194	288632
TO-13T-14	onshore	60.21290869	746919	279404	803501	299997
TO-13T-15	onshore	76.21072109	730925	289401	802578	315361
TO-13T-16	onshore	71.03954528	732001	309671	800886	327034
TO-13T-17	onshore	105.6542735	779662	329495	787045	224099

## APPENDIX 2: PUBLIC CONSULTATIONS – MINUTES OF MEETINGS

### MINUTES OF THE MEETING HELD IN LORUGUMU LOCATION, TURKWEL DIVISION IN LOIMA DISTRICT AT LORUGUMU TRADING CENTRE ON THURSDAY 24<sup>TH</sup> FEBRUARY, 2011.

#### Attendance:

1. Mr. David Areman - Assistant Chief, Lorugumu Location
2. Community opinion leaders and members

The meeting was chaired by the Assistant Chief, Lorugumu Location, Mr. David Areman. He called the meeting to order at 10:00 a.m. with a word of prayer. He welcomed and thanked all the members present and requested the EIA team to introduce themselves and address the community members.

Mr. Nicholas then gave a brief overview of the proposed seismic survey in Block 13T by Tullow Oil Kenya B.V. He elaborated the company's intention to carry out seismic survey. He told the community that the main purpose of the meeting was to collect their opinions concerning the proposed project. He also explained the seismic technology to be used with emphasis on the fact that the vibrations induced will not be harmful in any way and that the environment will be protected.

The community raised the following views concerning the proposed project:

- They asked whether the proponent will compensate the community in case oil prospects are found on people's land.
- They were concerned about the grazing lands locally known as *akwar*, watering points and livestock. They therefore asked whether they will be affected during the project operations.
- They expressed fear of community displacement during the project operations.
- They suggested that the community should be educated and awareness created on the project operations that the proponent will undertake in the area.
- They wanted to know how compensation will be done in case the project causes destruction to the grazing lands, watering points and the livestock.
- They expressed fear of accidents caused by the vehicles and machines during project operations.
- They asked whether the community will be in charge of all the activities that the proponent will undertake and suggested that they should be involved at all stages of the project operations.
- A member urged others to spearhead corporate social responsibilities that the proponent might wish to implement in the area.
- They want the community to be involved in project activities, especially during recruitment of the youth. They further said that recruitment should be equal, transparent and gender sensitive and that their leaders should be involved.
- They wanted to know how the community will benefit from the proposed project.
- They urged the EIA team to take into consideration the community views.
- They demanded respect of their cultural practices, especially respect for the girls and women by the company staff.

Responses were made by assuring the community that the views raised will be taken into consideration. There will be no displacement during seismic survey. There will be creation of

awareness to the community before the project operations commence in the area. The entire project operations will be governed by the relevant laws and policies related to the project. The proponent will implement some of the corporate social responsibilities that the community will identify. Lastly, they were assured that there will be community involvement in project activities through consultative meetings which will be held with both the community members and the leaders. The assistant chief made his closing remarks by thanking the members who attended the meeting and urged the community to cooperate with the proponent during the project operations. He said that the proposed project had their blessings. The meeting adjourned at 11:15 a.m.

## **MEETING HELD IN TURKWEL LOCATION, TURKWEL DIVISION IN LOIMA DISTRICT AT THE BARAZA GROUND ON THURSDAY 24<sup>TH</sup> FEBRUARY, 2011.**

### **Attendance:**

1. Mr. Titus Nakuwa - Chief, Turkwel Location
2. Community opinion leaders and members

The meeting commenced with a prayer at 12:30 p.m. The meeting was chaired by the Chief, Turkwel Location, Mr. Titus Nakuwa, and he welcomed and thanked the EIA team and community members for attending the meeting.

A brief background and objective of the meeting was given by Mr. Nicholas. He explained to the community members how the seismic survey will be conducted during project operations. It was stressed that the main objective of the meeting was to collect the community's views concerning the proposed project in the area. He emphasized the socio-economic benefits of the project to the community through employment and other development projects that might arise during the project operations. He pointed out some of the corporate social responsibilities like provision of water, construction and equipping of schools, health facilities and many more. He then welcomed the community to present their views concerning the proposed seismic survey in the area.

- They welcomed all development projects and expressed excitement at the prospect of having the proposed project.
- They suggested that the proponent should create awareness and educate the community on various project activities that will be undertaken before and during the operation through holding of meetings.
- They suggested that the community members, especially the youth, should be given priority in employment opportunities. They further said that the recruitment should be equal for all community members.
- They believe that the community will benefit during the project operations in the area.
- They requested the proponent and the government to provide water to the community.
- They want the proponent to create awareness and educate the community on the activities that will be undertaken before and during project operations.
- They requested the proponent to help the community through various projects and implement corporate social responsibilities which the community will identify.
- They felt that the project will have negative impacts on the grazing lands and wanted to know how the impacts will be mitigated. They therefore requested that they should not be affected.
- They wanted to know how compensation will be conducted when the grazing lands, settlements, structures and farms will be affected.
- They wanted to know the benefits associated with the proposed project.
- They expressed fear of accidents caused by the vehicles and machines, to the animals and children, and suggested that the speed must be regulated.
- They reported that the dispensary in the area is not well-equipped and requested the proponent to equip and construct more health facilities.
- They said that the EIA team took the right procedure by consulting the community members.

The communities were assured that the views presented will be taken into consideration and that recommendations will be made in the report for further actions to be taken. The chief made his closing remarks by thanking the community members for attending the meeting and

welcomed the proposed project in the area. The meeting ended at 1:50 p.m. with a word of prayer.

**MEETING HELD IN KALEMUNYANG SUBLOCATION, LORUGUMU LOCATION IN TURKWEL DIVISION, LOIMA DISTRICT AT THE BARAZA GROUND ON THURSDAY 24<sup>TH</sup> FEBRUARY, 2011.**

**Attendance:**

1. Mr. Joseph Long'orio - Assistant Chief, Kalemunyang Sub- location
2. Community opinion leaders and members

The meeting started at 3:40 p.m. with a word of prayer and was chaired by the Assistant Chief, Kalemunyang Sub-location, Mr. Joseph Long'orio. The meeting comprised of community members from Kabulokor, Kotela, Kang'alita villages, Kalemunyang and Naremit sub-locations. There was full representation of the community leaders from the villages. He welcomed the members present and introduced the EIA team. The brief background of the proposed seismic survey project and the aim of the meeting were addressed by Mr. James.

