

Reconnaissance Energy Namibia (Pty) Ltd

Final Environmental Impact Assessment (EIA) Report
Vol. 2 of 3 to Support the Application for Environmental
Clearance Certificate (ECC) for the Proposed Petroleum
(Oil and Gas) Exploration Operations (Drilling of Multiple
Stratigraphic Wells) in the Petroleum Exploration
License (PEL) No. 73 covering Blocks 1719, 1720,
1721, 1819, 1820 and 1821,
KAVANGO BASIN, KAVANGO WEST AND EAST
REGIONS, NORTHERN NAMIBIA

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June 2019

OPERATOR

Reconnaissance Energy Namibia (Pty) Ltd Subsidiary of
Reconnaissance Energy Africa Ltd (ReconAfrica)

LICENSE PEL 73

Blocks 1719, 1720, 1721, 1819, 1820 and 1821

WORKING INTERESTS

ReconAfrica owns 90%
National Petroleum Corporation of Namibia (Namcor)
(A State Owned Company) 10% with costs carried to the development stage

TYPE OF PETROLEUM EXPLORATION OPERATIONS

Drilling of Multiple Stratigraphic Wells Two (2) to Three (3)

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CITATION: *Risk-Based Solutions (RBS), 2019. Environmental Impact Assessment (EIA) Report, Vol. 2 of 3 Report to Support the Application for Environmental Clearance Certificate (ECC) for the Proposed Petroleum Exploration Operations (Drilling of Stratigraphic Wells) in Petroleum Exploration License (PEL) 73 Covering Blocks 1719, 1720, 1721, 1819, 1820 and 1821, Etosha Basin, Kavango West and East Regions, Northern Namibia.*

STATEMENT OF QUALIFICATIONS / SUMMARY CV /PROFILE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP) – DR. SINDILA MWIYA

Dr. Sindila Mwiya has more than eighteen (18) years of direct technical industry experience in Environmental Assessment (SEA, EIA, EMP, EMS), Energy (Renewable and Non-renewable energy sources), onshore and offshore resources (minerals, oil, gas and water) exploration / prospecting, extraction and utilisation, covering general and specialist technical exploration and production support, Health, Safety and Environment (HSE) permitting for Geophysical Surveys such as 2D and 3D Seismic and Gravity Surveys for mining and petroleum (oil and gas) operations support, through to engineering planning, layout, designing, logistical support, recovery, production / operations, compliance monitoring, rehabilitation, closure and aftercare projects lifecycles.

Through his companies, Risk-Based Solutions (RBS) and Foresight Group Namibia (FGN) (Pty) Ltd, which he founded, he has undertaken more than 200 projects for local, regional (SADC) and international clients. He continues to work for global reputable resources (petroleum and mining / minerals) and energy companies such as BW Offshore (Singapore), Shell Namibia B. V. Limited (Namibia/ the Netherlands), Tullow Oil (UK), Debmarine (DBMN) (Namibia), Reconnaissance Energy Africa Ltd (ReconAfrica) (UK/Canada), Osino Resource Corporation (Canada/Germany/Namibia), Desert Lion Energy Corporation (Canada/ Australia), Petrobras Oil and Gas (Brazil) / BP (UK), REPSOL (Spain), ACREP (Namibia/Angola), Preview Energy Resources (UK), HRT Africa (Brazil / USA), Chariot Oil and Gas Exploration (UK), Serica Energy (UK), Eco (Atlantic) Oil and Gas (Canada / USA), ION GeoVentures (USA), PGS UK Exploration (UK), TGS-NOPEC (UK), Maurel & Prom (France), GeoPartners (UK), PetroSA Equatorial Guinea (South Africa / Equatorial Guinea), Preview Energy Resources (Namibia / UK), Sintezneftegaz Namibia LTD (Russia), INA Namibia (INA INDUSTRIJA NAFTE d.d) (Croatia), Namibia Underwater Technologies (NUTAM) (Namibia), InnoSun Holding (Pty) Ltd (Namibia / France) and OLC Northern Sun Energy (Pty) Ltd (USA /Namibia). Dr. Sindila Mwiya is highly qualified with extensive experience in petroleum, mining, renewable energy (Solar, Wind, Biomass, Geothermal and Hydropower), Non Renewable energy (Coal, Petroleum, and Natural Gas), applied environmental assessment, management and monitoring (Scoping, EIA, EMP, EMP, EMS) and overall industry specific HSE, cleaner production programmes, geoenvironmental, geological and geotechnical engineering specialist fields.

Dr. Sindila Mwiya has undertaken and continues to undertake and manage high value projects on behalf of global and local clients with the single biggest project executed recently valued at NAD4.9 Billion. Currently, (2019-2021) Dr. Sindila Mwiya is responsible for permitting planning through to completion compliance monitoring for four (4) major upstream petroleum operations valued at NAD4.2 Billion for three (3) of our global clients operating in Namibia and other parts of the World. He continues to work as an Environmental Assessment Practitioner (EAP), Technical Consultant (RBS / FGN), Project Manager and has worked as a Lecturer (University of Namibia- UNAM), External Examiner/ Moderator (Namibia University of Science and Technology-NUST), National (Namibia) Technical Advisor (Directorate of Environmental Affairs, Ministry of Environment and Tourism / DANIDA – Cleaner Production Component) and Chief Geologist for Engineering and Environment Division, Geological Survey of Namibia, Ministry of Mines and Energy and a Field-Based Geotechnician (Specialised in Magnetics, Seismic, Gravity and Electromagnetics Exploration and Survey Methods) under the Federal Institute for Geoscience and Natural Resources (BGR) German Mineral Exploration Promotion Project to Namibia, Geophysics Division, Geological Survey of Namibia, Ministry of Mines and Energy.

He has supervised and continues to support a number of MScs and PhDs research programmes and has been a reviewer on international, national and regional researches, plans, programmes and projects with the objective to ensure substantial local skills development pivotal to the national socioeconomic development through the promotion of sustainable natural resources coexistence developmental approaches, utilisation, management and for development policies, plans, programmes and projects financed by governments, private investors and donor organisations. Since 2006, he has provided extensive technical support to the Department of Environmental Affairs (DEA), Ministry of Environment and Tourism (MET) through GIZ and continues to play a significant role in the amendments of the Namibian Environmental Management Act, 2007, (Act No. 7 of 2007), preparation of new Strategic Environmental Assessment (SEA) Regulations, preparation of the updated Environmental Impact Assessment (EIA) Regulations as well as the preparation of the new SEA and EIA Guidelines and Procedures all aimed at promoting effective environmental management practices.

Among his academic achievements, Dr Sindila Mwiya is a holder of a PhD (Geoenvironmental Engineering and Artificial Intelligence) – Research Thesis: Development of a Knowledge-Based System Methodology (KBSM) for the Design of Solid Waste Disposal Sites in Arid and Semi-arid Environments (Namibia)), MPhil/PG Cert and BEng (Hons) (Engineering Geology and Geotechnics), qualifications from the University of Portsmouth, School of Earth and Environmental Sciences, United Kingdom. During the 2004 Namibia National Science Awards, organised by the Namibian Ministry of Education, and held in Windhoek, Dr. Sindila Mwiya was awarded the Geologist of the Year for 2004, in the professional category. Furthermore, as part of his professional career recognition, Dr. Sindila Mwiya is a life member of the Geological Society of Namibia, Consulting member of the Hydrogeological Society of Namibia and a Professional Engineer registered with the Engineering Council of Namibia.

**WINDHOEK
JUNE 2018**

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LIST OF ACRONYMS

AOD	Aquifer Confinement Overburden
APV	Aquifer pollution vulnerability
BGWP	Base of Groundwater Protection
CSR	Corporate Social Responsibilities
DEA	Department of Environmental Affairs
DWA	Department of Water Affairs
EA	Environmental Assessment
EC	Environmental Commissioner
ECC	Environmental Clearance Certificate
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GRN	Government of the Republic of Namibia
I & APs	Interested and Affected Parties (Stakeholders)
KAZA TFCA	Kavango Zambezi Transfrontier Conservation Area
Mamsl	Meters Above Mean Sea Level
MME	Ministry of Mines and Energy
MSS	Ministry of Safety and Security
MWAF	Ministry of Water Affairs and Forestry
MET	Ministry of Environment and Tourism
NAD	Namibia Dollar (N\$)
Namcor	National Petroleum Corporation of Namibia
PA	Petroleum Agreement
PEL	Petroleum Exploration License
RBS	Risk-Based Solutions
ReconAfrica	Reconnaissance Energy Africa Ltd
SOE	State Owned Enterprises
TD	Total Depth
ToR	Terms of Reference
TDS	Total Dissolved Solids
VAT	Value Added Tax

NON TECHNICAL SUMMARY

1. Background

Reconnaissance Energy Namibia (Pty) Ltd (the proponent) and subsidiary of Reconnaissance Energy Africa Ltd (ReconAfrica) holds 90% interest in the petroleum exploration rights under the Petroleum Exploration License (PEL) No. 73 covering the latitude and longitude degree square Blocks 1719, 1720, 1721, 1819, 1820 and 1821. The remaining 10% is held by National Petroleum Corporation of Namibia (Namcor), a State owned company (Parastatal) with costs carried to the development stage. Reconnaissance Energy Namibia (Pty) Ltd is the operator of the license situated in the Kavango Basin which is the eastern extension of the greater Etosha Basin in northern Namibia and the greater Kalahari Basin of Southern Africa. PEL 73 cover parts of the Kavango West and Kavango East Regions of northern Namibia.

In accordance with the provisions of the Petroleum Agreement (PA) signed between the Ministry of Mines and Energy (MME) representing the Government of the Republic of Namibia (GRN) and Reconnaissance Energy Namibia (Pty) Ltd, Reconnaissance Energy Namibia (Pty) Ltd has committed to undertaking exploration activities including the drilling of multiple stratigraphic wells within the license area in order to evaluate the subsurface geology and petroleum systems with potential for oil and / or natural gas occurrences within the license area. A total of eight (8) potential wells drilling locations were initially identified and only two (2) well locations numbers 5-6 and 6-2 falling within Blocks 1819 and 1820 will initially be drilled. Depending on the results of the proposed two (2) initial wells drilling outcomes, other localities may also be drilled in future.

2. Summary of the Proposed Activities

The company intends to drill two (2) stratigraphic Petroleum (oil and gas) wells and the drilling is scheduled to start in the last quarter (Q4) of 2019 between the months of October and December 2019. The proposed drilling operations will be undertaken using a land-based, drilling rig similar, but bigger than a standard water drilling rig platform. The various components of the rig will be transported to site by a truck and the rig will be built onsite. After drilling completion, the rig will be disassembled and the various components will be packed and transported to the next drilling location or final destination. The likely key sources of negative environmental (physical, biological and socioeconomic/cultural/ archaeological) impacts can be divided into two (2) main categories and these are:

(1) Routine and physical presence operational activities:

- (i) Pre-construction and drilling requirements;
- (ii) Construction;
- (iii) Mobilisation;
- (iv) Spudding and Conductor casing;
- (v) Drilling surface / intermediate and setting casing and cementing process through up 900 m;
- (vi) Drilling and continuous coring from 900 meters (2953') to 1900 meters (6234');
- (vii) Drilling below 1900 meters to total depth, estimated at 2500 meters (+/-8202');

- (viii) Plug and abandon hole;
- (ix) Rehabilitate all surface disturbances and clear the site of any debris, and;
- (x) Camp removal, site closure / abandonment.

(2) Unplanned accidental events:

- (i) Major land accidental incidence such as diesel / oil spill / fire / explosion.

A standard single well site for conventional onshore oil or gas drilling will typically affect a surface area measuring 150 m by 150 m. The well site will typically hold the drilling rig and additional equipment along with supervisory accommodation and material storage. Once drilling is completed the affected area will be reclaimed to minimise surface disturbance. To prepare for the drilling operations, the existing access road may require to be upgraded and vegetation around the proposed well sites will be cleared and ground levelled. A grader will be required to upgrade and level the existing tracks in order to accommodate for the transportation of heavy truck-mounted drill rig as well as other supply truck that will be services the operations.

A bulldozer and a grader combined with labour-based manpower where it exists, will be used to create new access roads to the drilling localities and around the actual drilling sites. Careful consideration will be given to the sensitivities of the receiving environment including: not cutting down of larger trees and protected flora as well as being on a look out for possible unexploded ordinances that may be buried. The scale and duration of site preparation is site-specific and may last for few hours to a couple of days.

3. Regulatory Requirements

The proposed oil and gas stratigraphic well drilling activities are listed in the Environmental Management Act, 2007 (Act No. 7 of 2007) and Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 and cannot be undertaken without an Environmental Clearance Certificate (ECC). The company is required to have undertaken Environmental Assessment (EA) and preparation of the Environmental Scoping, Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP) reports in order to support the application for ECC. Reconnaissance Energy Namibia (Pty) Ltd as the proponent and operator of the license area has appointed Risk-Based Solutions (RBS) CC as the environmental consultant to apply for the ECC for the proposed drilling operations in PEL 73.

This Environmental Impact Assessment (EIA) Report Vol. 2 of 3 has been prepared by Risk-Based Solutions (RBS) CC on behalf of the proponent in order to fulfil the environmental requirements with respect to the proposed drilling operations in PEL 73. The purpose of this Scoping Report is to identify key environmental issues to be covered in the Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP).

4. Summary of the Baseline Environment

The general area of PEL 73 comprise sandy terrain with topographic setting averaging around 1115 m above mean sea level with gently adulating and mature forested Kalahari Longitudinal Dune Belts aligned in east west direction. The temperatures are highest on average in November, at above 26°C and the annual rainfall within the PEL 73 is around 588 mm. The rainy season is from November to April. The well locations 5-6 and 6-2 falls in the Ncamangoro and Mashare Constituencies of the Kavango West and East Regions, respectively. Ncamangoro Mashare Constituencies falls within the boundaries of the Mbunza and Sambyu

Traditional Authorities, respectively. Overall, the proposed well locations are situated in a remote and sparsely populated areas with limited skills base. The project area is accessible via the D3425 Gravel Road from Rundu to Ncaute. Alternatively, from Grootfontein along tarred B8 Road to Rundu until the northern fence of the Mangetti National Park boundary and turn right into the straight sandy track linking the D3425 to the B8 tarred Road (4 x 4 Only).

The highest population density in the area is concentrated along the D3425 along the Omatako Ephemeral River Channel. Increasingly, however, forested communal land is also being allocated to the local people on leaseholds who in turn are fencing some of this land making it difficult to access in some area due to the fences. The main economic activities of the area are: Subsistence agriculture, mainly small-scale millet (mahangu) farming, timber harvesting including community forestry resources and tourism. Livelihoods are thus considerably diversified, with residents relying also on wages and salaries, pensions, Government monthly grants and cash remittances. Source of water supply in the project area is groundwater with recharge linked to the Omatako Ephemeral River Channel.

In terms of fauna and flora, the general project is estimated to have at least 67 species of reptile, 32 amphibian, 116 mammal, 210 bird species (breeding residents), at least 107 species of larger trees and shrubs (>1m in height) and up to 111 species of grasses are known to or expected to occur in the general PEL 73 area.

With well known pre-colonial farming settlements with links to historical and modern cultural heritages, both the Kavango East and West Regions and the general surrounding license area is likely to hold archaeological resources. Based on the results of field-based assessment that has been undertaken, the local drilling sites falls within undisturbed forested areas with no signs of historical or modern archaeological / cultural resources.

The over utilisation of the natural resources such as illegal logging, wood and grasses for rural housing and homestead / communal farms fencing, unseasonal and too frequent fires, poaching, subsistence agriculture of slash and burn as well as the clearing for the ever increasing settlements in key habitat areas including pristine forested areas that are now being allocated to the local communities as new leaseholds are some of the biggest problems facing the fauna and flora in the Kavango West and Kavango East Regions.

5. Public and Stakeholder Consultation

Public and stakeholder consultations process covering all the Interested and affected Parties (I&APs) were conducted during the months of March and May 2019. Copies of the Environmental Assessment Reports were distributed to the following key the institutional stakeholders including the Offices of the Governors of Kavango West and Kavango East Regions as well as the Ministry of Safety and Security (MSS) in both regions with respect to the assessment of unexploded ordnances around the proposed drilling localities. Well attended public /stakeholder meetings were held in Nkurenkuru, Kavango West Region and Rundu, Kavango East Regions on the 9th and 10th May 2019 respectively.