During the meeting, the community raised the following views and suggestions concerning the proposed project:

- The community requested that the proponent provide potable water.
- They said there is only one secondary school in Lorugumu Location and they therefore requested more schools to be constructed and equipped with learning materials.
- They requested the construction of a dispensary and roads in the area.
- They reported that the areas are insecure because of cattle raiding from the neighbouring communities.
- They emphasized that the community has the right to their communal/ancestral land which should not be destroyed.
- They suggested that the community should be involved in all the project activities.
- They want the community, and not individual people, to benefit from the proposed project.
- They wanted to know what will happen if oil prospects are found on the grazing lands and watering points.
- They said that the EIA team took the right procedure by informing the community on the proposed project in the area.
- They requested the proponent to consider the communities in the oil prospect areas in order to benefit from the project.
- They welcome all development projects in Loima district.
- They believe that communities will benefit in terms of employment, especially the youth, and requested that the elderly people also should be considered during recruitment.
- They asked whether the community will still be provided with relief food even after the commencement of the project.
- They believe that when oil will be exploited in the region, the community living standards will improve.
- They expressed fear that the community will not be involved during the project operation.
- They are afraid that inter-district and intra-district conflicts will occur during recruitment.
- They wanted to know the specific areas where the proposed project will be located and how the compensation will be done in case of displacement of people.
- They said that the increase in the number of vehicles, noise from the vehicles and the machines, will scare the animals and accidents might occur.
- They wanted to know if grazing land will be affected by cutting down of trees and they suggested that the lands should not be destroyed.
- They have high expectation that oil will be found in the area and they said that they will be excited.



- They said they will not be receptive if the company will fetch workers from other districts.
- They insisted that all kinds of employment should be given to the local community.
- They demanded that the company staff respect their culture, cultural practices and especially their girls and women.

Mr. James responded by assuring them that the views will be taken into consideration. He assured the community that the project will be operated according to the relevant laws and policies governing the proposed project operations. He emphasized that the meeting focused on their concerns and that proposed project is in its first stage of seismic survey and not oil drilling/exploitation.

He told the members that they will benefit from the project in terms of development projects like road construction, schools, hospitals, provision of water and other corporate social responsibilities that the proponent will implement. He assured the community that all the mitigation measures for any anticipated negative impacts will be recommended and implemented by the proponent. He responded to the issue concerning the relief food distribution, that their lifestyle will positively change and that they will depend on themselves for food, other needs and facilities. He told them that the machines that will be used will have minimal noise and the seismic technology will not affect them.

He further told them that the specific sites for oil prospects are not yet known but with research it might be known in the near future. Lastly, he assured the members that there will be equal, transparent and gender sensitive recruitment in the block.

The assistant chief made his closing remarks by thanking the members for attending the meeting. He urged the community to cooperate with the proponent during project operations. The meeting adjourned at 5:00 p.m.

## MEETING HELD AT THE BARAZA GROUND IN LORENGIPPI LOCATION, TURKWEL DIVISION IN LOIMA DISTRICT ON FRIDAY 25<sup>TH</sup> FEBRUARY, 2011.

### Attendance:

1. Councillor Turkwel Ward - Mr. Lucas Kanyareng
2. Community opinion leaders and members

The meeting commenced with a prayer at 9:00 a.m. The councillor, Turkwel Ward, Mr. Lucas Kanyareng welcomed and thanked all the members present. He then introduced the EIA team. The background of the proposed project and teams' mission in block 13T was given by Mr. James.

The community then raised the following issues, concerns and suggestions:

- They were excited to hold the meeting with the EIA team and to present their views concerning the proposed project which they requested to be taken into consideration.
- They welcomed all development projects in the area.
- They complained the major problem in the district is water scarcity.
- They reported that the youth and other people in the community do not have jobs and therefore, they want to benefit from the project through employment.
- They said they do not want to rely on relief food.
- They believe that the area has a lot of minerals from the hills surrounding Lorengippi Location.
- They wanted to know how the seismic technology will be conducted and asked if the current roads in the area will be used for laying of seismic cables.
- They reported that foreigners have been visiting the area and promise them development projects which have never been implemented.
- They reported that they have gold at a hill called *Lomuria-ng'apethur* and believe that it can be exploited but insecurity poses a major challenge.
- They reported that insecurity is very high in the location because of frequent attacks from the Pokots, the Tepesi and the Karamojong communities.
- They expect the proposed project to benefit the community.
- They said they do not have any technology to discover oil but believe that oil will be found in the area.
- They reported that they do not have enough security officers like the Kenya Police Reserve (KPR) and the Administration Police (AP). They therefore want the government to deploy enough KPR and AP in Lorengippi Location.
- They want the proponent to source labour locally.
- The youth reported that they have Lorengipi Land Use Planners Association group which should be involved during the project operation.
- They want the company's staff to respect their culture, dressing code and especially girls and women. They also said they will not tolerate immorality and rape cases.
- They want the whole community and not the leaders only to be involved in the project
- They requested the proponent to support the pastoralist market in the location through buying of livestock.
- They wanted to know if the community will be allowed to exploit minerals like gold during the project operation.
- They want the proponent to create awareness and educate the community on all the activities that will be undertaken by the proponent to avoid suspicion.

- They said that the company's vehicles might cause accidents to the people and livestock and requested that measures should be taken to curb it.
- They want any machines and vehicles producing sound and movement of the company staff to be restricted especially at night because of the high state of insecurity.
- They want the company's staff and project operations not to interfere with the cultural practices especially at "*akiriket /arimo*" a place where the elders perform rituals.
- They requested the proponent to open up the road in the location which leads to Kapenguria in West Pokot District.
- They said that specific tree species especially along the luggas should not be cut because livestock and the community depend on them for pasture and have cultural value. They further suggested that company staff be educated on what will be required from them once project operations commence.
- They requested the proponent to set up its camp in the area and that the stray animals be kept at the camps until the owners are found.

Mr. James responded by informing them that the project is in its first phase of seismic survey which requires an EIA to be done in order to find out whether oil prospects will be found. He assured them that all the issues raised will be taken into consideration in the report which will be available at the NEMA office in the district. He emphasized that the community will benefit from the project, for instance through provision of water, construction of roads, schools and many more. He assured them that there will be community participation in any activity that the proponent would want to conduct. Lastly, he told them that there will be equal job opportunities in the block especially the unskilled labour.

The councillor made his closing remarks by emphasizing that the report should be presented to the community. The meeting adjourned with a word of prayer at 12:35pm.

# **MEETING HELD AT THE BARAZA GROUND IN NAIPA SUBLOCATION, KOTARUK LOCATION, TURKWEL DIVISION IN LOIMA DISTRICT ON SATURDAY 26<sup>TH</sup> FEBRUARY, 2011.**

## **Attendance:**

- |  |                            |
|--|----------------------------|
| 1. Acting Chief, Kotaruk Location        | - Mr. Emmanuel Elim Somale |
| 2. Assistant Chief, Kotaruk Sub-location | - Mr. James Atiktik        |
| 3. Community opinion leaders and members |                            |

The meeting started with a prayer at 10:10 a.m. The meeting comprised of community members from Kotaruk Location, Naremit village, Lokipetot-areng'an and Naipa Sub- locations. All the members present were welcomed,,then the EIA team was introduced.

The background and objectives of the proposed project were addressed by Mr. Nicholas. The floor was then opened to the community members to present their views concerning the proposed project.

- They welcome all development projects and especially the proposed project.
- They said they will be excited when the project operates in the area.
- They wanted to know the size of the land that will be occupied by the project.
- They reported that the community has a major problem of water scarcity, food insecurity and insecurity as a result of raiding from the neighbouring communities of Pokot and Uganda.
- They were concerned about the grazing land and watering points and suggested that it should not be destroyed by the project operation.
- They wanted to know the specific site where oil will be exploited.
- They do not want pictures of the livestock taken because of their cultural beliefs.
- The company staff should not take pictures of their women and the elderly men because of their traditional way of dressing.
- The company staff should respect their culture, cultural practices, and especially the girls and women.
- They reported that some tree species which have cultural value and provide pasture to the livestock should not be cut.
- They reported that in the early 1980s, a foreign company came to Naber-kachurokimak village in Kotaruk Location and the community did not know what operation was undertaken, but the company left metal poles in the area.
- They urged the proponent to a create good working relationship with the community in order to avoid conflict.
- They believe that security will be improved when the company exploits oil in the district.

The responses to the issues raised were addressed by Mr. James and he assured the community that their views will be taken into consideration and that necessary recommendations will be made in order to avoid and/or reduce the anticipated negative impacts.

The acting chief made his closing remarks by informing the members that they were excited to have the meeting in the area and recommended that the community should always be involved in the meetings in order to enhance good relationship between the proponent and the community. He urged the community members to be attending all the organised meetings in the area. Lastly, he emphasized that the issues raised by the community should be taken into consideration. The meeting ended with a word of prayer at 11:35 a.m.

**MEETING HELD AT THE BARAZA GROUND IN LOCHWAAANG'IKAMATAK SUBLOCATION, LOCHWAA LOCATION, LOKICHAR DIVISION IN TURKANA SOUTH DISTRICT ON MONDAY 28<sup>TH</sup> FEBRUARY, 2011.**

**Attendance:**

- |  |                          |
|--|--------------------------|
| 1. Chief, Lochwaa Location               | - Mr.Yohana Ekitela      |
| 2. Assistant Chief, Lochwaa Sub-location | - Mrs. Mary Amoni Lokope |
| 3. Councillor, Lokichar Ward             | - Benjamin Ebenyo        |
| 4. Community opinion leaders and members |                          |

The meeting started at 10:48 a.m. with a word of prayer. The chief, Lochwaa Location, Mr. Yohana Ekitela, welcomed everyone and introduced the EIA team. The background and objectives of the proposed project were addressed by Mr. Nicholas. The floor was then opened to the community members to present their views.

- The chief said that the proposed project will be beneficial and gave an example of the Africa oil BGP in Loperot Sub-location where the youth benefited through employment.
- He encouraged the youth to go to schools and undertake academic courses like driving and other courses which will help them when the project operates in the area.
- He encouraged the community to present their views, especially the corporate social responsibilities that they wish the proponent to implement.
- He further said that the proposed project will not affect the community Pastoralism lifestyle.
- They wanted to know what will happen in case the project operations affect the grazing land, watering points and individual lands and settlements.
- They reported that the community elders especially the Laibons do not allow any development projects and the members are restricted to exploit resources like gold in the area.
- They welcome all development projects in the area.
- A member encouraged others to accept and welcome all development projects like oil exploration in the area. He also said the community elders should always be receptive to the projects.
- They suggested that the project operations should not destroy trees which provide pasture to the livestock and should also not interfere with valued cultural sites like the graves.
- They expressed fear of speeding vehicles causing accidents to livestock and people.
- They want their leaders to be vigilant on the activities of such development projects and believe that the project will not cause any adverse negative impacts.
- They suggested that the community should be educated and awareness created through holding of meetings in order to be aware of the project's operations.
- They demanded that the company staff respect their culture, cultural activities, and especially their girls and women.
- Since they do not have any secondary schools, they requested the construction of secondary schools in Lochwaa Location.
- They requested the proponent to provide potable water and construct toilets.
- They reported that past projects in the district have not benefited them and suggested that the proponent should construct more dispensaries and equip them with enough medicine and an ambulance.
- They requested the proponent to offer education bursaries to the needy students and support the community groups in various projects they might wish to implement.
- They requested that employment opportunities should be given to the local community, especially the youth.

- They reported that the area M.P has neglected them and that they had expected him to attend the meeting.
- They complained that they have been presenting their views to other organizations, especially NGOs, but those views have never been taken into consideration or implemented.
- They said they have been deceived in the past that development projects like oil exploration causes adverse negative impacts to the environment. They therefore wanted to know the anticipated negative impacts of the proposed project.
- They said they have lost interest in the proposed projects in the area.
- They complained that NEMA has not been helping them in mitigating negative impacts caused by past projects implemented like the excavation ditches made by the fibre optic project which caused deaths to animals, and for which they were not compensated.
- They requested the proponent to pay land rates on behalf of the community to the County Council of Turkana because most of them are poor.