Overall, the proposed project activities has received greater positive support from I&APs because if the results of the proposed petroleum drilling operations proves positive, it will tremendous and positively transform the local, regional and national socioeconomic landscapes of Kavango West Region, Kavango East Region and Namibia as whole. As part of the Corporate Social Responsibilities (CSR), it's hereby recommended that the drilling of water boreholes to supply water for the proposed oil and gas drilling operations be considered by Reconnaissance Energy Namibia (Pty) Ltd. The new water boreholes shall be equipped with cattle drinking points and a veterinary vaccination fence and handed over to the Regional Councils on completion of the drilling operation for use by all the local communities. The de-

bushing and widening of the sandy track road linking the D3425 to the B8 tarred Road from Grootfontein to Rundu for the benefits of the wider local rural community shall also be considered if CSR financial resources are available.

In addressing the potential risk for unexploded ordinances around the project area, Reconnaissance Energy Namibia (Pty) Ltd shall prepare detailed maps of the drilling locations areas of interest showing access passing through untouched areas, drilling locations and all supporting areas such as the campsite. The maps shall be provided to the Regional Commander Kavango West Region, Chief Inspector Ithete, Namibian Police, Ministry of Safety and Security (MSS) in order for the explosive team to be able to go in field and undertake detailed field-based site-specific surveys of the areas of interest before drilling mobilisation can be implemented. Reconnaissance Energy Namibia (Pty) Ltd exploration team shall accompany the Namibian Police Explosive team when conducting the field-survey in order to make sure that key areas of interest are cleared.

Whenever a project team goes to the field as part of the preparatory, implementation, operation, closure or abandonment the political (Governors and local Councillors) and traditional leaders of the Kavango West and East Regions shall be informed and kept updated on the progress.

6. Alternatives and Impact Assessment Results

Alternatives to the proposed project activities have been considered and included: The location of the proposed drilling locations, safety and security requirements, existing supporting infrastructure, land use, visual effects, source of fresh water supply, sources of energy, solid and liquid waste management, sources of labour and the no action / no drilling options. Components of the receiving environment (physical, biological, socioeconomic, cultural and archaeological) that have been evaluated and assessed with respect to the proposed drilling operations have been grouped as follows:

- ❖ **Physical environment** (Water quality, physical infrastructure and resources, air quality, noise and dust, landscape and topography, soil quality, and Climate change influences);
- ❖ **Biological environment** (Habitat, protected areas and resources, flora, fauna and ecosystem functions, services, use values and non-use or passive use), and;
- ❖ **Socioeconomic, cultural and archaeological environment** (Local, regional and national socioeconomic settings, subsistence agriculture, community forestry, tourism and recreation and cultural, biological and archaeological resources).

The following is the summary of the impact assessment results of the key components of the receiving environment:

1. Fauna and Flora: Campsite and drilling site physical disturbances, vehicles movements and actual drilling operations may affect the local fauna and the flora (*Assessment of negative Impacts localised Low, Significant Impact: Negligible*);
2. Water Pollutions: In the context of the impact assessment of the risk posed by the proposed oil and gas exploration drilling in the study area, it is concluded that most of the risk categories are *moderate to negligible* if proposed measures are adhered to. However, the risks associated with: aquifer pollution vulnerability, impacts due to contaminated water discharge, impacts due to tank bursts or/and pipe breaks and that associated with impacts due to backwash water have high to moderate impacts with regard to water resources negative impacts in the study area. The exploration hole will

be materially isolated from the rest of its immediate surrounding by cement casing/grouting and properly closed on top; else total plugging of the exploration hole is recommended;

3. Noise and Dusts Generation – The proposed operations are likely to generate noise and dust from the campsite and drilling site physical disturbances, vehicles movements and actual drilling operations. Vehicle and other related noise will be limited around the operations based with no existing background noises (*Assessment of negative Impacts localised Low, Significant Impact: Negligible*);
4. Air Emissions: The main sources of air emissions are likely to be from combustion fuels from the vehicles, generators, and other equipment, vehicles and fugitive emissions (*Assessment of negative Impacts Localised Low, Significant Impact: Negligible*);
5. Solid Waste management: Although very limited for a very short period of time, various types of wastes are likely to be generated mainly around the proposed campsite and drilling locations. Waste management will not be an issue because necessary facilities and containers for waste management will be provided (*Assessment of negative Impacts Low, Significant Impact: Negligible*);
6. Liquid Waste management: Generated mainly around the proposed campsite and drilling locations. Liquid waste management will not be an issue because chemical toilets will be provided (*Assessment of negative Impacts Low, Significant Impact: Negligible*), and;
7. General Disturbances / Cultural and Social: Cultural Social issues will need to be considered seriously because the proposed survey area fall largely in communal land with different traditional authorities. However, the actually drilling locations do not have villages close nearby and the actual drilling locations are not fixed and can be shifted as maybe required (*Assessment of negative Impacts Localised Low, Significant Impact: Negligible*).

7. Conclusion and Recommendations

The overall significance negative impacts that the proposed project activities will have on the receiving environmental will be localised, temporally for the duration of the drilling operations and will be of low significance without mitigations and negligible with mitigations.

Based on the findings of this Environmental Assessment covering Environmental Scoping and Environmental Impact Assessment (EIA), it's hereby recommended that the proposed stratigraphic multi-well drilling operations in the PEL No. 73 covering Blocks 1719, 1720, 1721, 1819, 1820 and 1821 be issued with an new Environmental Clearance Certificate with the following key conditions:

- (i) The proponent must adhere to the provisions of all national legislation, regulations, policies, procedures and permits / authorisation requirements;
- (ii) The proponent shall adhere to all the provisions of the EMP and mitigation measures must be implemented and monitored as detailed in EMP Report Vol. 3 of 3, and;
- (iii) Villages / settlements and communal crop fields shall be avoided when choosing the access route, camp site, water well location and actual drilling location. A distance of 500 m to 1 km is hereby recommended between any local villages / settlements and the campsite / drilling locality.

1. BACKGROUND TO THE PROJECT

1.1 Introduction

Reconnaissance Energy Namibia (Pty) Ltd (the Proponent and Operator) holds petroleum exploration rights under the Petroleum Exploration License (PEL) No. 73 covering Blocks 1719, 1720, 1721, 1819, 1820 and 1821. Reconnaissance Energy Namibia (Pty) Ltd, is a subsidiary of Reconnaissance Energy Africa Ltd (ReconAfrica), a public listed company in Canada and United Kingdom. The company intends to drill stratigraphic multi-wells within license area and starting with the two (2) well locations Nos. 5-6 and 6-2 to be drilled to a Total Depth (TD) of about 2500 m (2.5 km).

The overall aim and objective of the proposed stratigraphic multi-wells drilling operations is to study the geology and petroleum systems of the PEL 73 and in particular, the potential for both large scale conventional and non-conventional play types within the Kavango Basin. Depending on the outcomes of the proposed initial drilling operations, additional drilling operations may be undertaken within the license area.

1.2 Petroleum Exploration License (PEL) No. 73

ReconAfrica through its wholly owned subsidiary Reconnaissance Energy Namibia (Pty) Ltd owns 90% interest in Petroleum Exploration Licence 73 covering the Kavango Basin in northeast Namibia, pursuant to a Petroleum Agreement signed between the company and the Namibian Ministry of Mines and Energy (MME) representing the State. The National Petroleum Corporation of Namibia (Namcor), a State owned company (Parastatal) holds the remaining 10% interest in the Licence, with its costs carried to the development stage. The Licence has an exploration period comprising three phases, ending 29th January 2024, or if extensions are requested and granted, ending 29th January 2026.

Following declaration of a commercial discovery, the Petroleum Agreement entitles ReconAfrica to a production licence having a 25 year term. The fiscal terms of the Petroleum Agreement call for a 5% royalty, and an additional profits tax that applies late in the life of a producing field. ReconAfrica's Namibian subsidiary, Reconnaissance Energy Namibia (Pty) Ltd, is required to pay Namibian corporate income tax of 35%.

1.3 Project Location

The exploration licence covers an area of approximately 25,341.33 sq km (6.3 million acres), and based on commercial success. PEL No. 73 covering Blocks 1719, 1720, 1721, 1819, 1820 and 1821 falls within the Kavango Basin forming part of the greater Etosha Basin of northern Namibia and Kalahari Basin of Southern Africa (Figs. 1.1 -1.3). PEL 73 is situated in Kavango West and East Regions of northern Namibia (Figs. 1.3 and 1.4). A total of eight (8) potential well drilling locations have identified in Blocks 1819 and 1820 but only two (2) locations (Wells locations 5-6 and 6-2) will be drilled first to be followed by additional drilling if the initial results proves positive (Fig. 1.5).

The proposed well drilling locations 5-6 and 6-2 falls in the Ncamangoro and Mashare Constituencies of the Kavango West and East Regions, respectively (Fig. 1.5). Ncamangoro Mashare Constituencies falls within the boundaries of the Mbunza and Sambyu Traditional Authorities, respectively.



Figure 1.1: Regional location of PEL No. 73 covering Blocks 1719, 1720, 1721, 1819, 1820 and 1821 (Source: Risk-Based Solutions, 2015).

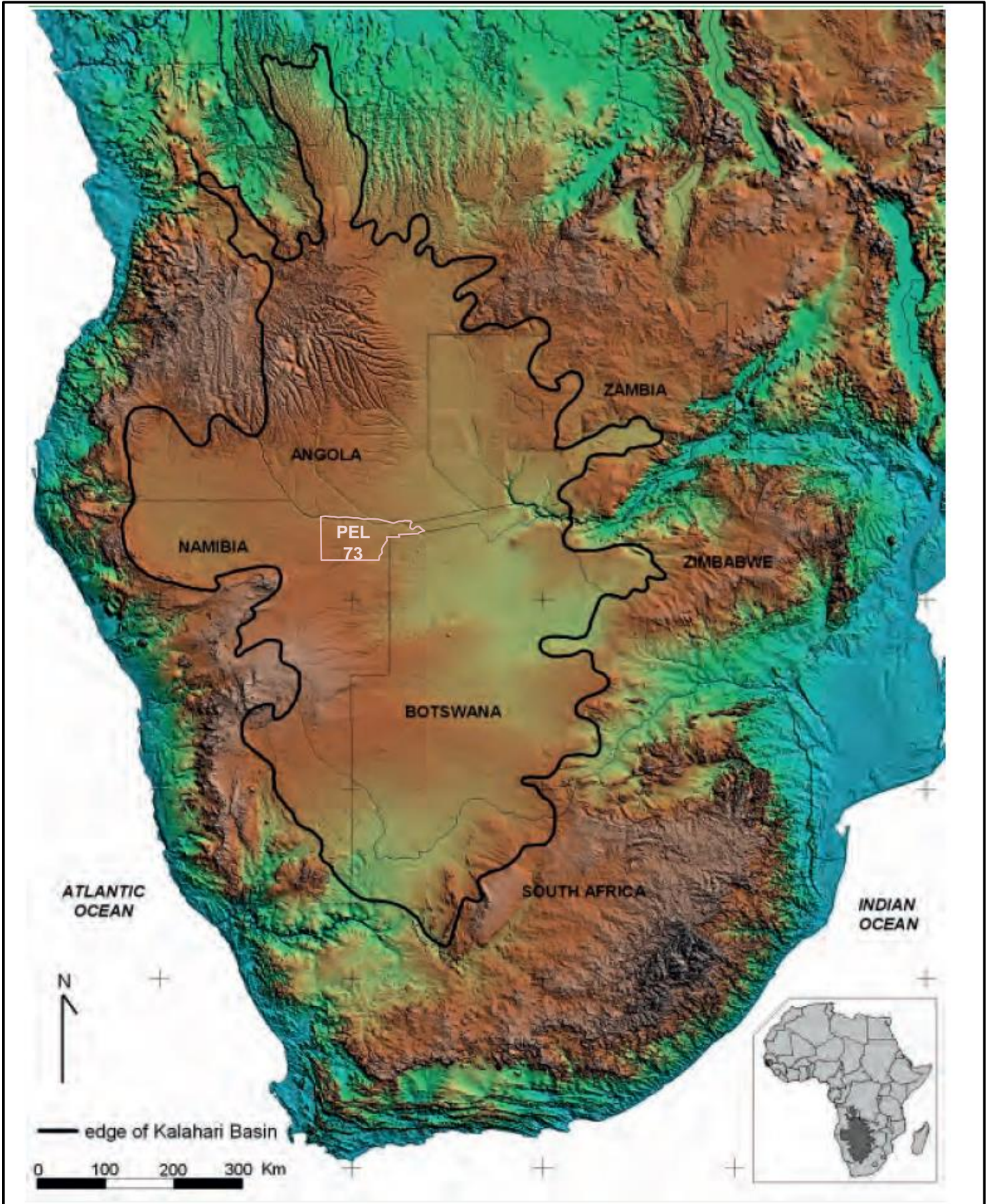


Figure 1.2: Lateral extent of Kalahari Group sediments (Source: Haddon, 2005)

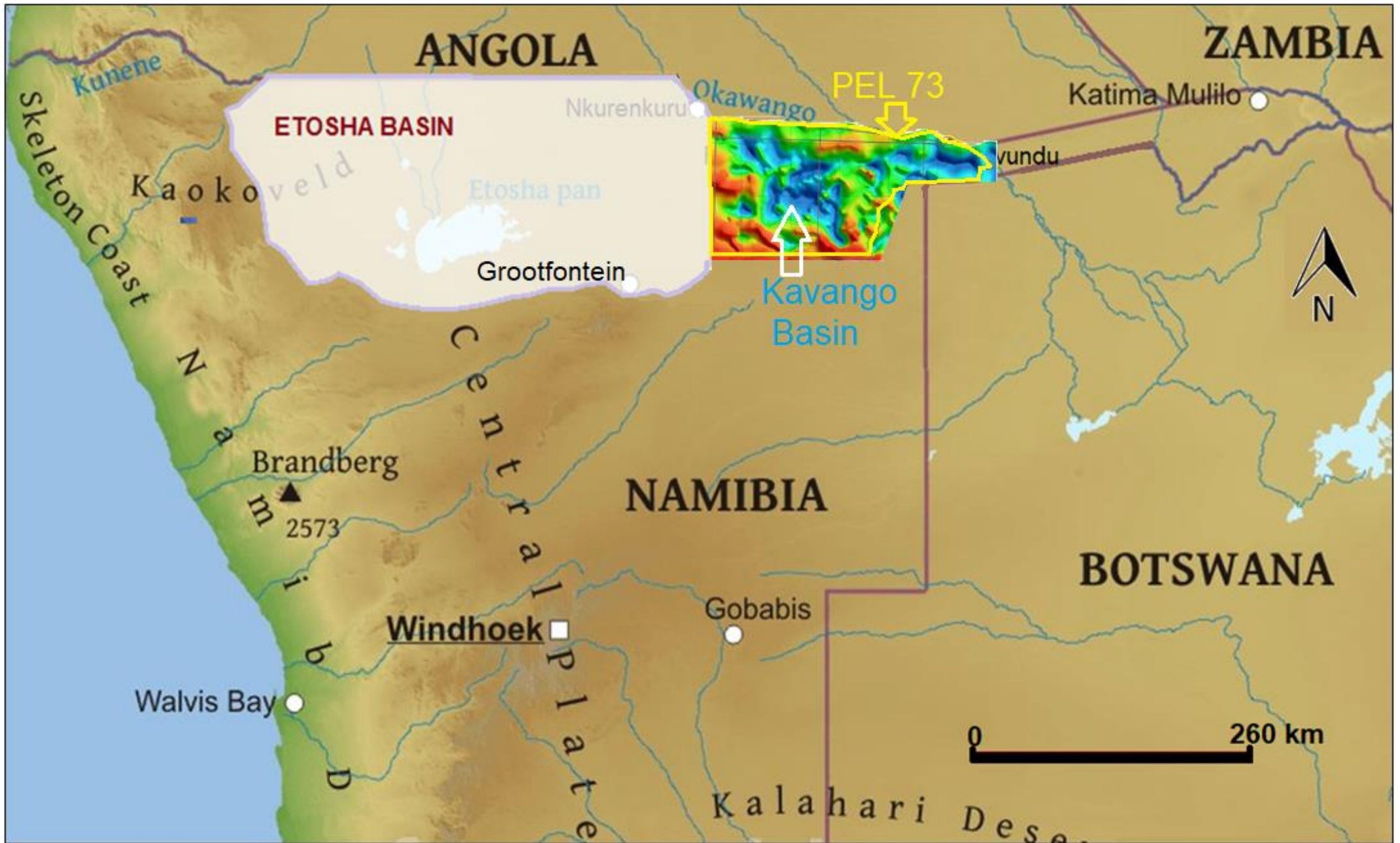


Figure 1.3: The Kavango Basin in north-eastern Namibia showing the location of the PEL 73 covering 1719, 1720, 1721, 1819, 1820 and 1821 (Source: www.freeworldmaps.net).