Responses were made by clarifying to them that the proposed project is in its first stage which does not involve oil drilling. He assured them that the project activities will not destroy grazing land, watering points and settlements. He also said that the corporate social responsibilities of the company will be identified by the community through holding meetings with the community. Lastly, he said that the anticipated negative impacts will be mitigated and assured them that their views will be taken into consideration.

The area councillor made closing remarks by encouraging the community to cooperate with the proponent and said that the project had their blessing. He suggested that the proponent should create a community committee in order to have a good working relationship with the community. The meeting adjourned at 1:00 p.m. with a word of prayer.



**MEETING HELD AT THE BARAZA GROUND IN LOCHEREMOIT VILLAGE IN LOCHWAA SUBLOCATION, LOCHWAA LOCATION, LOKICHAR DIVISION IN TURKANA SOUTH DISTRICT ON MONDAY 28<sup>TH</sup> FEBRUARY, 2011.**

**Attendance:**

1. Assistant Chief, Lochwaa Sub-location - Mrs. Mary Amoni Lokope
2. Community opinion leaders and members

The meeting started at 2:28 p.m. with a word of prayer. The meeting was chaired by the assistant chief, Lochwaa Sub-location, Mrs. Mary Amoni. She welcomed and thanked the members present. The EIA team then introduced themselves and addressed the community members.

The background of the proposed project was addressed by Mr. Nicholas. The floor was then opened to the community members to present their views.

- They welcome all development projects in the area.
- They will be receptive to projects which will benefit the community.
- They wanted to know what will happen to their livestock when the project commences.
- They said the project area should be small enough and well-fenced so as not to interfere with the grazing land.
- They felt that the proponent and government will get the larger share of benefit than the local community.
- They believe that when the project commences its operations, the youth and the elderly will benefit through employment.
- They wanted to know how the community will benefit from the project.
- The elders suggested that oil should not be exploited in the area because of fear of war but faced reactions from the youth who later said that oil exploitation should be done if oil prospects are found in the area.
- They reported that the community elders especially the Laibons do not allow any development projects in the area because they are not aware of the project benefits.
- They pointed out that there are many unemployed youth in the area. Therefore, they requested the proponent to employ the youth and other community members.
- They requested the proponent to provide potable water, construct schools, a dispensary and road especially in Sopol and Kimagur villages in Lochwaa Sub-location.

The community was assured that the environment will be protected and the project's operations will be conducted in accordance to the relevant laws and policies governing the proposed project, like the EMCA, 1999.

The assistant chief made her closing remarks by informing the members that they were excited to have the meeting in the area and requested that the community should always be involved through meetings in order to enhance good relationship between the proponent and the community. The meeting ended at 5:00 p.m. with a word of prayer.

## **MEETING HELD AT THE BARAZA GROUND IN LOKICHAR LOCATION, LOKICHAR DIVISION IN TURKANA SOUTH DISTRICT ON TUESDAY 1<sup>st</sup> MARCH, 2011.**

### **Attendance:**

1. Chief, Lokichar Location - Mrs. Josephine Akiru Ekal
2. Community elders and members

The meeting started at 10:00 a.m. with a word of prayer. The chief, Lokichar Location, Mrs. Josephine Akiru, welcomed the members present. The EIA team was introduced, followed by a brief background of the proposed project.

Community views concerning the proposed project were as follows:

- They said they have not read the report that Africa Oil B.G.P prepared. They also said that NEMA has not involved the community in any way.
- They want the proponent to involve the community in all the project's operations through holding of consultative meetings.
- They do not want a committee to be created especially during recruitment. They suggested that the proponent should create direct links with the community leaders and members.
- They want recruitment to be equal, transparent and gender sensitive to community members and especially the youth.
- They reported that Africa Oil B.G.P operating in Loperot did not employ the youth and suggested that labour should be sourced locally especially the unskilled labour.
- They said they want the community, and not individual people in the community, to benefit as always happens with other projects implemented in the area.
- They reported that since Africa Oil B.G.P started its operations in Block 10BB, there has been environmental degradation of soil erosion and the area has become windy. They do not want the proponent to destroy tree species which provide pasture to the livestock. They therefore recommended reforestation.
- They want the company staff to respect their cultural way of life, especially their dressing and should not take photographs.
- They want project operations not to destroy watering points and grazing land because they greatly rely on them.
- They requested the proponent to train local labourers on various project operations because there are many youth who have undertaken various academic courses.
- They believe that when Africa Oil B.G.P commenced its operation in Loperot, it affected the grazing land and water levels reduced in boreholes. They therefore want to be compensated.
- They emphasized that when the project operation commences in Block 13T which covers Central Pokot District, they do not want community members from Pokot to be recruited to work together with the Turkana community.
- They wanted to know why oil has not been exploited in the district after a lot of research and surveys done since the 1980s. They felt that adverse negative impacts are associated with oil exploitation.
- They felt that oil exploitation will cause war, so they want the company to pay or compensate the community even before oil is exploited in the area.
- They were worried that the machines that will be used during seismic survey will affect the current roads in the area.
- They said that the company staff should not be given armed security officers from the local administration; instead the local community should provide them with security.

- They want corporate social responsibilities to be implemented, like provision of water, construction of schools, roads and many more.
- They requested the proponent to support the local pastoralist market through buying of livestock.
- They want the government to inform the community what has happened to the research that foreign companies had conducted in the past. They suspected that the companies have been exploiting resources like minerals and that the community has not been aware.

Responses were made that the proposed project will not cause negative impacts to the environment. Closing remarks were made by the area chief and she emphasized that recruitment should be equal, transparent and gender sensitive. She requested the proponent to support women groups in the area. She assured the community members that the concerns raised will be taken into consideration in order for the community to be receptive. Lastly, she said that the proposed project in the location had their blessings. The meeting ended at 1:20 p.m. with a word of prayer.

**MEETING HELD AT THE BARAZA GROUND IN KANAODON SUBLOCATION, KATILU LOCATION, KATILU DIVISION IN TURKANA SOUTH DISTRICT ON WEDNESDAY 2<sup>ND</sup> MARCH, 2011.**

**Attendance:**

1. Mr. Moses Silale - Assistant Chief, Kanaodon Sub-location
2. Mr. Samson Etukutan - Councillor, Katilu Ward
3. Community elders and members

The meeting started at 11:45 a.m. with a word of prayer. The meeting comprised of members from Kang'akimak, Kagitang'ikori, Nakatwan, Loupe, Awar-naparan, Kadoido and Kanaodon villages. Assistant Chief, Mr. Moses Silale, welcomed the members and introduced the EIA team.

A brief background of the proposed project and the objectives of the meeting were addressed by Mr. James. The community members were enlightened on the proponent's intention to conduct seismic survey for oil and gas in the area. He mentioned the use of machines during the project operation. He emphasized that the main aim of the meeting was to collect the community's views concerning the proposed project. He highlighted some of the benefits like employment and implementation of corporate social responsibilities that will be identified by the community.

The community raised the following views.

- They said that the proposed project will benefit the community.
- They want the proponent to source labour locally, especially the unskilled and skilled labour and should be equal, transparent and gender sensitive.
- They want the project operations like making of cut lines not to destroy or pass through their settlements and grazing lands.
- They expressed fear of environmental degradation and health hazards caused by the machines during the project operation.
- They wanted to know the benefits associated with the proposed project.
- They reported that water in the boreholes has dried and schools are not well equipped. They requested the proponent to provide potable water and equip the schools.
- They have heard that oil producing countries have wars. They therefore said that they do not anticipate war in the district as a result of oil exploitation in the future.
- They expressed fear of displacement during the project operation.
- They asked whether the community or individual people affected will be compensated and how compensation will be done.
- They requested the proponent to construct access roads which will link the communities within the district by constructing a bridge across R.Turkwel which separates Loima and Turkana South Districts.
- They requested the government and the proponent to enhance and improve security in the district because of frequent attacks from the neighbouring Pokot community.
- They said that the area is still poor in terms of development and they welcome all development projects in the area.
- They were worried about their livestock health and wanted to know what will happen to the livestock when shrubs are destroyed.
- They requested the proponent to provide farming tools and construct canals at the irrigation schemes along R.Turkwel.

- A member encouraged others to accept the proposed project because they believe that it will benefit the whole community.
- The area councillor, Mr. Samson Etukutan, informed the community members that a stakeholders' meeting was held concerning the proposed project and all the necessary and relevant issues were discussed.
- He reported that gold is mined at a place called Kanaodon at a small scale and requested the proponent not to destroy tree species which have cultural value.
- He said that excavation ditches that will be made should be carefully protected to avoid accidents of livestock and people in the area.
- He emphasized that the Kanaodon community needs to be supported by the proponent through planting of trees, construction of schools, provision of water and many more.
- He reminded them that the main aim of the meeting was to collect the community's views concerning the proposed project.

The community was informed that the machines which will be used will not cause adverse negative impacts. Mr. James also assured them that the cut lines which will be created will not affect grazing lands, mature trees and watering points. Lastly, he said that the cut lines will be left to the community to use as access roads.

The assistant chief made closing remarks by encouraging the community to cooperate with the proponent when the project operation commences. He also said that the proposed project had their blessing and thanked the EIA team for holding the meeting with the community members. The meeting adjourned with a prayer at 1:30 p.m.

**MEETING HELD AT THE BARAZA GROUND IN LOKAPEL SUB LOCATION, KATILU LOCATION, KATILU DIVISION IN TURKANA SOUTH DISTRICT ON WEDNESDAY 2<sup>ND</sup> MARCH, 2011.**

**Attendance:**

1. Mr. Samson Etukutan - Councillor, Katilu Ward
2. Mr. Josphat Lochii - Assistant Chief, Lokapel Sub-location
3. Community elders and members

The meeting started with a prayer at 3:10 p.m. Assistant Chief, Lokapel Sub-location, Mr. Josphat Lochii, welcomed the members then introduction of the EIA team followed. A brief background of the proposed project was explained to the community by Mr. James. The community members were enlightened on how seismic survey will be conducted in the area. He emphasized that community views concerning the proposed project were important for report preparation. He highlighted some of the project benefits like employment and implementation of corporate social responsibilities that will be identified by the community. Community views raised were as follows:

- The youth wanted to know how recruitment will be conducted in the district.
- They wanted to know how the community will benefit from the proposed project.
- They asked how they will benefit in terms of farming at the irrigation schemes, water, schools, roads and communication networks in the area.
- They reported that some of the schools like Lokapel Primary School are always affected by floods during the rainy season.
- They reported that there are many needy students in the area who pass well in the national examination but lack school fees. They therefore requested academic bursaries from the proponent.
- They requested the proponent to support the community through C.B.Os and self-help groups instead of working with their leaders. They therefore requested the company to form direct links with the community members.
- They are proud to have resources like gold and other minerals and the community should be compensated if the proponent will exploit the resources.
- They suggested that labour should be sourced locally and tenders should be awarded to competent community members.
- They welcome all development projects in the area.
- They requested the proponent to construct irrigation canals from River Turkwel at the irrigation schemes.
- They reported that many organizations, like NGOs, have been promising them development projects which have never been implemented.
- They reported that they have only one dispensary (Lokapel Dispensary) which lacks medical personnel and drugs, so they are forced to walk a long distance to Katilu in order to access medical service.
- They requested the proponent to equip health facilities with enough medical personnel and drugs and also veterinary drugs for the livestock.
- They reported that the area is faced with food insecurity and the livestock have been dying as a result of drought and diseases.
- They reported that the major challenge is of insecurity due to frequent attacks as a result of cattle raiding from the neighbouring Pokot community.
- They wanted to know adverse negative impacts associated with the operation of machines during seismic survey.