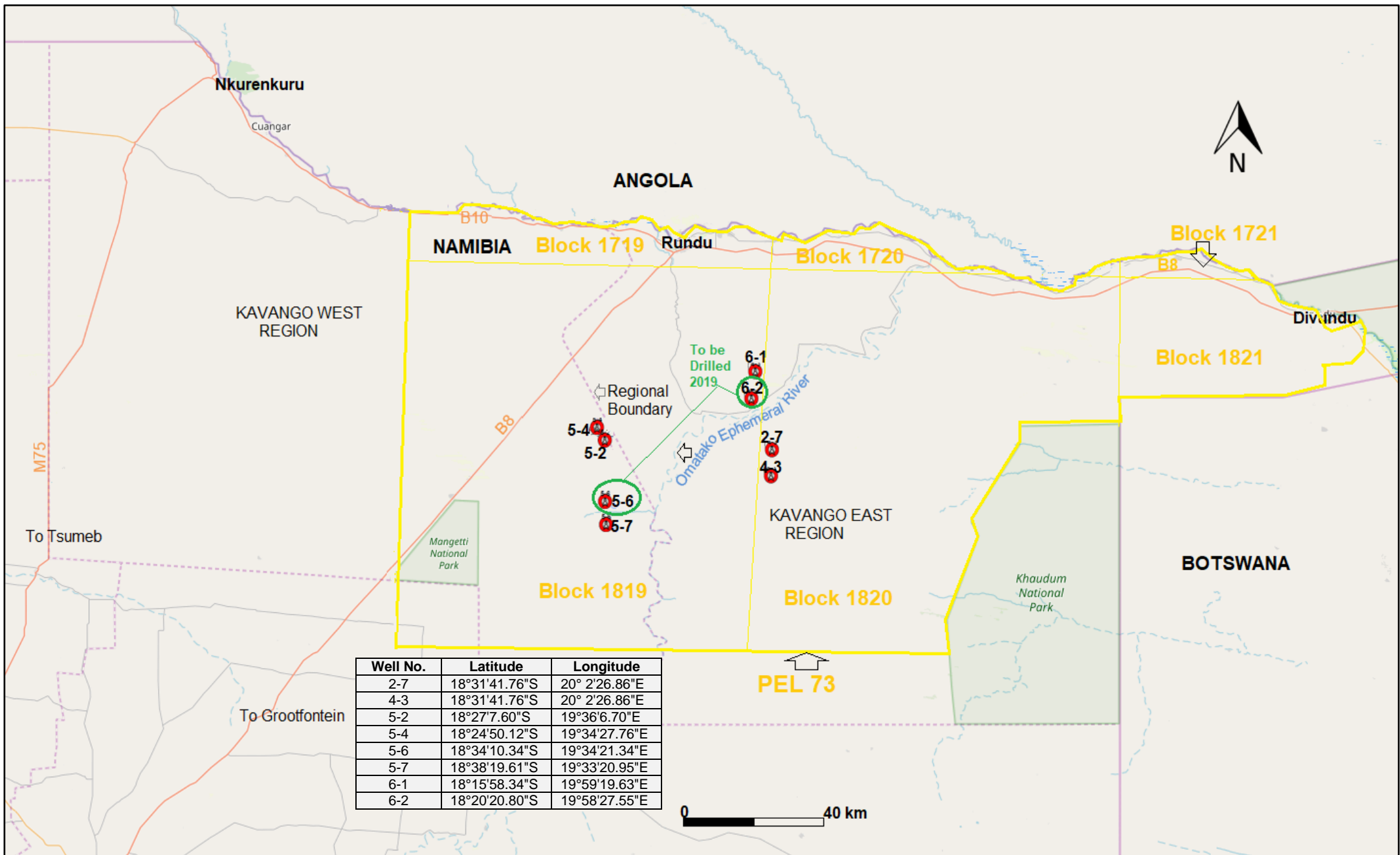


Figure 1.4: Kavango West and Kavango East Regional boundary and the wells locations (Data Source: www.mme.gov.na and Reconnaissance Energy Namibia, 2019).

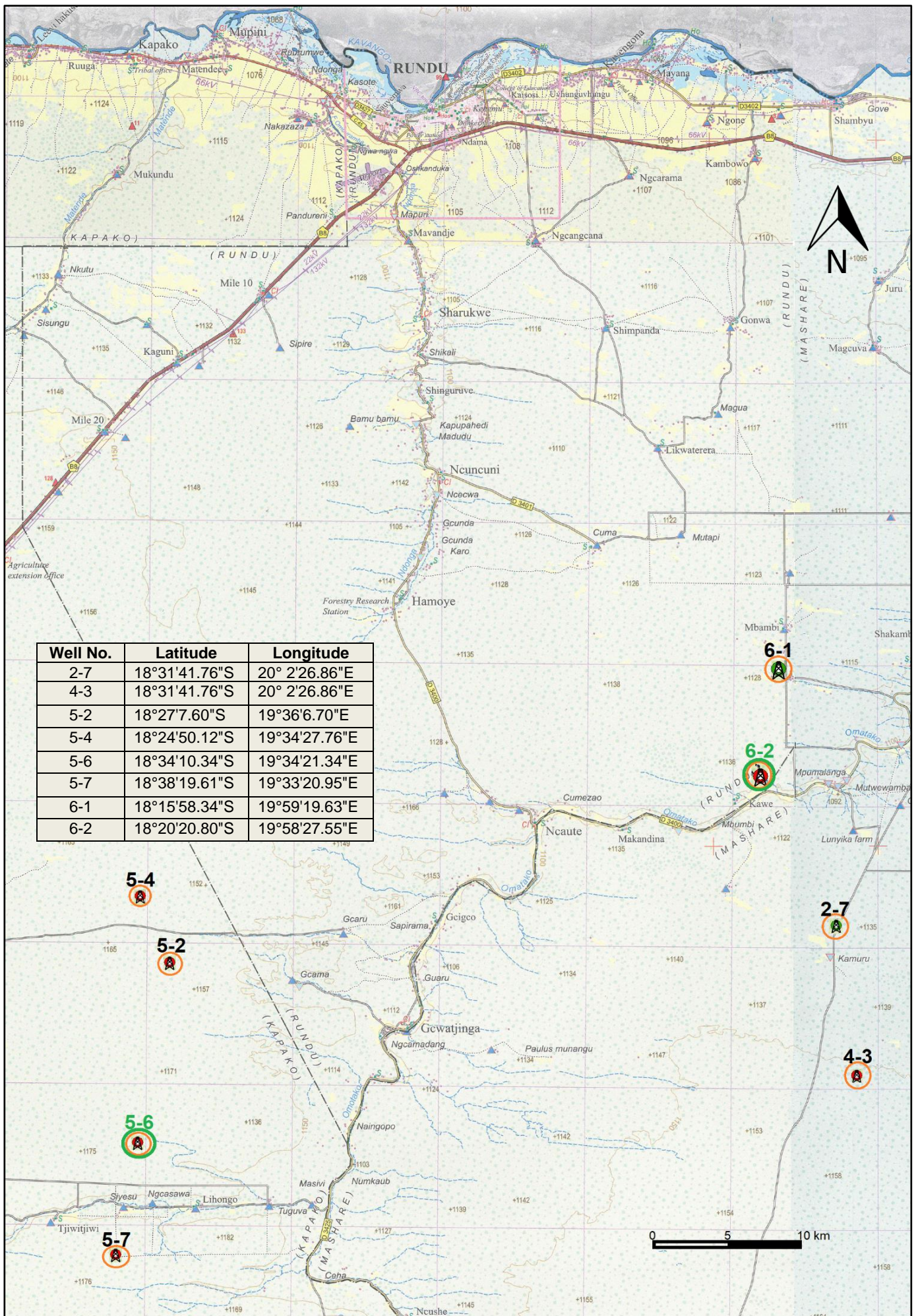


Figure 1.5 Detailed well locations (Source: Extract from the 1: 250000 Map Sheet, Namibia Survey General, 2002).

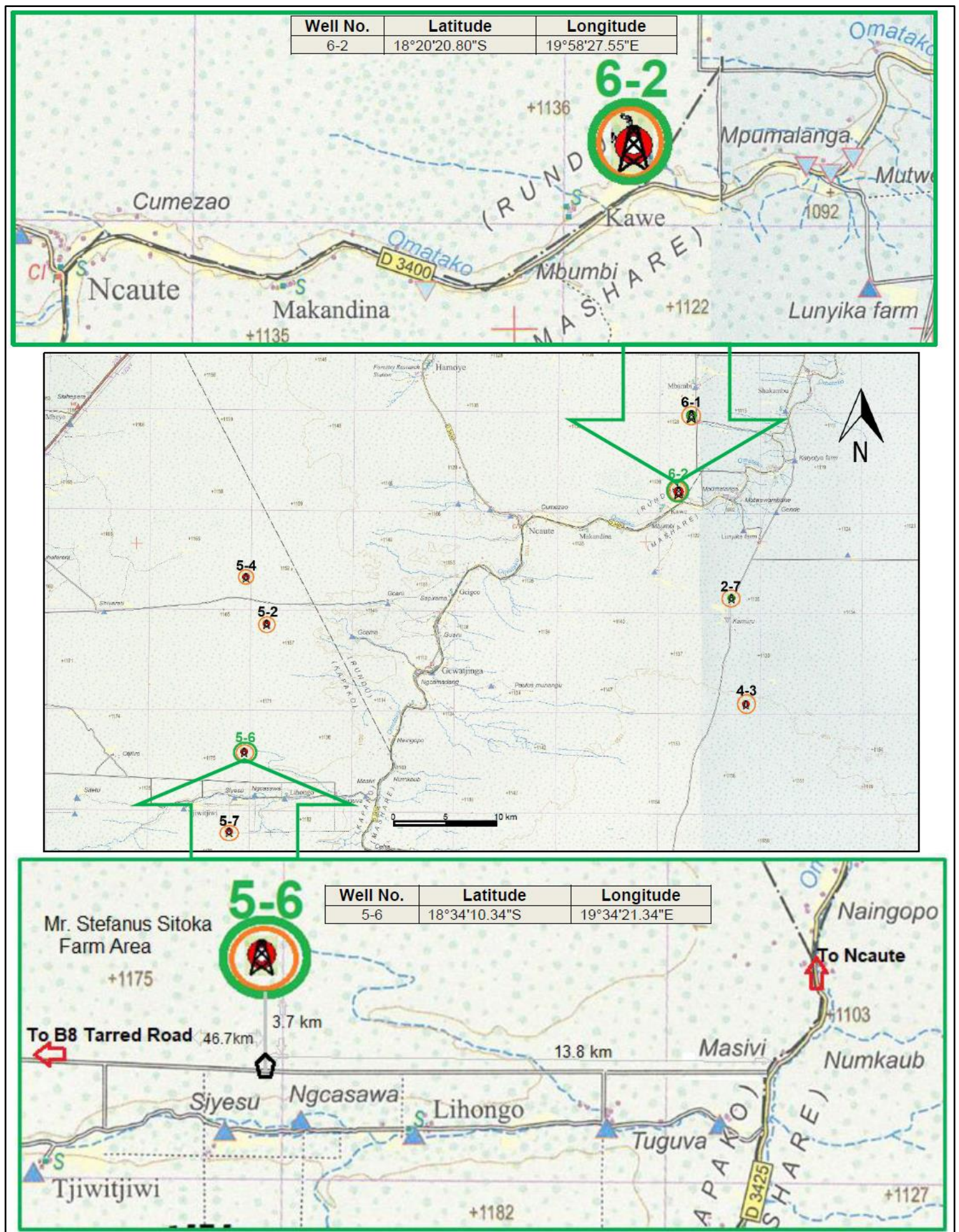


Figure 1.6 Enlarged detailed well locations 5-6 and 6-2 (Source: Extract from the 1: 250000 Map Sheet, Namibia Survey General, 2002).

1.4 Access to the Drilling Locations 6-2 and 5-6

1.4.1 Overview

The following is the summary of the local access to the two (2) initial targeted drilling locations 6-2 and 5-6 as shown in Figs. 1.6 and 1.7):

- (i) **The drilling location 6-2:** From Grootfontein along the B8 tarred road to Rundu drive for 253 km (2.5 km before the turn-off from the B8 into the Town of Rundu). Turn right into the D3425 gravel road to Ncaute which is 55.4 km away (Plate 1.1). Just before Ncaute settlement turn left into the excellent gravel road D3400 towards Makandena for 18 km (Plates 1.2 - 1.4). There is an existing 500 m long access track coming off the D3400 road (Plate 1.5 and Figs. 1.6 and 1.7). The drilling location is situated about 500 m to the north off the D3400 road (Plate 1.6).

Alternatively, from Grootfontein along tarred B8 Road to Rundu, drive for 156 km until the northern fence of the Mangetti National Park boundary (Fig. 1.7). Turn right into the straight sandy track parallel to the Park boundary fence and drive for 61 km along this track linking the D3425 to the B8 tarred Road from Grootfontein to Rundu to the location 18° 36" 08.51" S, 19° 42" 02.69" E and turn left at this location into D3425 road and drive for 35 km to Ncaute following the Omatako Ephemeral River Channel (Plates 1.7-1.9 and Figs. 1.6 and 1.7). Just after Ncaute settlement, turn right into the excellent gravel road D3400 towards Makandena for 18 km. The drilling location is situated about 500 m to the north off the D3400 road with an existing sandy track coming off the D3400 gravel road (Plate 1.6 and Figs. 1.6 and 1.7);

- (ii) **The drilling location 5-6:** From Grootfontein along the B8 tarred road to Rundu drive for 253 km (2.5 km before the turn-off from the B8 into the Town of Rundu) (Fig. 1.7). Turn right into the D3425 gravel road to Ncaute which is 55.4 km away (Plates 1.1 and 1.2). Along the D3425 road from Ncaute following the Omatako Ephemeral River Channel, drive for 35 km up to location 18° 36" 08.51" S, 19° 42" 02.69" E right turn. Turn right into the straight sandy track linking the D3425 to the B8 tarred Road from Grootfontein to Rundu (Plates 1.7 -1.9). Drive for 13.8 km to the location 18° 36" 07.41" S, 19° 34" 13.31" E and turn right at this location into a newly cleared private farm access of Mr. Stefanus Sitoka (Plates 1.10 - 1.12 and Figs. 1.6 and 1.7). The drilling location area 5-6 is about 3.7 km from this junction towards the north (Plate 1.13).

Alternatively, from Grootfontein along tarred B8 Road to Rundu, drive for 156 km until the northern fence of the Mangetti National Park boundary (Plate 1.9 and Fig. 1.7). Turn right into the straight sandy track parallel to the Park boundary fence and drive for 46.7 km along this track linking the D3425 to the B8 tarred Road from Grootfontein to Rundu to the location 18° 36" 07.41" S, 19° 34" 13.31" E, elevation 1181mamsl and turn north (left) at this location into a newly cleared private farm access of Mr. Stefanus Sitoka (Plates 10 -12 and Figs. 1.6 and 1.7). The drilling location area 5-6 is about 3.7 km from this junction towards the north (Plate 1.13).

1.4.2 Accessibility Challenges

Access challenges including heavy sandy terrain, thick bushes (Plates 1.14 -1.16) and potential for extremely slippery and muddy D3425 road during the rainy season (**December – March**) on certain sections of the 35 km stretch between Ncaute and the location 18° 36" 08.51" S, 19° 42" 02.69" E, along the Omatako Ephemeral River Channel (Plates 1.17 and 1.18).