- They believe that the project will employ both the youth and other people in the community
- They want the project operation not to affect the grazing land, trees with cultural value, watering points, structures and settlements.
- They reported that there was no transparency during employment of the youth by Africa Oil B.G.P operating in Loperot Sub-location in Turkana South District.
- The councillor emphasized the bottom-up approach and said that the community should be directly informed of all the project operations that will be undertaken by the proponent.
- Lastly, he emphasized the issues of employment and said that it should be transparent and equal for all the community members.

Responses were made to the issues raised by assuring the community that the machines which will be used will not cause any adverse negative impacts. The views raised will be taken into consideration and they will be protected by the relevant laws and policies governing the proposed project. The assistant chief made his closing remarks by thanking the EIA team for consulting the community and encouraged the community to cooperate with the proponent during the project operation. The meeting ended at 4:50 p.m. with a word of prayer.

## **MEETING HELD AT THE BARAZA GROUND IN KAPUTIR LOCATION, KAINUK DIVISION IN TURKANA SOUTH DISTRICT ON THURSDAY 3<sup>RD</sup> MARCH, 2011.**

### **Attendance:**

1. Mr. Charles Ekidor Lopuya - Chief, Kaputir Location
2. Community elders and members

The meeting commenced at 11:15 a.m. with a prayer. The Chief, Kaputir Location, Mr. Charles Ekidor, welcomed and thanked the members present. He informed the EIA team that the location has three sub-locations, namely; Lorogon, Nakwamoru, and Kalomwae. He also said that the population in the location is approximated to be 15,000 people. The meeting comprised of members from Kaputir, Lokwar, Nakuse, Kang'irisae, Nawoiyaregai villages and Kaputir town. The EIA team was then introduced.

The background of the proposed project and the objective of the meeting were addressed by Mr. James. The community was informed that the proponent intended to conduct seismic surveys in the area and that the main aim of the meeting was to collect community views concerning the proposed project. The community raised the following concerns:

- They were excited to have the proposed project in the area.
- They believe that the project will benefit the community through employment and other projects that might arise during project operations.
- They were worried that oil exploitation might cause war between countries.
- They requested the proponent to source labour locally especially unskilled labour.
- They felt that the project operations might affect mature trees which provide pasture to the livestock.
- They welcome the proposed project in the area.
- They said that the EIA team took the right procedure by consulting the community members.
- The youth said that the proposed project will improve the economic standards of the community.
- They said that construction of cut lines might cause environmental degradation which will affect livestock
- The youth requested to be considered during recruitment.
- They believe that oil will be found in the area and especially in R. Turkwel.
- They wanted to know the period in which the project will operate in the area and about the payment of labourers.
- They reported that they always present their views to their leaders but their views are not taken into consideration.
- They believe that the state of insecurity in the area will be greatly improved during project operations.
- They want the proponent to take the shortest time possible to commence the project in the area.
- They complained that the houses in the area do not have electricity yet Turkwel Gorge produces electricity from River Turkwel.
- They reported that there was no transparency when Africa Oil B.G.P operating in Loperot conducted recruitment.
- They requested the proponent to create awareness and educate the community on the various project operations which will be undertaken.
- The chief asked what percentage the community will get from proposed project.

- He also wanted to know if the community self-help groups and CBO will be involved in the project.
- He reported that the schools in the location are not well equipped and requested the proponent to support the youth in the area academically and to construct the chief's office.
- He wanted to know how compensation will be made if individual land, watering points and grazing land is affected by the proposed project operations.

Responses were made by informing the community that in case oil prospects will be found in the area, the community will be informed through meetings. The chief said that the proposed project had their blessings. The meeting ended with a prayer at 12:35 p.m.

**MEETING HELD AT THE BARAZA GROUND IN KALEMUNG'OROK SUB LOCATION, KAPUTIR LOCATION, KAINUK DIVISION IN TURKANA SOUTH DISTRICT ON THURSDAY 3<sup>RD</sup> MARCH, 2011.**

**Attendance:**

1. Assistant Chief, Kalemung'orok Sub-location - Mr. Henry Etabo
2. Community elders and members

The meeting commenced with a prayer at 2:00 p.m. The meeting comprised of community members from Nabeye, Namakat, Simalele, Nakabosa, Kaikunyuk, Ekoraputh, and Kang'irega villages and Kalemung'orok town. The EIA team was introduced and the community was addressed on the proposed project. An explanation was given of how the seismic technology will be conducted in the area. The community members were encouraged to present their views concerning the proposed project.

- They welcome all development projects in the area.
- They thanked the EIA team for holding the meeting with the community members.
- They said that oil exploitation might cause war among countries.
- They expressed fear of loss of livestock during the project operation in the area.
- They reported that many youth are unemployed. They therefore expect them to get employment during project operations.
- They suggested that trees should be planted in order to reduce adverse environmental impacts.
- They requested the proponent to provide water to the community.
- They said that recruitment should be equal, transparent, and gender sensitive to the local community members of Kalemung'orok Sub-location.
- They requested that the grazing land and watering point should not be destroyed.
- They believe that there are many resources, especially minerals and oil, which can be exploited in the area.
- They said that the community elders and members should be informed and awareness created before the project operates in the area.
- They reported that when Africa Oil B.G.P commenced its operation in Loperot, the community members in Kalemung'orok were not informed.
- They reported that they are frequently attacked by the neighbouring Pokot community as a result of livestock raiding.
- They felt that the government and their leaders have neglected them and that is why the area is not developed.
- They said that the cut lines which will be constructed might be used by the communities during livestock raiding.
- They believe that security will be improved when the project operates in the area.
- A member encouraged others, especially the elders, to accept the proposed project because it will benefit the community in terms of education, employment and other development activities that might arise during the project operations.
- They wanted to know the adverse negative impacts associated with the proposed project.
- They requested the proponent to construct schools for Kalemung'orok community members.
- They wanted to know the corporate social responsibilities that the proponent might implement.
- They complained that there are no drugs and medical personnel at Kalemung'orok Dispensary. They therefore requested the proponent to construct a dispensary in the area.

The community will be informed through meetings and the issues of corporate social responsibilities will be discussed at a later stage, and will be identified by the community. Lastly, they were assured that the proponent will work together with the community. The meeting adjourned with a prayer at 3:37 p.m.

## **MEETING HELD AT THE BARAZA GROUND IN KAINUK TOWN, KAINUK LOCATION, KAINUK DIVISION IN TURKANA SOUTH DISTRICT ON FRIDAY 4<sup>TH</sup> MARCH, 2011.**

### **Attendance:**

1. Mr. Eyanae .L. Apang'ole - Chief, Kainuk Location
2. Community elders and members

The meeting started at 2:25 p.m. with a prayer. The area chief, Mr. Eyanae Apang'ole, welcomed all the members present. He then told the community members to present their views concerning the proposed project. The EIA team introduced themselves and explained to the community how the seismic survey will be conducted.

- They said that the EIA team took the right procedure by consulting the community members.
- They said that they have community leaders who must be recognised by the proponent.
- They want the proponent to respect Laibon sites which are found in the remote areas of Kainuk Division.
- They want the project operations not to interfere with their grazing land and watering points.
- They requested the proponent to provide them with tree seedlings which the community will plant and provide water to the community members living in the remote areas of Kainuk Division.
- They requested that academic scholarships be granted to the needy students.
- They reported that the committee that Africa Oil B.G.P formed did not help the community especially during recruitment, and workers who worked had differing salaries stated in their contracts.
- The youth want to be given priority during recruitment when the project operation commences.
- They welcome the proposed project and want all the project operations including recruitment to be transparent to the community.
- Some members want a committee to be formed which should comprise of members from Kainuk Location only and every person in the location should be considered for employment, especially the unskilled labour.
- They want the proponent to support them at the irrigation schemes by providing farming tools and water for irrigation.
- They want the proponent to compensate them in case the machines and vehicles cause accidents to livestock and affect watering points.
- They reported that the youth in Kainuk location have various academic qualifications and must be considered during recruitment.
- Some members said they do not want a committee to be formed in Kainuk Location; instead the proponent should form direct links with the community members.
- They wanted to know the plans that the proponent has for older people or elders of the community.
- They requested the proponent to educate and create awareness to the community before the project operates by holding meetings with the community members.
- They said that they will be receptive to the project operation if the proponent will work together with the community.
- They want labour to be sourced from Kainuk area and not from other areas in the district.
- They asked what plans the proponent had for the community in terms of schools, water, health facilities and support for the needy students.
- The chief wanted to know what will happen to the affected settlements, grazing lands and watering points and how the community will benefit from the proposed project.



- They want the government to protect its resources, like gold, which they believe are present in the area.

The community was assured that the views raised will be taken into consideration and awareness will be create in the community. The chief urged the proponent to consult the community before any activity commences. Lastly, he said that the proposed project had their blessing. The meeting ended with a word of prayer at 4:35 p.m.

## **MEETING HELD AT THE BARAZA GROUND IN WEI WEI LOCATION, IN SIGOR DIVISION IN CENTRAL POKOT DISTRICT ON SARTUDAY 5<sup>TH</sup> MARCH, 2011.**

### **Attendance:**

1. Mr. Mathew Tirono - Chief, Wei Wei Location
2. Mr. Moses Oruma - D.O, Sigor Division
3. Community members

The meeting started at 12:45 p.m. with a word of prayer. The chief, Wei Wei Location, Mr. Mathew Tirono, welcomed all the members present. In attendance was the D.O Sigor Division, Mr. Moses Oruma. He encouraged the members to present their views concerning the proposed project. The EIA team was introduced, followed by a brief background of the proposed seismic survey project in the area. The community raised the following views:

- They asked what will happen to the community when the project operation affects their farms and settlements.
- They wanted to know how the community will benefit from the proposed project and if they will be displaced during the project operation.
- They wanted to know if the water levels in the rivers and underground water will be affected.
- They welcomed all development projects and wanted to know how the cut lines will be made in the area.
- They requested the proponent to help the community in controlling soil erosion and to support the needy students with education.
- They wanted to know how the seismic activities will be conducted in the area and asked whether the community will be involved during the project operations.
- They wanted to know the effects of seismic technology and requested the proponent to create awareness to the community before any activity commences in the area.
- They requested the proponent to make accessible roads for the community to use especially in the remote areas in Sigor Division.
- They expressed fear of ground shake during seismic operations due to the use of vibration machines.
- The youth requested the proponent to consider them during the recruitment process.
- They wanted to know the specific site where seismic survey will be conducted in the area.
- They wanted to know why the area was demarcated as Block 13T which covers Turkana districts and who classified the Areas into blocks.
- They said that past projects in the area had adverse negative impacts like installation of electricity poles and creation of ditches that caused accidents to the livestock.

Responses were made by informing the community that the areas were demarcated into blocks by National Oil Corporation of Kenya and that the specific site for oil and gas exploration is not yet known. The project activities will not have adverse negative impacts to the environment and the community's health, and mitigation measures will be put in place to reduce or avoid the anticipated impacts. For instance, mature trees will not be cut. They were assured that the views raised will be taken into consideration and that their interests will be protected by the relevant laws and policies like the EMCA, 1999. Lastly, the EIA team informed them that the report will be available at NEMA's office in Central Pokot District.

The DO informed the community that they will participate in the proposed project through meetings. He assured them that the report will be available at NEMA office and the willing community members will be allowed to read the report. The members thanked the EIA team for

holding the meeting with the community members. The meeting ended with a prayer at 2:15 p.m.

## **APPENDIX 3: COPIES OF LABORATORY RESULTS**

## **APPENDIX 4: CERTIFICATES OF THE CONSULTANTS**

## **APPENDIX 5: TKBV PIN NUMBER AND VAT CERTIFICATES**





Application Reference No. PR/8896

Registration No: 0009552

For official use

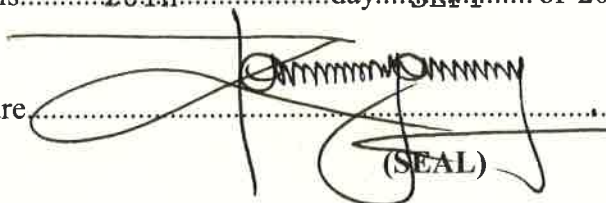
NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

THE ENVIRONMENTAL MANAGEMENT AND CO-ORDINATION ACT  
ENVIRONMENTAL IMPACT ASSESSMENT LICENCE

This is to certify that the Project Report/Environmental Impact Assessment Study Report received from  
TULLOW OIL KENYA BV..... (Name  
of individual/firm)..... P.O. BOX 63298-00619, NAIROBI..... (Address)  
submitted to the National Environment Management Authority in accordance with the Environmental Impact  
Assessment & Audit Regulations regarding PROPOSED OIL AND GAS SEISMIC SURVEY.....  
.....  
(title of project) whose objective is to carry on OIL AND GAS SEISMIC EXPLORATION.....  
.....  
.....  
..... (briefly describe purpose) located  
at BLOCK 13T PARTS OF CENTRAL POKOT, LOIMA, TURKANA CENTRAL AND.....  
TURKANA SOUTH DISTRICTS..... (locality and district)  
has been reviewed and a licence is hereby issued for implementation of the project, subject to attached  
conditions.