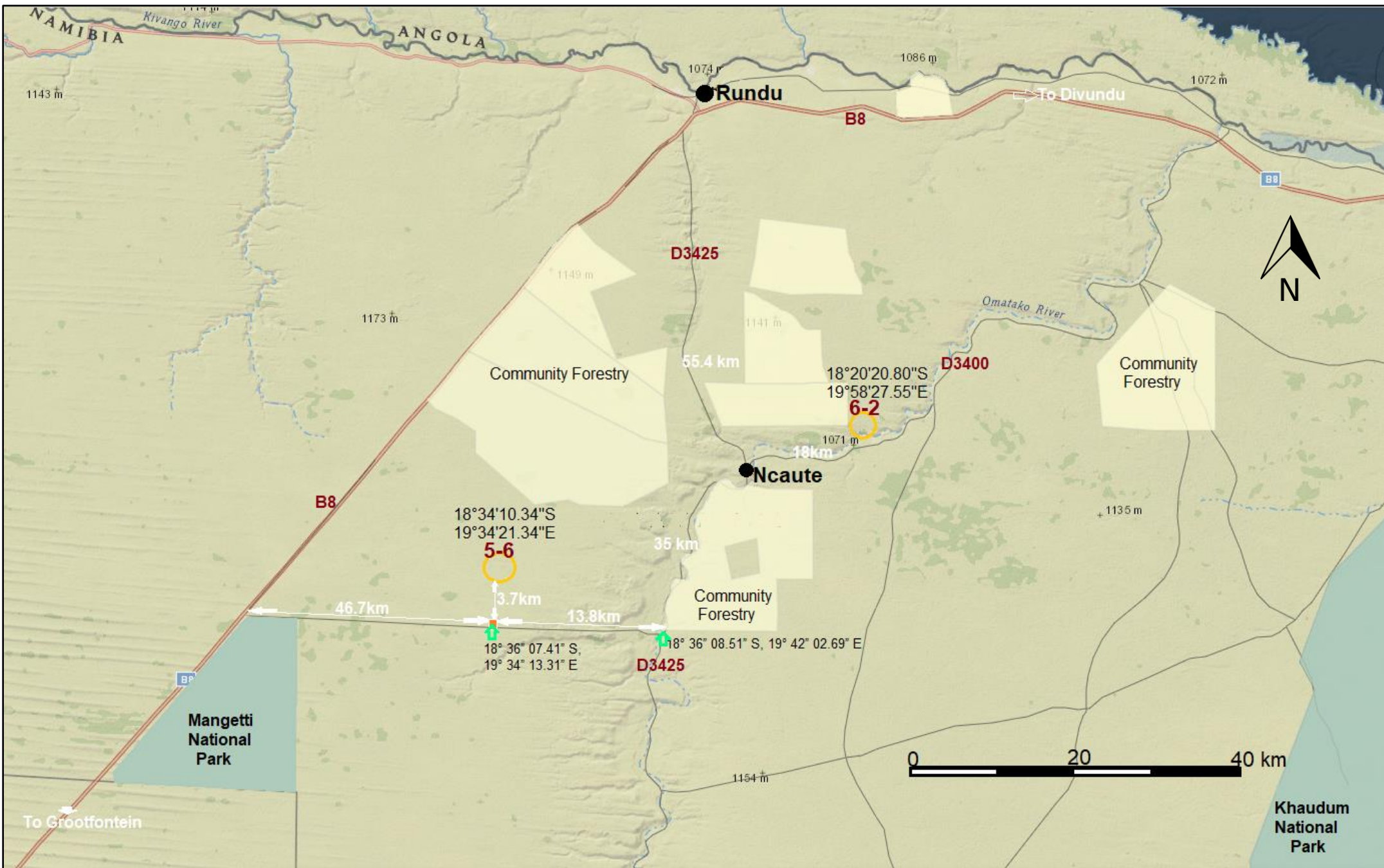


Figure 1.7 Access to the drilling locations 5-6 and 6-2 (Sources: www.kavangozambezi.org/en/- arcgis Accessed, March 2019).



Plate 1.1: The D3425 gravel road from Rundu to Ncaute which is 55.4 km away.



Plate 1.2: The settlement of Ncaute.



Plate 1.3: The D3400 18 km towards Makandena to the well location 6-2.



Plate 1.4: The nearest village / settlement to the well location 6-2.



Plate 1.5: Sandy access to the well location 6-2 coming off the D3400 road.



Plate 1.6: General view around the well location 6-2 showing plenty of low vegetation/openings for a campsite or drilling location without cutting down the big trees.



Plate 1.7: The Omatako Ephemeral River Channel along the D3425 road from Ncaute to the well location 5-6.



Plate 1.8: The location $18^{\circ} 36' 08.51''$ S, $19^{\circ} 42' 02.69''$ E, a key turn to the well location 5-6 into the straight sandy track linking the D3425 to the B8 tarred Road from Grootfontein to Rundu. This turn is 35 km from Ncaute along the D3425 road.



Plate 1.9: The straight sandy track to the well location 5-6 linking the D3425 to the B8 tarred Road from Grootfontein to Rundu.



Plate 1.10: Location $18^{\circ} 36'' 07.41''$ S, $19^{\circ} 34'' 13.31''$ E, the key turning point from the well No. 5-6 location area through the newly cleared private farm access of Mr. Stefanus Sitoka.



Plate 1.11: Newly cleared private farm access by Mr. Stefanus Sitoka towards the well location 5-6.



Plate 1.12: Existing campsite by Mr. Stefanus Sitoka south of the general well location 5-6 area.



Plate 1.13: General view around well No. 5-6 location area showing plenty of low vegetation/ openings for a campsite or drilling location without cutting down the big trees.

Plate 1.14: Access challenges including heavy sandy terrain to well 5-6 location.

Plate 1.15: Well 5-6 bush thinking that will require bush clearing and winding of the access.

Plate 1.16: Well 6-2 bush thinking that will require bush clearing and winding of the access.

Plate 1.17: Potential for extremely slippery sections along the D3425 road during the rainy season (December – March) on certain sections of the 35 km stretch between Ncaute and the location 18° 36" 08.51" S, 19° 42" 02.69" E, along the Omatako Ephemeral River Channel.

Plate 1.18: Potential for extremely muddy sections along the D3425 road during the rainy season (December – March) on certain sections of the 35 km stretch between Ncaute and the location 18° 36" 08.51" S, 19° 42" 02.69" E, along the Omatako Ephemeral River Channel.

1.5 Project Motivation

The Kavango Basin, location of PEL 73, offers both large scale conventional and non-conventional potential petroleum (oil and gas) exploration play types. The implementation of the proposed drilling operations is a vital step in trying to understand the geology, stratigraphy and the petroleum system of the basin. The results from the proposed drilling operations will be used to optimise the geological and petroleum system exploration models and assist in evaluating the possibility of the Kavango Basin as well as the greater Etosha Basin being able to contain potential economically viable hydrocarbon reserves.

Finding hydrocarbons (oil and gas) and the development of a successful oil and gas industry in Kavango East or West Regions will have direct and indirect benefits to Namibia and its people and to include the following:

- ❖ Increased State income through rights rentals and payment of direct and indirect taxes;
- ❖ Increased understanding and knowledge of the Kavango Basin, the greater Etosha and Kalahari Basins petroleum systems of Namibia that could finally led to the discovery of economic oil or gas or both resources that will change the economic landscape of Namibia for benefits of its people;
- ❖ Contributions to the national geosciences skills development and knowledge transfer through on job training and short-term job attachments of Namibians;
- ❖ Contributions to the short and long-term strategies of attracting investments in the petroleum exploration sector in Namibia through new data acquisition, research, monitoring and management.
- ❖ Contribution to the long-term strategy that will promote the coexistence of petroleum operations with other land users in Namibia;
- ❖ Direct contributions to the training of young Namibians through contributions to the national training fund;
- ❖ Contributions to economic growth through ongoing exploration investments and potential future oil and gas discovery;
- ❖ Creation of employment opportunities through short and long-term contacts, and;
- ❖ Contribution to the development of local infrastructures to support the ongoing oil and gas exploration opportunities.

The socioeconomic impacts of exploratory drilling will primarily be concerned with provision of temporary employment, supply of services and demands on local infrastructure services. The socioeconomic impacts will be small and short term, since the duration of drilling activities is predicted to be only between 20 – 30 days. However, such impacts will start before mobilisation of equipment to the drilling site occurs, and will continue even after drilling has finished.

Subject to the availability of the local skilled base to support the proposed project activities, safety, commercial and other technical considerations, Reconnaissance Energy Namibia (Pty) Ltd plans to maximise the use of Namibian goods and services providers for the drilling operations, in accordance with its commitment to shared prosperity in its host countries. Many of the jobs associated with oil and gas exploratory drilling require highly specialised skillsets, the majority of which will be supplied by the international drilling companies contracted by

Reconnaissance Energy Namibia (Pty) Ltd. Nonetheless, as a company committed to creating shared prosperity in its host countries, Reconnaissance Energy Namibia (Pty) Ltd is seeking to maximise the employment and development opportunities of suitably-qualified Namibian personnel and services providers wherever possible.

1.6 Project Spatial Extent and Scope of the Assessment

The spatial scope of the proposed drilling operations covers the following locations:

- ❖ Drilling locations immediate impact zones: The area likely to be directly influenced by the drilling activities at the well location and includes: a radius of 150 m site operational areas, campsite, material storage and all the support services and equipment, and;
- ❖ Drilling location broader impact zone including the access road and all the surrounding socioeconomic zones of the local constituency / communal area, regional (Kavango East and West Regions) and national (Namibia) likely to be positively or negatively affected by the proposed drilling operations and logistics.

1.7 Summary of EIA Approach and Methodology

1.7.1 Overview of the EIA Methodology

The Environmental Assessment process inclusive of all the specialist studies was undertaken in accordance with the provisions of the Petroleum (Exploration and Production) Act 1991 (Act 2 of 1991) as amended, the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 and the Environmental Management Act, 2007, (Act No. 7 of 2007) as shown in Fig. 1.8.

The assessment process also took into considerations Reconnaissance Energy Namibia (Pty) Ltd corporate governance requirements as well as all other relevant Namibian laws, regional (Southern Africa Development Community – SADC) and international environmental and petroleum exploration protocols, standards and practices applicable for onshore oil and gas well drilling operations.

1.7.2 Summary EIA Terms of Reference (ToR)

Summary of the proposed activities, alternatives and key issues considered during the Environmental Assessment (EA) process are shown Table 1.1 with more details provided in Annex 1 (Scoping Report).

The EIA and EMP process was performed with reasonable skill, care and diligence in accordance with professional standards and practices existing at the date of performance of the assessment and that the guidelines, methods and techniques used and applied in this study conformed to the national regulatory requirements, process and specifications in Namibia and in particular as required by Ministry of Mines and Energy (MME), Ministry of Environment and Tourism (MET) and the client (Proponent).

The preparation of the EIA and EMP reports was undertaken in line with the January 2015 MET Environmental Assessment Reporting Guideline.

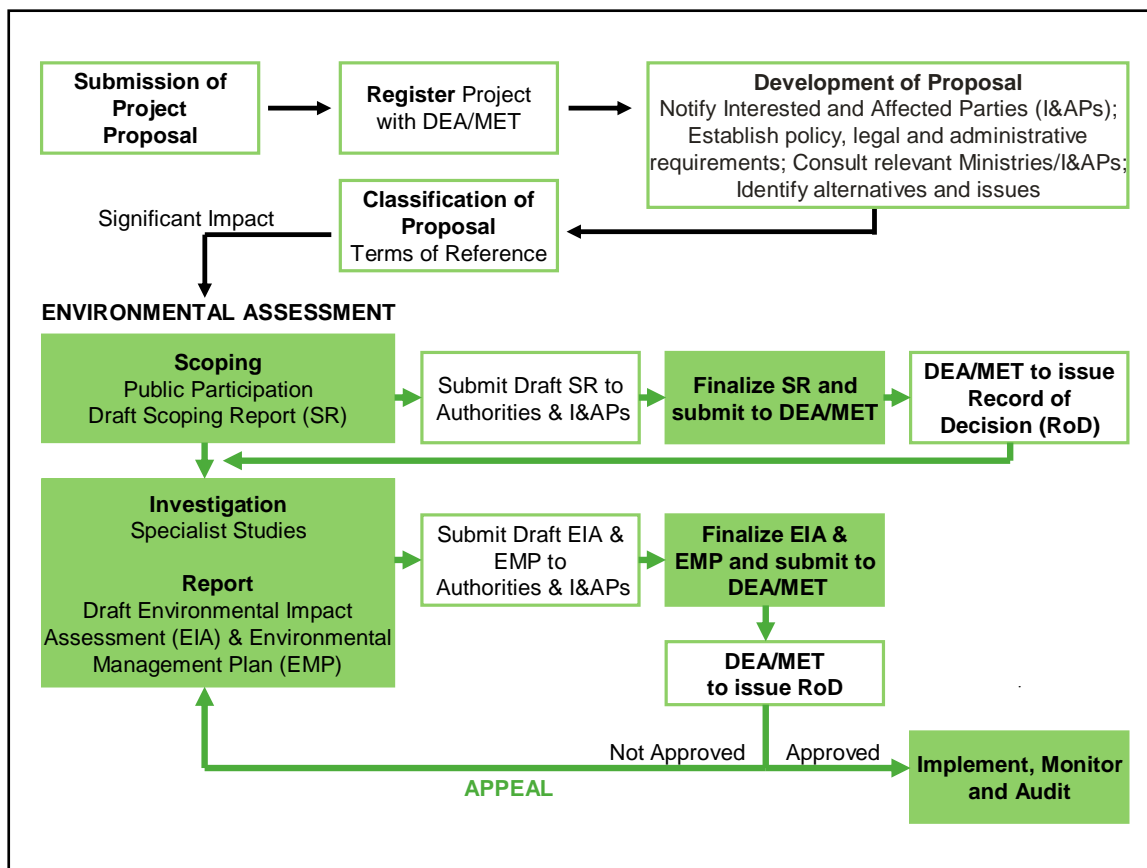


Figure 1.8: Schematic presentation of Namibia's Environmental Assessment Procedure.

Table 1.1: Summary of the proposed activities, alternatives and key issues considered during the Environmental Assessment (EA) process covering EIA and EIA.

PROPOSED PROJECT ACTIVITIES	ALTERNATIVES CONSIDERED	KEY ISSUES TO BE EVALUATED AND ASSESSED WITH ENVIRONMENTAL MANAGEMENT PLAN (EMP) / MITIGATION MEASURES PREPARED	
<ol style="list-style-type: none"> 1. Pre-construction and drilling requirements 2. Construction phase 3. Mobilisation 4. Spudding and Conductor casing 5. Drilling surface / intermediate and setting casing and cementing process through up 900 m 6. Drilling and continuous coring from 900 meters (2953') to 1900 meters (6234') 7. Drilling below 1900 meters to total depth, estimated at 2500 meters (+/-8202') 8. Plug and abandon hole 9. Rehabilitate all surface disturbances and clear the site of any debris 10. Camp removal, site closure / abandonment, and; 11. Major land accidental incidence such as diesel / oil spill/ fire / explosion 	<ol style="list-style-type: none"> (i) Drilling locations: Alternative locations have been identified and out of the eight (8) sites initially selected, only two (2) will be drilling for now. Additionally, the locations of each of the two (2) wells to be drilling can also be moved around an event that site-specific location is not environmentally favourable; (ii) Other Alternative: Water supply options including the use of existing bore ore drilling of new boreholes that can later be handed over to the local community. Considerations for other land uses opportunities such as agriculture, timber harvesting, conservation and tourism have also been evaluated (iii) Ecosystem Function (What the Ecosystem Does (iv) Ecosystem Services (v) Use Values (vi) Non-Use, or Passive Use (vii) The No-Action Alternative 	Potential land use conflicts / opportunities for coexistence between proposed exploration and other existing land uses such as agriculture, community forestry, timber harvesting conservation and tourism	
		Physical Environment	<ol style="list-style-type: none"> 1. Water quality 2. Physical infrastructure and resources 3. Air quality, noise and dust 4. Landscape and topography 5. Soil quality 6. Climate change influences.
		Biological Environment	<ol style="list-style-type: none"> 1. Habitat 2. Protected areas and resources 3. Flora 4. Fauna 5. Ecosystem functions, services, use values and non-use or passive use.
		Socioeconomic, cultural and archaeological environment	<ol style="list-style-type: none"> 1. Local, regional and national socioeconomic settings 2. Subsistence agriculture 3. Community forestry 4. Tourism and recreation 5. Cultural, biological and archaeological resources
		Environmental Management Plan (EMP) Providing Mitigation Measures and Monitoring Plan	
		Mitigation shall focus on the following in order of preference: <ol style="list-style-type: none"> 1. Enhancement, e.g. provision of new habitats; 2. Avoidance, e.g. alternative / sensitive design to avoid effects on ecological receptors; 3. Reduction, e.g. limitation of effects on receptors through design changes; and 4. Compensation, e.g. community benefits such as a water well being provided. 	

1.7.3 Summary of Key Environmental Assessment Steps

In accordance with the provisions of the EIA Regulations, 2012, the key assessment steps are summarised in Fig. 1.8. A detailed outline of the methodology and approach is provided in the Scoping Report (Annex 1).