Dated this 28TH day of SEPT of 2011.

Signature

  
(SEAL)

*for* Director General  
The National Environment Management Authority

CONDITIONS OF LICENCE

1. This licence is valid for a period of 24 MONTHS..... (time within which the project should commence) from the date hereof.
2. The Director-General shall be notified of any transfer/variation/surrender of this licence.

P. T. O.

## **1. General Conditions**

- 1.1. This approval is for oil and gas seismic exploration in Central Pokot and Turkana Districts.
- 1.2. The license shall be valid for 24 months from the date of issue.
- 1.3. The proponent shall provide the final project accounts (final project costs) on completion of construction phase. This should be done prior to project commissioning/operation/occupation
- 1.4. Without prejudice to the other conditions of this license, the proponent shall implement and maintain an environmental management system, organizational structure and allocate resources that are sufficient to achieve compliance with the requirements and conditions of this license.
- 1.5. The Authority shall take appropriate action against the proponent in the event of breach of any of the conditions stated herein or any contravention to the Environmental Management and Co-ordination Act, 1999 and regulations thereunder.
- 1.6. This licence shall not be taken as statutory defence against charges of pollution in respect of any manner of pollution not specified herein.
- 1.7. The proponent shall ensure that records on conditions of licenses/approval and project monitoring and evaluation shall be kept on the project site for inspection by NEMA's Environmental Inspectors.
- 1.8. The proponent shall submit an Environmental Audit Report in the first year of operation/commissioning to confirm the efficacy and adequacy of the Environmental Management Plan.
- 1.9. The proponent shall comply with NEMA's improvement orders throughout the project cycle

## **2. Construction Conditions**

- 2.1. The proponent shall undertake environmental impact assessment specific to the site where oil or gas is discovered before exploitation phase.
- 2.2. The proponent shall put up a project signboard as per the Ministry of Works Standards indicating the NEMA license number among other information
- 2.3. The proponent shall ensure that all excavated material and debris is collected, re-used and where need be disposed off as per the Environmental Management and Coordination (Waste Management) Regulations 2006.
- 2.4. The proponent shall ensure strict adherence to the provisions of Environmental Management and Coordination (Noise and Excessive Vibrations Pollution Control) Regulations 2009.
- 2.5. The proponent shall ensure strict adherence to the Occupational Safety and Health Act (OSHA), 2007.
- 2.6. The proponent shall ensure that construction workers are provided with adequate personal protection equipment (PPE), sanitary facilities as well as adequate training.
- 2.7. The proponent shall ensure strict adherence to the Environmental Management Plan developed throughout the project cycle.

- 2.8. The proponent shall ensure that the development adheres to zoning specifications issued for development of such a project within the jurisdiction of Turkana and Pokot County Councils with emphasis on approved land use for the area.

### **3. Operational Conditions**

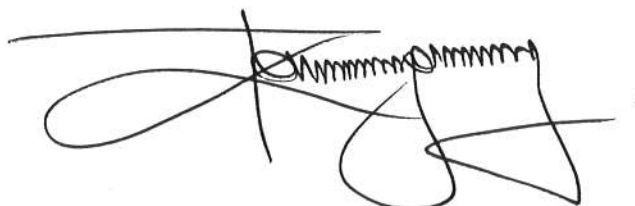
- 3.1. The proponent shall ensure that all waste water is disposed as per the standards set out in the Environmental Management and Coordination (Water Quality) Regulations 2006.
- 3.2. The proponent shall ensure that all equipment used are well maintained in accordance with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations 2009.
- 3.3. The proponent shall ensure that all solid waste is handled in accordance with the Environmental Management and Coordination (Waste Management) Regulations 2006.
- 3.4. The proponent shall ensure that all workers are well protected trained as per the OSHA, 2007
- 3.5. The proponent shall comply with the relevant principal laws, by-laws and guidelines issued for development of such a project within the jurisdiction of Ministry of Public Health and Sanitation, Directorate of Occupational Health and Safety Services, Turkana and Pokot County Councils, Ministry of Energy, Ministry of Lands and other relevant Authorities.
- 3.6. The proponent shall ensure that environmental protection facilities or measures to prevent pollution and ecological deterioration such as cleaner production technique, soil water and vegetation protection, waste management plan, emergency response plan, spill prevention and response plan, environmental awareness, occupational health and safety plan are designed, constructed and employed simultaneously with the proposed project.

### **4. Notification Conditions**

- 4.1. The proponent shall notify the Authority the project start date at lease one week earlier.
- 4.2. The proponent shall seek written approval from the Authority for any operational changes under this licence
- 4.3. The proponent shall ensure that the Authority is notified of any malfunction of any system within 12 hrs on the NEMA hotline 020 6006041 and mitigation measures put in place
- 4.4. The proponent shall keep records of all pollution incidences & notify the Authority within 24 hrs.
- 4.5. The proponent shall notify the Authority of its intent to decommission three months in advance in writing.

### **5. Decommissioning Conditions**

- 5.1. The proponent shall ensure that a decommissioning plan is submitted to the Authority for approval at least three (3) months prior to decommissioning
- 5.2. The proponent shall ensure that all pollutants and polluted material is contained and adequate mitigation measures provided during the phase.

A handwritten signature in black ink, consisting of a large, stylized 'S' or 'Z' shape followed by a series of vertical strokes and a final loop.