The following is the summary of the key environmental assessment steps:

- (i) Project screening process was undertaken in November – December 2018;
- (ii) A Draft Scoping Report prepared was prepared in January – March 2019 and released for public consultation March 2019 (Annex 1);
- (iii) The project was registered with the Environmental Commissioner through the submission of the Draft Scoping Report through the Ministry of Mines and Energy (Competent Authority) on the 3rd April 2019;
- (iv) Specialist studies (Flora, Fauna, Water, Socioeconomic and Archaeology) implemented in November 2018 – March 2019;
- (v) Public and stakeholder consultations process including publishing of notices in local newspapers was undertaken in May 2019. Additionally letters were sent to the Kavango West and Kavango East Regional Councils as well as to the Police Explosive Units in Kavango West and East Regions with respect to advice on possibility of unexploded ordinances at the drilling localities;
- (vi) Additional local consultation outreach process were undertaken through the Offices of Governors for Kavango West and Kavango East Regions;
- (vii) Well attended public /stakeholder meetings were scheduled in Nkurenkuru and Rundu on the 9th and 10th May 2019 respectively;
- (viii) An approval of the project Scoping Report was issued by the Environmental Commissioner in the Ministry of Environment and Tourism (MET) dated 27th May 2019 (Fig. 1.9);
- (ix) Finalised the preparation of the Scoping report and prepared the Draft EIA and EMP Reports –May – June 2019;
- (x) Comments and inputs from the public and stakeholder consultations used to finalise the Draft EIA and EMP Reports – June 2019, and;
- (xi) The final EIA and EMP reports used to support the application for Environmental Clearance Certificate (ECC) for the proposed petroleum (Oil and Gas) exploration operations (drilling of multiple stratigraphic wells) in the Petroleum Exploration License (PEL) No. 73 covering Blocks 1719, 1720, 1721, 1819, 1820 and 1821 in Kavango Basin;
- (xii) The ECC application to be submitted to the Office Environmental Commissioner through the Ministry of Mines and Energy (Competent Authority) - **June 2019**.



REPUBLIC OF NAMIBIA

MINISTRY OF ENVIRONMENT AND TOURISM

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21 May 2019

OFFICE OF THE ENVIRONMENTAL COMMISSIONER

Dr. Sindila Mwiya
The Environmental Assessment Practitioner
Risk Based Solutions CC
P. O. Box 1839
Windhoek

Dear Sir,

SUBJECT: DRAFT ENVIRONMENTAL SCOPING REPORT VOL 1 OF 3 TO SUPPORT THE NOTIFICATION FOR APPLICATION OF ENVIRONMENTAL CLEARANCE CERTIFICATE PROJECT REGISTRATION FOR THE PROPOSED PETROLEUM (OIL AND GAS) EXPLORATION OPERATION LICENSE (PEL) 73 COVERING BLOCKS 1719, 1720, 1721, 1819, 1820 & 1821 ETOSHA BASIN, KAVANGO WEST AND EAST REGIONS, NORTHERN NAMIBIA

The above subject bear reference

This letter serve to acknowledge receipt of your draft Scoping report, dated 3 April 2018. Kindly, proceed with the full Environmental Impact Assessment report and Environmental Management Plan (EMP) which will form the basis upon which an environmental clearance certificate for the project will be issued.

Yours sincerely,


Fredrick Mupoti Sikabongo
DEPUTY ENVIRONMENTAL COMMISSIONER



“Stop the poaching of our rhinos”

All official correspondence must be addressed to the Permanent Secretary

Figure 1.9: Approval of the project Scoping Report issued by the Environmental Commissioner in the Ministry of Environment and Tourism (MET) dated 27th May 2019.

1.7.4 Specialist Studies to be undertaken for EIA and EMP

Based on the recommendations of the final Scoping Report, the following desktop specialist studies were undertaken as part of the Environmental Assessment Process leading to the preparation of the EIA and EMP Reports for the proposed two (2) stratigraphic well drilling operations in PEL 73:

- (i) Flora and fauna (Annex 2);
- (ii) Socioeconomic (Annex 3);
- (iii) Archaeology (Annex 4), and;
- (iv) Ground and surface water (Annex 5).

1.7.5 EMP Framework

The overall focus of the EMP framework has been to develop appropriate mitigation measures for each activity likely to have significant positive or negative impacts on the physical, biological, socioeconomic, cultural and archaeological receiving environment. The mitigation measures as detailed in the EMP Report Vol. 3 of 3 have focus on the following approach in order of preference:

- (i) Enhancement, e.g. provision of new habitats;
- (ii) Avoidance, e.g. alternative / sensitive design to avoid effects on ecological receptors;
- (iii) Reduction, e.g. limitation of effects on receptors through design changes, and;
- (iv) Compensation, e.g. community benefits such as a water well being provided.

1.7.6 Assumptions and Limitations

The following assumptions and limitations underpins the approach to this EIA study:

- ❖ The proposed activities information, plans and appropriate data sets received from the project partners, specialist assessments are assumed to be current and valid at the time of the study;
- ❖ The Impact assessment outcomes and recommendations provided in this report are valid for the entire duration of the proposed initial two (2) wells drilling and the subsequent multiple additional wells that may be drilled based on the results / outcomes of the wells 5-6 and 6-2;
- ❖ A precautionary approach has been adopted in instances where baseline information was insufficient or unavailable or site-specific information for the additional are not yet available for the multiple wells to be drilled based on the outcomes of the well locations 5-6 and 5-2, and;
- ❖ Mandatory timeframes as provided for in the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007) will apply to the review and decision of the EIA and EMP reports by the Environmental Commissioner.

2. PROPOSED PROJECT DESCRIPTION

2.1 Overview

Reconnaissance Energy Namibia (Pty) Ltd acquired a high resolution geomagnetic survey of the licence area and conducted a detailed analysis of the resulting data and other available data, including reprocessing and reinterpretation of all existing geological and geophysical data. The survey and analysis confirm that the Kavango Basin reaches depths of up to 9.144 km (30,000 feet), under optimal conditions to preserve a thick interval of organic rich marine shales and is anticipated to hold an active petroleum system.

Reconnaissance Energy Namibia (Pty) Ltd intend to drill two (2) petroleum (oil and gas) stratigraphic wells 5-6 and 6-2 in Blocks 1829 and 1820 in PEL 73. The drilling operations are set to start in the last quarter (Q4) of 2019 between the months of October and December 2019. The proposed drilling operations will be undertaken using a land-based rig.

The proposed drilling operations will be undertaken in remote area with challenging logistical arrangements such as the sandy and potential slippery accesses roads (Plates 1.17 and 1.18).

2.2 Logistical Arrangements and Site Layout

To prepare for initial drilling, the access road and well site/s may require vegetation clearing, levelling, if necessary, with a bulldozer and/or grader / labour-based option if manpower exists with the local area, with careful consideration given to sensitivities of the receiving environment including: not cutting down of larger trees and protected flora as well as being on a look out for possible unexploded ordinances that may be buried.

The scale and duration of site preparation is site-specific and may last for few hours to a couple of days depending on the length of the access or size of the site to be prepared. A temporary drilling campsite will be established around each of the drilling sites. Fig. 2.1 shows an indicative drill site layout to be established at each of the drilling locations. The campsite will accommodate the drilling crew and equipment.

Energy supply will be provided by diesel generators for the operations requiring higher voltage while solar will be used for lighting and gas for cooking. Chemical toilets will be provided onsite.

A standard single well site for conventional onshore oil or gas drilling will typically affect a surface area measuring 150 metres by 150 metres (Fig. 2.1). The well site will typically hold the drilling rig and additional equipment along with supervisory accommodation and material storage (Fig. 2.1).

Once drilling is completed the affected area will be reclaimed to minimise surface disturbance. Standard drilling supplies such as food and fuel and parts will be obtained in Windhoek or Rundu. Specialised drilling equipment and fluids not available in Namibia will be sourced internationally.

Water supply will either be trucked to the site or obtained from two (2) new boreholes that could be drilled in the area, one (1) each well location. The boreholes will be drilled an estimated depth of 150 m within the Kalahari Group and polyvinyl chloride (PVC) casing will be installed from 0 – 150 m.

Once the drilling operations have completed the water borehole could be handover to the local community with a condition of being able to utilise the boreholes in the event that additional

drilling operations becomes necessary in the future. The various components of the rig will be transported to site by a truck and the rig will be built onsite. After drilling completion, the campsite and the rig will be disassembled and the various components will be packed and transported to the next drilling location.

2.3 Drilling Rig and Well Design

2.3.1 Rig Components and Specifications

Onshore drilling rigs can vary quite dramatically depending on what environment and formations the rig will be drilling. Originally, the rigs were nothing more than wooden structures in a “v-frame” structure. Today rigs are built out of steel components that would allow it to be moved after the well drilling operations.

Fig. 2.2 shows the key components of a land based rig. Detailed specification of a land-based drilling rig similar to type that will be used for the proposed drilling operations in PEL 73 is shown in Fig. 2.3.

The list characteristics of the drilling fluids to be used for the proposed drilling operations in PEL 73 is shown in Table 2.1.

Table 2.1: Drilling fluids characteristics (Source: Reconnaissance Energy Namibia, 2019).

Material	Concentration, lb/bbl	Function	Property	Units	Range
Bentonite	5 - 10	Viscosity / Filtration Control	Density	S.G.	1.2
Potassium Chloride	5 - 60	Inhibition Source of Kio	Funnel Viscosity	sec/qt	45 -60
Caustic Potash	0.25 - 0.75	Alkalinity	Plastic Viscosity	cP	12 - 25
PHPA	0.5 - 1.5	Encapsulation Agent	Yield Point	lb/100 sq ft	10 - 20
Starch	3 - 6	Filtration Control	6rpm(reading)	n/a	8 - 10
Lignite	2 - 4	HTHP Filtration Control	10s Gel Strength	lb/100 sq ft	6 - 8
Barite	As Needed	Weight Material	10m Gel Strength	lb/100 sq ft	8 - 20
Drill Paper	As Needed	Fluid Loss Control Material	API Filtration	mL/30min	8 - 10
LCM Materials	As Needed	Fluid Loss Control Material	Solids Content	v/v %	<6%

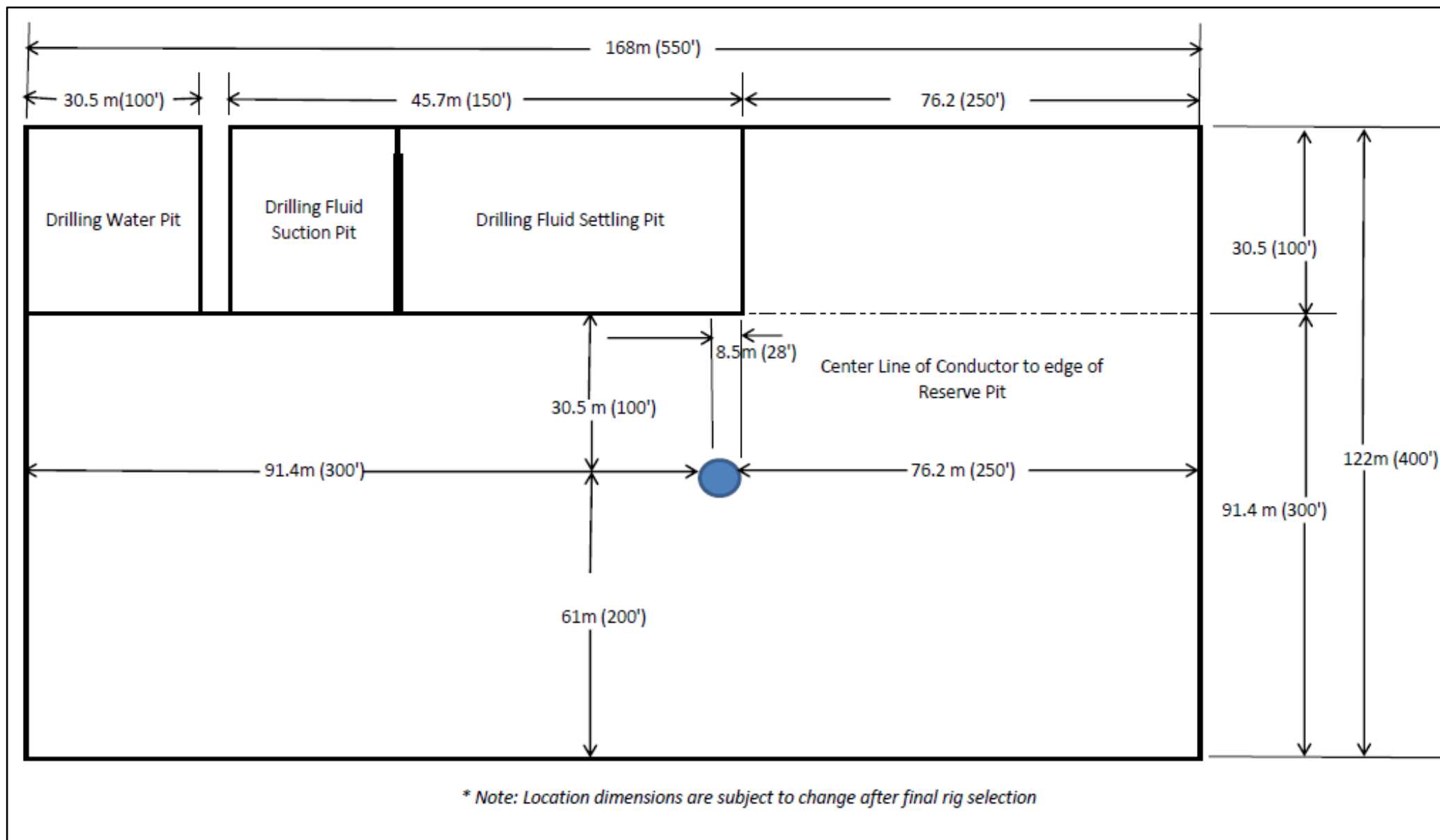


Figure 2.1: Indicative Well site layout (Source: Reconnaissance Energy Namibia, 2019).

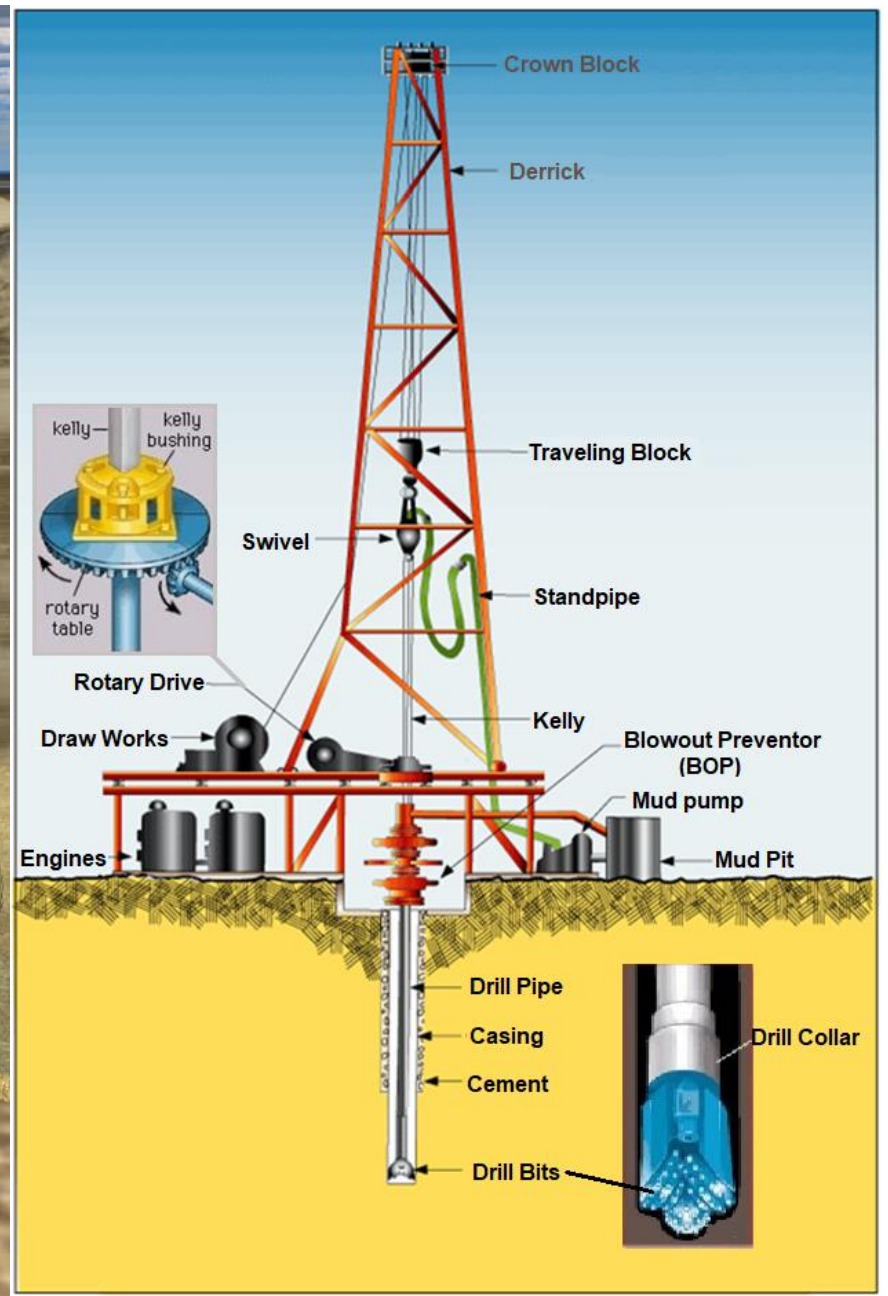
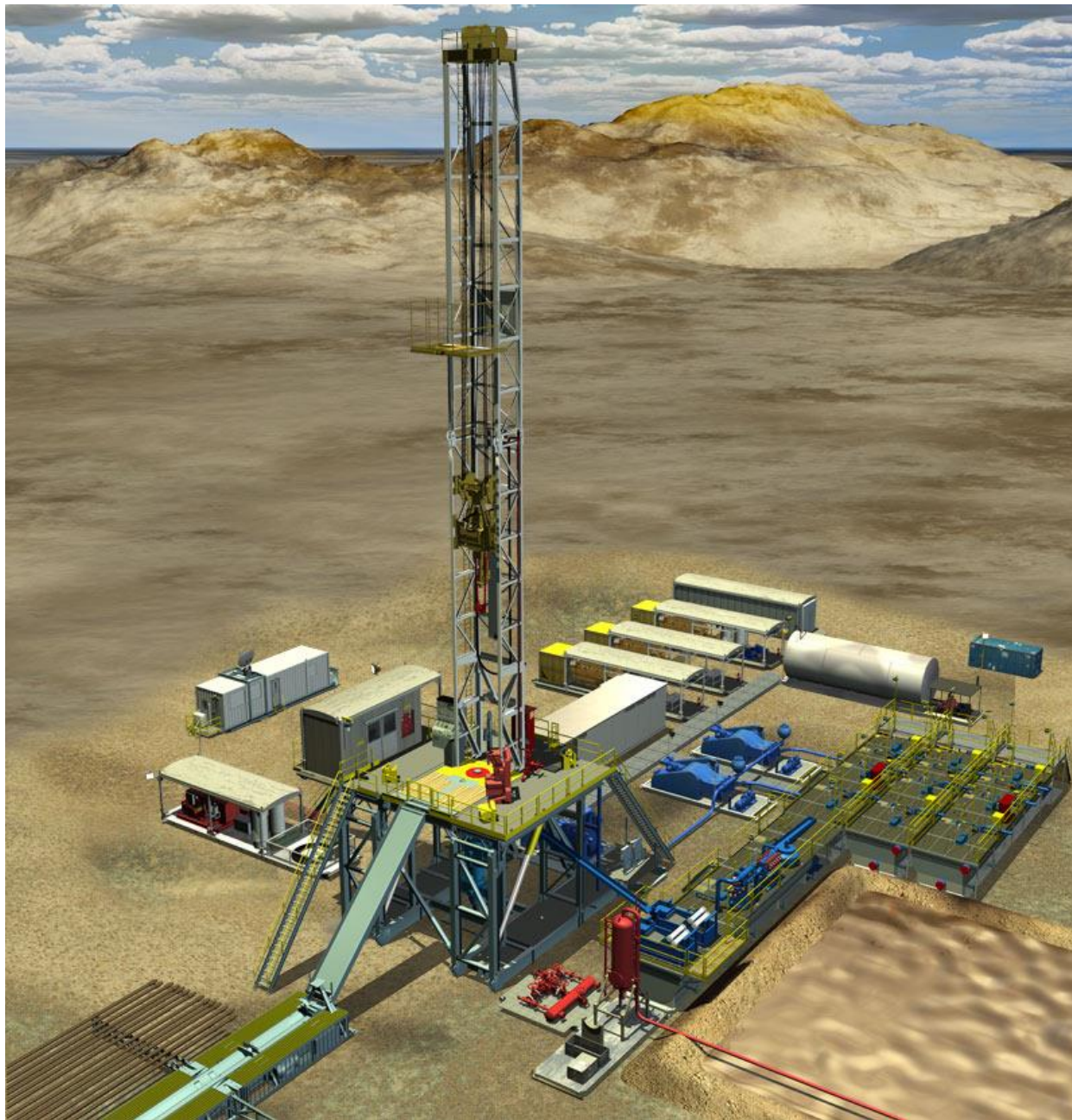


Figure 2.2: Components of an onshore Oil Rig (Source: Modified from [www. entranceconsulting.com](http://www.entranceconsulting.com)).

EQUIPMENT SPECIFICATIONS		DRILL ROD AND CASING		FLUID INJECTION SYSTEM	
WEIGHT		Drill rod	Up to range III	Mission Magnum mud pump	4 x 3 x 13
Total full weight	46 Tonne (excluding truck)	Casing	Up to range III	FMC piston pump	220 L per min
Load per rear axle	8,5 Tonne (approx.)	Angle drilling	Up to range II	Service winch	4 t – 24 m
Tyres	Super single off road or double highway tyres	MAST		Wire line winch	2 t – 1800 m of wire rope at 60 m/min
TRANSPORTING DIMENSIONS		External Mast	Multiple closed cell rectangular sections	Tool lubrication for DTH	
Length (excluding truck)	17.2 m	Internal Mast	Large diameter central section and rails	Power break out for breaking hammer and drill collars	
Height retracted	4.2 m	Hydraulic Mast erection	Hydraulic Cylinder	Power slips	
Width	2.5 m	Table opening	27,5" (697 mm)	CONTROL CABIN	
OPERATING DIMENSIONS		Mast slide	2500 mm	Rotating Cabin for optimal view of Mast top and Mast table	
Length (excluding truck)	17.2 m	HYDRAULIC SYSTEM		Air-conditioning and sound abatement for operators comfort	
Height retracted	14.0 m	System type	Full variable flow hydraulic system with load sensing	Ergonomic layout of controls and panels	
Height extended	23.4 m	Hydraulic tank	2400 LAUX tank plus 1000 L operating = 3400 L	PAINT SPECIFICATIONS	
Width	2.5 m	Filters	On suction and pressure lines	Three coat marine standard system with total of 400 microns DFT	
Clearance under table	From 1.5 m to 4,1 m with fully extended Outriggers	PIPE HANDLING SYSTEM			
ENGINE		Rotation Angle	0° (parallel to Mast) - 130°		
1 x Caterpillar C27 ACERT 708kW IND C @ 1800 rpm		Mounted	2 Axle Trailer with super tyres		
Fuel tank capacity	1450 L	Operating Cabin	Also remote control of all hydraulic function		
COOLING		Self alignment and attached to drill Rig with hands off make and brake system			
3 x Horizontal cooler for hydraulic system		Full range of screw and welded casings up to Range III and 24 °			
1 x Horizontal combined water, after cooler and diesel overflow					
-10° C/14° F to 50° C/122° F design temperature					
TOP DRIVE					
Drive type	Hydraulic				
Maximum torque	36 kNm (intermittent)				
Rotation brake	For directional drilling				
Hydraulic pull-down	200 kN				
Hydraulic pull-up	900 kN				
Rotary Speed	Variable step less control with torque limiter				
Torque & Speed at Gear 3	5 220 Nm (320) bar @ 330 rpm (360 l/min) – nominal				
Torque & Speed at Gear 2	20 870 Nm (320) bar @ 82 rpm (360 l/min) – nominal				
Torque & Speed at Gear 1	536 000 Nm (320) bar @ 43 rpm (360 l/min) – nominal				
Drive through hole	5"				
Float Sub & Sub Saver	100mm float				
FEED SYSTEM					
Cylinder size	280/200mm				
Feed cylinder stroke	2 x 4100mm				
Max pressure	350 bar				
Pull up	900 kN				
Pull down	200 kN				
Pullback feed speed	Cylinder 0,4 m/sec, Top Drive 0,8 m/sec				
Pull-down feed speed	52 m/min				
Working clearance to table	15.9 m (including Floating Sub)				



Figure 2.3: Detailed specification of a land-based drilling rig similar to type that will be used for the proposed drilling operations (Source: Reconnaissance Energy Namibia, 2019).

2.3.2 Overview of the Well Design and Plan

Reconnaissance Energy Namibia (Pty) Ltd intend to drill the proposed two (2) petroleum (oil and gas) stratigraphic wells Nos. 5-6 and 6-2) in PEL 73 to Total Depth (TD) 2500 km (Fig. 2.4). The estimated lithological depths will vary but expected to be as follows:

- ❖ Kalahari Group +/- 200 to 500 m, and;
- ❖ Basalt formation +/- 600 – 900 m.

The following is the summary of the well drilling plan:

- (i) Tri – cone, Mud Rotary method to be used through the Kalahari Sands formation assuming the following:
 - ❖ Drill 0 – 60m 18 inch;
 - ❖ Place 14 inch Steel casing into hole, and;
 - ❖ Cement in place.
- (ii) Continue drilling from 60 to refusal assuming the following plan:
 - ❖ Refusal being, the end of Kalahari sand and as far as possible through the basalt formation, and;
 - ❖ If the basalt formation is too hard, percussion drilling will be used to continue the hole until it has gone through the basalt formation.
- (ii) Well casing plan:
 - ❖ A 5.5 inch casing to case the hole;
 - ❖ Casing to be cemented in place, and;
 - ❖ Diverter/Rotation Blow-Out Preventer (BOP) will be installed.
- (iii) Conduct all safety tests, checks to ensure everything is in place before continuing onto the coring part of the hole;
- (iv) Once everything is in place, test, checks completed;
- (v) Start lowering HQ barrel (2.5 inch Core barrel), and;
- (vi) Start Drilling, retrieving core every 6 m to End of Hole (EOH) (drill and bore holes) or Total Depth (TD).

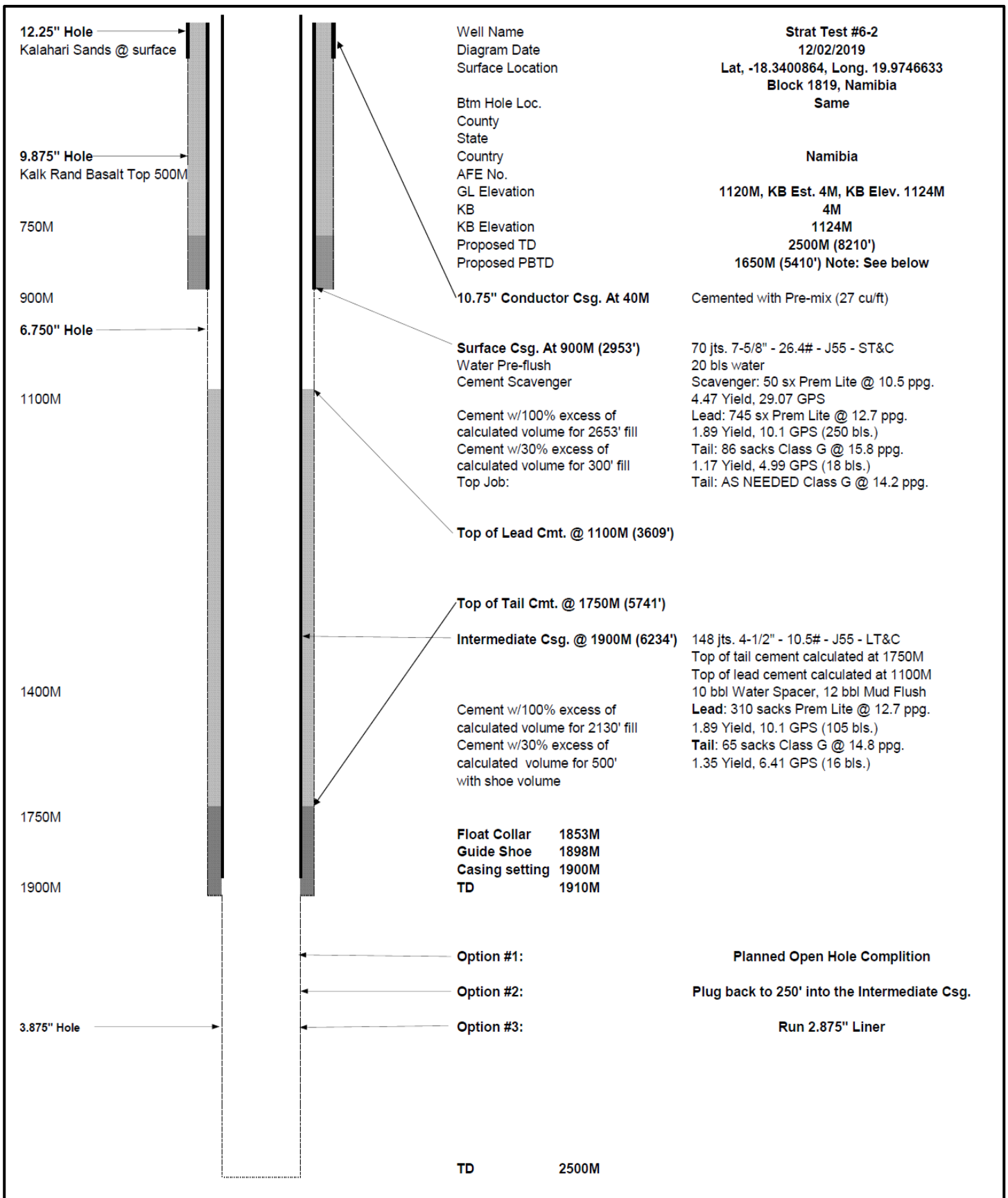


Figure 2.4: Well design (not to Scale) (Source: Reconnaissance Energy Namibia, 2019).

2.4 Stages of the Proposed Drilling Operations

The following is the summary of the key stages of the proposed drilling operations:

1. Pre-Construction and Drilling Requirements:

- ❖ Confirm location and access route, survey from nearest access point to location;
- ❖ Stake location to accommodate drilling contractor's foot print;
- ❖ Do overhead power line and buried line locates;
- ❖ Confirm surface use agreement with surface owner;
- ❖ Confirm that all permits, authorisations, consents and certificates such as Environmental Clearance Certificate (ECC), Radioactive Sources Authorisation, Explosive Permits, Oil Spill Contingency Plan (OSCP), Emergency Response Plan (ERP) and permit to drill are in place, and;
- ❖ Confirm water source options and method of transport. A back-up source will need to be confirmed.

2. Construction Phase:

- ❖ Drilling contractor construction equipment;
- ❖ Build access road and location per approved drilling permit and environmental requirements using acceptable building materials and practices;
- ❖ Dig and fence off reserve and water pits with sheep tight fencing or to local requirements, and;
- ❖ Drill water supply well and complete. Have rental diesel powered generator available.

3. Mobilisation:

- ❖ Drilling contractor drilling rig with support equipment;
- ❖ Drilling contractor living quarters and office facilities as required to support drilling personnel and up to 6 operator personnel;
- ❖ Mobilise casing, cement and well head equipment to location;
- ❖ Hold pre-spud meeting with all personnel, and;
- ❖ Notify Reconnaissance management and government of spud date and time.

4. Conductor Casing:

- ❖ Drill 12.25" (311.15mm) air/rotary to a minimum of 40 meters (+/- 157'). Set and grout 10.75" Overburden Drilling (OD) conductor in place (Figs. 2.5 and 2.6), and;

- ❖ Install diverter or rotating head system in preparation to drill to bottom of the Etjo formation.

5. Drilling surface / intermediate and setting casing and cementing process through up 900 m:

- ❖ Pick-up 9.875" (250.825mm) air / mud / rotary surface bit with Bottom Hole Assembly (BHA) as required;
- ❖ Have mud loggers rigged up and begin logging at 500 meters;
- ❖ Drill to 900 meters (+/-2953'), catch samples every 10 meters;
- ❖ Rig-up and run 7.625" Overburden Drilling (OD) casing to within 3 meters (+/- 10') of bottom;
- ❖ Cement casing per agreed to specifications;
- ❖ After waiting on cement for 6 hrs, cutoff casing and install 3000# wellhead, and;
- ❖ Test well head to 100 BAR (1500 PSI).

6. Drilling and continuous Coring from 900 meters (2953') to 1900 m (6234'):

- ❖ Install Blow-Out Preventer (BOP) and test to 207 Bar (3000 PSI);
- ❖ Test casing 70% of manufactures rating or 100 bar whichever is lower;
- ❖ Pick-up 171.45 mm (6.75") clean out bit. Drill out cement and 3m new hole;
- ❖ Pull Out of Hole (POOH) lay down tools. Strap or count drill pipe on way out of hole to confirm depth;
- ❖ Pick-up coring tools with core bit to cut minimum 63.50 m (2.5") core and Run In Hole (RIH);
- ❖ Begin coring from 903 meters to +/- 1900 meters;
- ❖ Core and retrieve cores as required. Retrieval and storage will be determined by geologist on site. A written procedure will be furnished before coring begins. Catch samples every 3 meters;
- ❖ Make wiper or reaming trips as required by hole conditions;
- ❖ Pull Out of Hole (POOH), deploy coring tools in preparation to run wire line logs;
- ❖ Log per attached logging procedure;
- ❖ Rig-up and run 114.3m (4.5") Overburden Drilling (OD) casing;
- ❖ Cement casing to agreed specifications;
- ❖ Waiting on cement (WOC) 6 hours, and;

- ❖ Land casing and pack-off as required. Test pack-off to 207 bar (3000 PSI).

7. Drilling below 1900 meters to Total Depth (TD) of +/- 2500m (+/-8202’):

- ❖ Pick-up 98.425m (3.875”) bit and required Bottom Hole Assembly (BHA);
- ❖ Run In Hole (RIH) to top of cement;
- ❖ Drill ahead from 1900 meters to 2500 meters. Catch samples every 3 m;
- ❖ Circulate samples per geologist’s instructions;
- ❖ Be prepared to trip for core as required. If additional coring is required, do so per on-site geologist’s instructions otherwise continue per above;
- ❖ At Total Depth (TD), circulate samples, and;
- ❖ Pull Out of Hole (POOH) to run wire line logs according to the logging procedure.

8. Plug and Abandon Hole:

- ❖ Run In Hole (RIH) open ended to plug and abandonment operations (P&A) hole per attached program;
- ❖ Pull Out of Hole (POOH) setting cement plugs per regulatory requirements;
- ❖ Cut-off well head. Install dry hole marker per local requirements;
- ❖ Back fill cellar and reclaim location as required by surface use agreement or permit requirements, and;
- ❖ Rig Down Move Out (RDMO) location.

9. Rehabilitate all surface disturbances and clear the site of any debris;

10. Camp removal, site closure / abandonment.

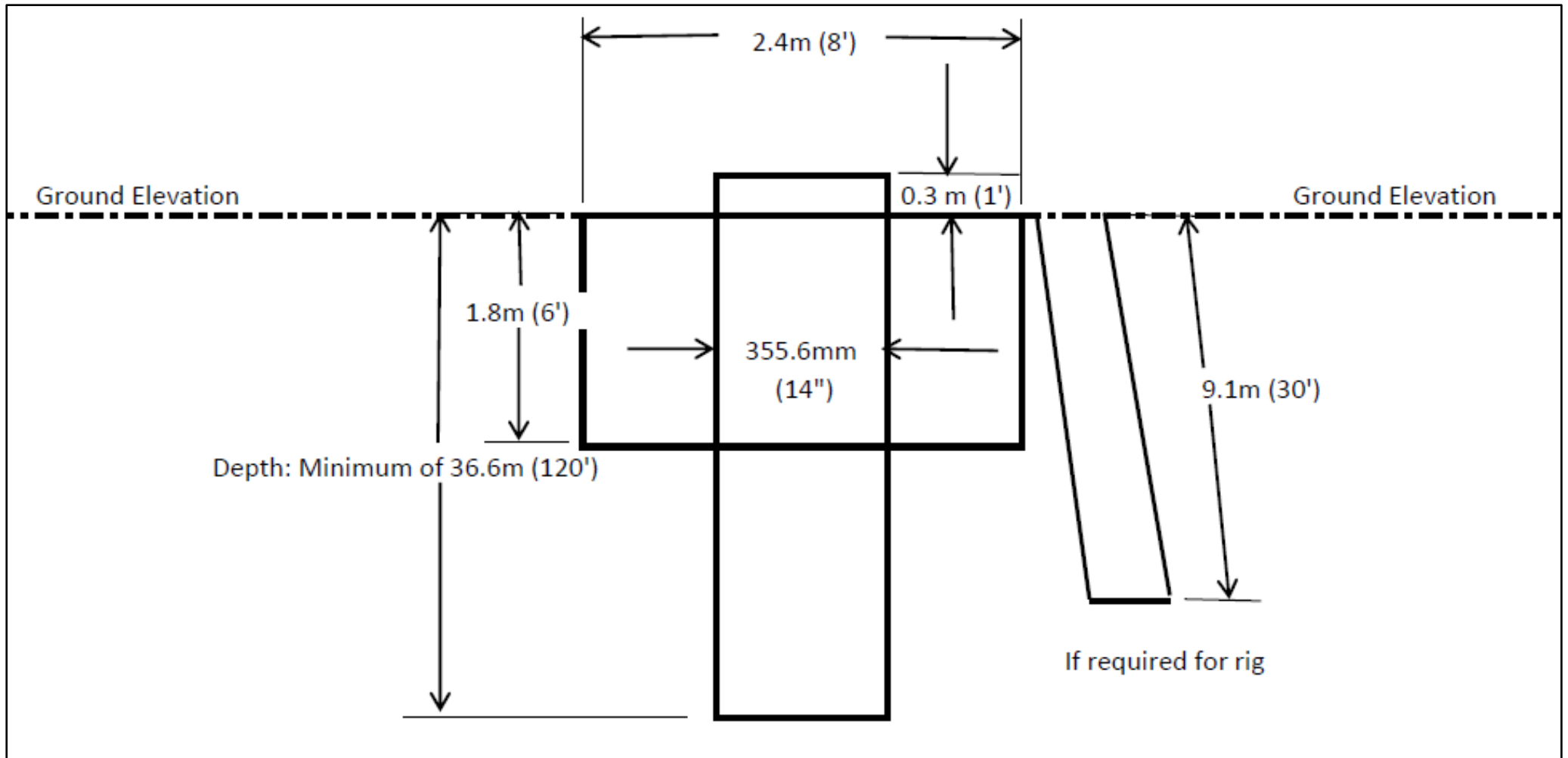


Figure 2.5: Indicative conductor, cellar ring and mouse hole (Source: Reconnaissance Energy Namibia, 2019).

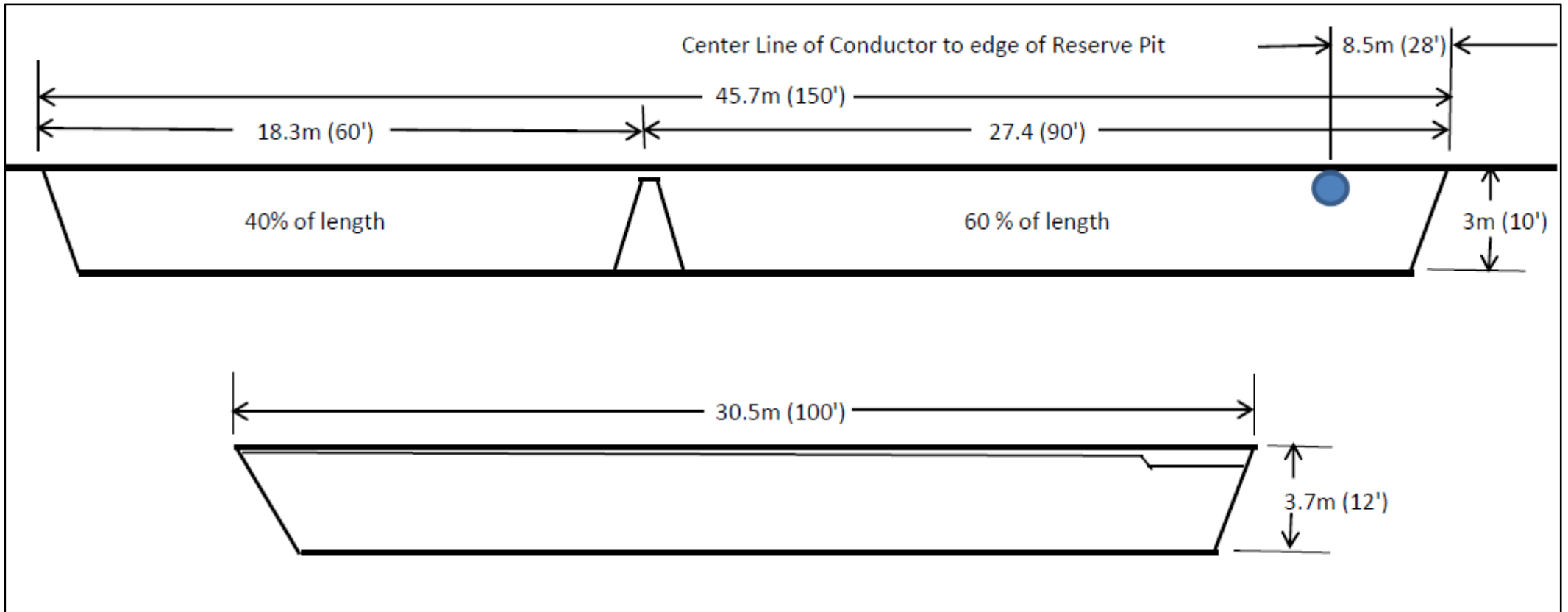


Figure 2.6: Indicative design of the proposed drilling mud reserve pit (Source: Reconnaissance Energy Namibia, 2019).

3. REGULATORY FRAMEWORK

3.1 Petroleum Exploration and Production Legislation

In accordance with the Petroleum (Exploration and Production) Act 1991 (Act 2 of 1991), and in an effort to promote petroleum exploration activities in Namibia, the Ministry of Mines and Energy (MME) has the mandate to issue three types of licenses namely; Reconnaissance, Exploration and Production Licences. Exploration licence is issued under Section 34 of the Petroleum (Exploration and Production) Act 1991 (Act 2 of 1991), and includes any renewal of such licence. A production licence is issued under Section 50 and includes any renewal of such licence.

3.2 Environmental Regulations

Environmental assessment and management in Namibia is governed by the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007). The proposed petroleum exploration activities by Reconnaissance Energy Namibia (Pty) Ltd covering Blocks 1719, 1720, 1721, 1819, 1820 and 1821 falls within the categories of listed activities that cannot be undertaken without an Environmental Clearance Certificate (ECC).

3.3 Legislation Register

The following is the summary of the key legislation relevant to the proposed offshore drilling project in PEL 73:

- ❖ Petroleum (Exploration and Production) Act, 1991 and Associated Regulations;
- ❖ Environmental Management Act, (No. 7 of 2007) and associated EIA Regulations;
- ❖ Immigration Control Act 7 of 1993;
- ❖ Customs and Excise Act 20 of 1998;
- ❖ The Regional Councils Act, 1992, (Act 22 of 1992);
- ❖ The Local Authorities Act, 1992, (Act 23 of 1992);
- ❖ Hazardous Substances Ordinance 14 of 1974;
- ❖ Atmospheric Pollution Prevention Ordinance 11 of 1976;
- ❖ Water Act 54 of 1956, Government Gazette No 217 dated 5 April 1962 and Water Resources Management Act, 2004, (Act No. 24 of 2004);
- ❖ Atomic Energy and Radiation Protection Act (Act No. 5 of 2005);
- ❖ The Nature Conservation Ordinance, Ordinance 4 of 1975, Amendment Act, Act 5 of 1996 and the current draft Parks and Wildlife Management Bill of 2006;
- ❖ The Labour Act 2004, (Act 15 of 2004), amended 2010;

- ❖ Convention on Biological Diversity (“Biodiversity”), 29 December 1993: Objective: To develop national strategies for the conservation and sustainable use of biological diversity;
- ❖ Convention on the International Trade in Endangered Species of Wild Flora and Fauna (CITES or “Endangered Species”), 1 July 1975: Objective: To protect certain endangered species from over-exploitation by means of a system of import/export permits;
- ❖ United Nations Framework Convention on Climate Change (“Climate Change”), 21 March 1994: Objective: To achieve stabilization of greenhouse gas concentrations in the atmosphere at a low enough level to prevent dangerous anthropogenic interference with the climate system, and;
- ❖ Kyoto Protocol to the United Nations Framework Convention on Climate Change (“Climate Change – Kyoto Protocol”), 1 January 1997: Objective: To further reduce greenhouse gas emissions by enhancing the national programs of developed countries aimed at this goal and by establishing percentage reduction targets for the developed countries.

3.4 Standards and Guidelines

Industrial effluent likely to be generated by the proposed drilling operations activities must comply with provisions of the Government Gazette No 217 dated 5 April 1962 (Table 3.1) while the drinking water quality comparative guideline values are shown in Table 3.2.

Table 3.1: R553 Regional Standards for Industrial Effluent, in Government Gazette No 217 dated 5 April 1962.

Colour, odour and taste	The effluent shall contain no substance in concentrations capable of producing colour, odour or taste	
pH	Between 5.5 and 9.5	
Dissolved oxygen	At least 75% saturation	
Typical faecal coli	No typical faecal coli per 100 ml	
Temperature	Not to exceed 35 °C	
Chemical demand oxygen	Not to exceed 75 mg/l after applying a correction for chloride in the method	
Oxygen absorbed	Not to exceed 10 mg/l	
Total dissolved solids (TDS)	The TDS shall not have been increased by more than 500 mg/l above that of the intake water	
Suspended solids	Not to exceed 25 mg/l	
Sodium (Na)	The Na level shall not have been increased by more than 50 mg/l above that of the intake water	
Soap, oil and grease	Not to exceed 2.5 mg/l	
Other constituents	Residual chlorine	0,1 mg/l as Cl
	Free & saline ammonia	10 mg/l as N
	Arsenic	0,5 mg/l as As
	Boron	1,0 mg/l as B
	Hexavalent Cr	0,05 mg/l as Cr
	Total chromium	0,5 mg/l as Cr
	Copper	1,0 mg/l as Cu
	Phenolic compounds	0,1 mg/l as phenol
	Lead	1,0 mg/l as Pb
	Cyanide and related compounds	0,5 mg/l as CN
	Sulphides	1,0 mg/l as S
	Fluorine	1,0 mg/l as F
	Zinc	5,0 mg/l as Zn

Table 3.2: Comparison of selected guideline values for drinking water quality (after Department of Water Affairs, 2001).

Parameter and Expression of the results	WHO Guidelines for Drinking-Water Quality 2 nd edition 1993		Proposed Council Directive of 28 April 1995 (95/C/13-1/03) EEC	Council Directive of 15 July 1980 relating to the quality intended for human consumption 80/778/EEC		U.S. EPA Drinking water Standards and Health Advisories Table December 1995		Namibia, Department of Water Affairs Guidelines for the evaluation of drinking-water for human consumption with reference to chemical, physical and bacteriological quality July 1991				
	Guideline Value (GV)	Proposed Parameter Value	Guideline Level (GL)	Maximum Admissible Concentration (MAC)	Maximum Contaminant Level (MCL)	Group A Excellent Quality	Group B Good Quality	Group C Low Health Risk	Group D Unsuitable			
Temperature	t	°C	-	-	12	25	-	-	-	-	-	-
Hydrogen ion concentration	pH, 25° C	-	R <8.0	6.5 to 9.5	6.5 to 8.5	10	-	-	6.0 to 9.0	5.5 to 9.5	4.0 to 11.0	<4.0 to >11.0
Electronic conductivity	EC, 25° C	mS/m	-	280	45	-	-	-	150	300	400	>400
Total dissolved solids	TDS	mg/l	R 1000	-	-	1500	-	-	-	-	-	-
Total Hardness	CaCO ₃	mg/l	-	-	-	-	-	-	300	650	1300	>1300
Aluminium	Al	µ g/l	R 200	200	50	200	S 50-200	150	500	1000	>1000	
Ammonia	NH ₄ ⁺	mg/l	R 1.5	0.5	0.05	0.5	-	1.5	2.5	5.0	>5.0	
	N	mg/l	1.0	-	0.04	0.4	-	1.0	2.0	4.0	>4.0	
Antimony	Sb	µ g/l	P 5	3	-	10	C 6	50	100	200	>200	
Arsenic	As	µ g/l	10	10	-	50	C 50	100	300	600	>600	
Barium	Ba	µ g/l	P 700	-	100	-	C 2000	500	1000	2000	>2000	
Beryllium	Be	µ g/l	-	-	-	-	C 4	2	5	10	>10	
Bismuth	Bi	µ g/l	-	-	-	-	-	250	500	1000	>1000	
Boron	B	µ g/l	300	300	1000	-	-	500	2000	4000	>4000	
Bromate	BrO ₃ ⁻	µ g/l	-	10	-	-	P 10	-	-	-	-	
Bromine	Br	µ g/l	-	-	-	-	-	1000	3000	6000	>6000	
Cadmium	Cd	µ g/l	3	5	-	5	C 5	10	20	40	>40	
Calcium	Ca	mg/l	-	-	100	-	-	150	200	400	>400	
	CaCO ₃	mg/l	-	-	250	-	-	375	500	1000	>1000	
Cerium	Ce	µ g/l	-	-	-	-	-	1000	2000	4000	>4000	
Chloride	Cl ⁻	mg/l	R 250	-	25	-	S 250	250	600	1200	>1200	
Chromium	Cr	µ g/l	P 50	50	-	50	C 100	100	200	400	>400	
Cobalt		µ g/l	-	-	-	-	-	250	500	1000	>1000	
Copper after 12 hours in pipe	Cu	µ g/l	P 2000	2	100	-	C TT##	500	1000	2000	>2000	
		µ g/l	-	-	3000 ¹	-	S 1000	-	-	-	-	
Cyanide	CN ⁻	µ g/l	70	50	-	50	C 200	200	300	600	>600	
Fluoride	F ⁻	mg/l	1.5	1.5	-	at 8 to 12 °C: 1.5	C 4	1.5	2.0	3.0	>3.0	
		mg/l	-	-	-	at 25 to 30 °C: 0.7	P,S 2	-	-	-	-	
Gold	Au	µ g/l	-	-	-	-	-	2	5	10	>10	
Hydrogen sulphide	H ₂ S	µ g/l	R 50	-	-	undetectable	-	100	300	600	>600	
Iodine	I	µ g/l	-	-	-	-	-	500	1000	2000	>2000	
Iron	Fe	µ g/l	R 300	200	50	200	S 300	100	1000	2000	>2000	
Lead	Pb	µ g/l	10	10	-	50	C TT#	50	100	200	>200	
Lithium	Li	µ g/l	-	-	-	-	-	2500	5000	10000	>10000	
Magnesium	Mg	mg/l	-	-	30	50	-	70	100	200	>200	
	CaCO ₃	mg/l	-	-	7	12	-	290	420	840	>840	
Manganese	Mn	µ g/l	P 500	50	20	50	S 50	50	1000	2000	>2000	
Mercury	Hg	µ g/l	1	1	-	1	C 2	5	10	20	>20	
Molybdenum	Mo	µ g/l	70	-	-	-	-	50	100	200	>200	
Nickel	Ni	µ g/l	20	20	-	50	-	250	500	1000	>1000	
Nitrate*	NO ₃ ⁻	mg/l	P 50	50	25	50	-	45	45	90	>180	
	N	mg/l	-	-	5	11	C 10	10	20	40	>40	
Nitrite*	NO ₂ ⁻	mg/l	3	0.1	-	0.1	-	3	-	-	-	
	N	mg/l	-	-	-	-	C 1	-	-	-	-	
Oxygen, dissolved	O ₂	% sat.	-	50	-	-	-	-	-	-	-	
Phosphorus	P ₂ O ₅	µ g/l	-	-	400	5000	-	-	-	-	-	
	PO ₄ ³⁻	µ g/l	-	-	300	3350	-	-	-	-	-	
Potassium	K	mg/l	-	-	10	12	-	200	400	800	>800	
Selenium	Se	µ g/l	10	10	-	10	C 50	20	50	100	>100	
Silver	Ag	µ g/l	-	-	-	10	S 100	20	50	100	>100	
Sodium	Na	mg/l	R 200	-	20	175	-	100	400	800	>800	
Sulphate	SO ₄ ²⁻	mg/l	R 250	250	25	250	S 250	200	600	1200	>1200	
Tellurium	Te	µ g/l	-	-	-	-	-	2	5	10	>10	
Thallium	Tl	µ g/l	-	-	-	-	C 2	5	10	20	>20	
Tin	Sn	µ g/l	-	-	-	-	-	100	200	400	>400	
Titanium	Ti	µ g/l	-	-	-	-	-	100	500	1000	>1000	
Tungsten	W	µ g/l	-	-	-	-	-	100	500	1000	>1000	
Uranium	U	µ g/l	-	-	-	-	P 20	1000	4000	8000	>8000	
Vanadium	V	µ g/l	-	-	-	-	-	250	500	1000	>1000	
Zinc after 12 hours in pipe	Zn	µ g/l	R 3000	-	100	-	S 5000	1000	5000	10000	>10000	
		µ g/l	-	-	5000	-	-	-	-	-	-	

P: Provisional
R: May give reason to complaints from consumers

C: Current; P: Proposed; S: Secondary;
T#: Treatment technique in lieu of numeric MCL;
TT##: treatment technique triggered at action level of 1300 µ g/l

3.5 Summary of the Drilling Permitting Requirements

Based on the analysis of all the key and relevant regulatory systems in Namibia with respect to the proposed drilling operations by in PEL 73, Table 3.3 summarises the likely key and important permits and endorsements that will be required before the proposed drilling can be implemented.

Table 3.3: Summary of the applicable permits, required supporting documents, authorising institution and applicable legal framework / legislation.

Type of Permit / Approval	Studies / Report / Documents Required	Authorising / Institution	Legal Framework
1. Environmental Clearance Certificate (ECC)	Environmental Assessment Study covering Scoping, Environmental Impact Assessment (EIA) and Environmental Management Plan (EMP).	Office of the Environmental Commissioner, Ministry of Environment and Tourism (MET)	Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007)
2. Freshwater Abstraction Including Borehole Drilling and Discharge Permits	Summary Report including boreholes location, volumes of freshwater pumped and wastewater likely to be discharged	Department of Water Affairs (DWA), Ministry of Agriculture, Water and Forestry (MAWF)	Water Act 54 of 1956, Government Gazette No 217 dated 5 April 1962 and Water Resources Management Act, 2004, (Act No. 24 of 2004);
3. Oil Spill Contingency Plan (OSCP)	Oil Spill Contingency Plan (OSCP)	Approved / Endorsed by the Ministry of Mines and Energy (MME) – Office of the Petroleum Commissioner	Petroleum (Exploration and Production) Act, 1991 and Associated Regulations
4. Emergency Response Plan (ERP)	Emergency Response Plan (ERP) Report	Authorisation Issued by the National Radiation Protection Authority (NRPA), Ministry of Health and Social Services (MHSS)	Atomic Energy & Radiation Protection Act (Act No 5 of 2005) and Radiation Protection & Waste Disposal Regulations (No 221 of 2011)
5. Radioactive Authorisation (Import and Export Permits) for the use of radioactive sources for logging	Radiation management Plan (RMP). The RMP must be in the prescribed format (Guide Available and the completion of the application form	The Inspector General Explosive Control Division Namibian Police Force, Ministry of Safety and Security (MSS)	Explosives Act, 1956 (Act 26 of 1956, as amended) and Regulations (GNR 1604 of 8 September 1972, as amended)
6. Explosive Permit (Import and Export) of Explosives in Namibia including Use, Store and Transportation	Written application for a permit to import, transport, use and store explosives must be submitted	Ministry of Mines and Energy – Office of the Petroleum Commissioner	Petroleum (Exploration and Production) Act, 1991 and Petroleum Regulations as Amended
7. Drilling Permit /Letter of Consent to Drill	Pre-Drilling Data Pack (PDDP), Basis of Well Design documents, ECC, Approved Oil Spill Contingency Plan (OSCP), Emergency Response Plan (ERP), and all other key supporting Documents and a mandatory Rig inspection		

3.6 Corporate Governance

The proponent is fully committed to doing business in compliance with all the applicable national laws, regional (Southern Africa Development Community–SADC) initiatives / protocols and international best practices in line with company’s’ Code of Business Conduct. The following key corporate governance documents are available from <http://reconafrika.com>.

- ❖ Code of Business Conduct and Ethics;
- ❖ Corporate Governance Committee Charter;
- ❖ Audit Committee Charter;
- ❖ Anti-Bribery Policy;
- ❖ Disclosure Policy, and;
- ❖ Whistle Blower Policy.

4. RECEIVING ENVIRONMENT

4.1 Overview

The PEL No. 73 covering Blocks 1719, 1720, 1721, 1819, 1820 and 1821 falls within the Kavango West and East Regions. The general license area is sandy averaging around 1115 m above mean sea level (mamsl) and dominated by gently undulating and mature forested Kalahari Longitudinal Dune Belts aligned in east west direction (Annex 1).

4.2 Climate

The license area has a subtropical steppe/ low-latitude semi-arid hot climate (Mendelsohn et al. 2002). Detailed information on the climate setting of the project area is provided in Annex 5. Within the license area, annual temperature may average 23°C. The temperatures are highest on average in November, at above 26°C. The lowest average temperatures in the year occur in July, when it is around 18 °C. The average annual rainfall within the PEL 73 is around 588 mm with up to 730 mm along the Okavango River.

4.3 Fauna and Flora

4.3.1 Overview

A detailed desktop fauna and flora assessment was undertaken as part of the EIA and EMP process in order to assess in detail the biodiversity of the project area (Annex 2). It is estimated that at least 67 species of reptile, 32 amphibian, 116 mammal and 210 bird species (breeding residents) are known to or expected to occur in the general Kavango East and West Regions (Annex 2). It is estimated that at least 107 species of larger trees and shrubs (>1m in height) and up to 111 species of grasses are known to or expected to occur in the general area.

4.3.2 Important Areas (Habitats)

The most important areas in the general area are (Annex 2):

- (i) Perennial Okavango River: The Okavango River is viewed as a site of special ecological importance in Namibia due to its biotic richness, threatened plants and insects (Curtis and Barnard 1998) (Fig. 4.1);
- (ii) Ephemeral Omuramba Omatako: Ephemeral rivers are viewed as sites of special ecological importance in Namibia due to its biotic richness, large mammals, high value for human subsistence and tourism (Curtis and Barnard 1998) (Fig. 4.1);
- (iii) Ephemeral Pans: Ephemeral pans are viewed as sites of special ecological importance in Namibia due to its biotic richness, endemic crustacean, Red Data birds, and habitat/resource for humans and wildlife (Curtis and Barnard 1998). Although important larger pans such as Nyae Nyae, etc. fall outside the PEL 73 area, all other smaller pans are also viewed as important habitat;
- (iv) Kaudum National Park: The Kaudum NP falls within the North-Eastern Kalahari Woodlands vegetation type with omurambas which act as ideal routes for wildlife. Dominant trees include: *Acacia erioloba*, *Adansonia digitata*, *Baikiaea plurijuga*, *Combretum imberbe*, *Guibourtia coleosperma* and *Spirostachys africana*. Important wildlife includes: African wild dog, leopard, lion, spotted hyaena, side-

striped jackal, elephant, giraffe, blue wildebeest, eland, kudu, oryx, red hartebeest reedbeek, roan, tsessebe and warthog. Important birds include: Abdim's stork, African golden oriole, African hobby falcon, Bradfield's hornbill, ground hornbill, lesser spotted eagle, racket-tailed roller, steppe eagle and yellow-billed kite (www.met.gov.na and Annex 2), and;

- (v) **Mangetti National Park:** The Mangetti NP falls within the North-Eastern Kalahari Woodlands vegetation type with the vegetation on the dune crests markedly different to that in dune valleys – i.e. Kalahari woodland vegetation dominates the dune crests, whereas mixed acacia savannah vegetation characterises the dune valleys. Dominant trees include: *Acacia erioloba*, *Acacia mellifera*, *Combretum collinum*, *Commiphora* species, *Schinziophyton rautanenii* and *Terminalia sericea*. Important wildlife includes: African wild cat, leopard, spotted hyaena, blue wildebeest, common duiker, kudu, oryx, sable, steenbok and occasional elephant and wild dog. Important birds include: bateleur, lapped-faced vulture, tawny eagle, Meyer's parrot and striped kingfisher (www.met.gov.na and Annex 2).

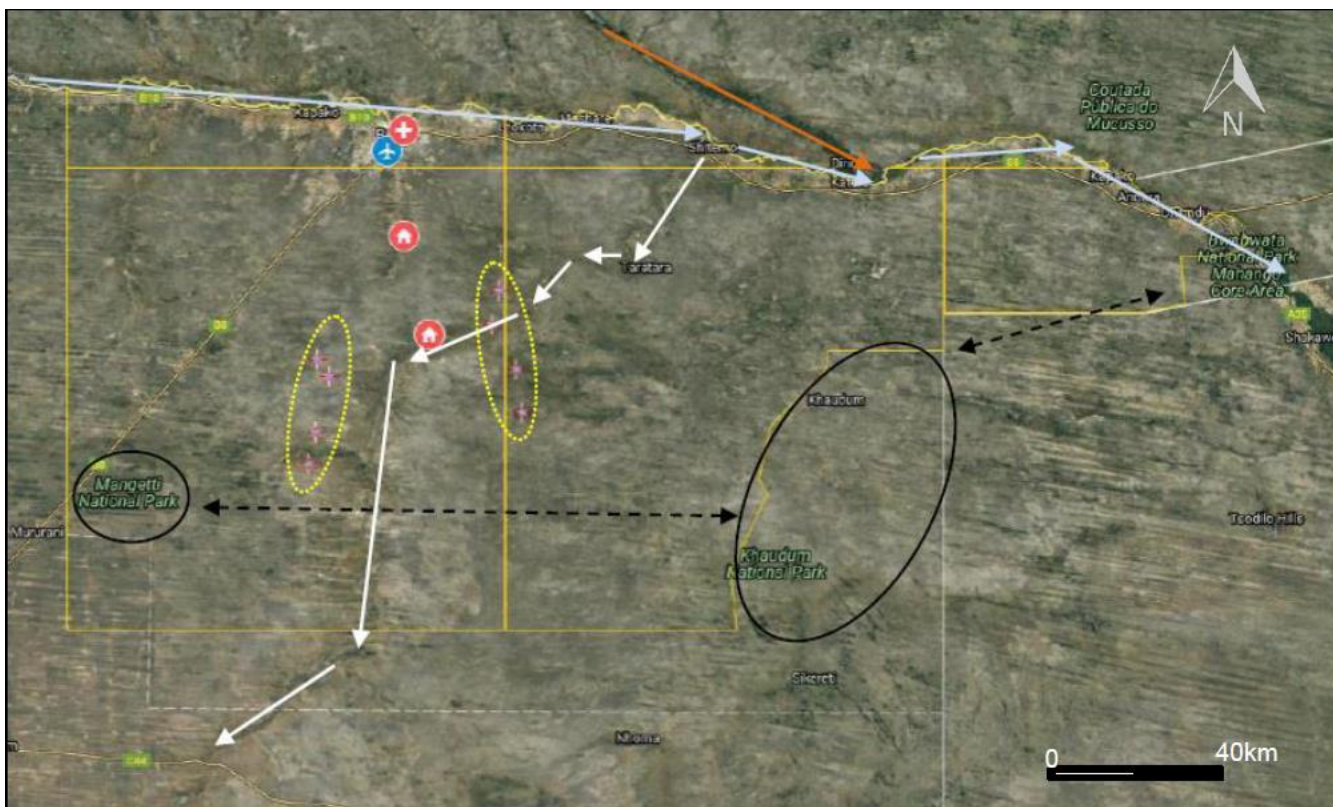


Figure 4.1: Important habitats in the general area are: Okavango River (blue arrows); Quito River (orange arrow); Omuramba Omatako (white arrows) and the Kaudum and Mangetti National Parks (black ovals). Elephant movement between Kaudum and Mangetti NP's and Kaudum NP and Bwabwata NP (Mahangu Core Area) are indicated (dotted black lines). Important prospecting sites indicated (dotted yellow lines).

The proposed well location does not fall in any of above listed sensitive habits. The general surrounding local well locations are not pristine.

4.3.3 Fauna and Flora Diversity Conclusions

Timber harvesting, wood and grasses harvesting for rural housing and homestead / communal farms fencing, signs previous wild fires, subsistence agriculture of slash and burn, new cleared forestry allocated for new leaseholds, erosion and bush encroachment are common all along the access routes and around the general proposed well location areas and are some of the biggest problems facing the fauna and flora in the Kavango West and Kavango East Regions (Plates 4.1 – 4.6).

The most important reptile species are viewed as the endemics (*Ichnotropis grandiceps* and *Lygodactylus bradfieldi*), species classified as rare (*Lycophidion multimaculatum*, *Psammophis jallae*, *Causus rhombeatus*) and species classified as vulnerable (*Stigmochelys pardalis*, *Psammobates oculiferus*, *Kinixys spekii*, *Python natalensis*, *Varanus albigularis*, *Varanus niloticus*) from the general area. Furthermore, *Ichnotropis grandiceps*, classified as data deficient (IUCN 2018) is also viewed as important (Annex 2).

The most important amphibian species from the area is the giant bullfrog (*Pyxicephalus adspersus*) with “population decreasing” according to the IUCN (2018) as it is consumed as food throughout its range.

The most important mammal species from the general area are probably those classified as rare (*Nycteris hispida*, *Kerivoula argentata*, *Kerivoula lanosa*, *Mastomys shortridgei*, *Civittictis civetta*, *Paracynictis selousi*) and endangered (*Lycaon pictus*, *Lutra maculicollis*, *Equus (burchellii) quagga*) under Namibian legislation and those classified by the IUCN (2018) as endangered (*Lycaon pictus*), vulnerable (*Loxodonta africana*, *Smutsia (Manis) temminckii*, *Acinonyx jubatus*, *Panthera pardus*, *Panthera leo*, *Hippopotamus amphibious*, *Giraffa camelopardalis*) and near threatened (*Hipposideros vittatus*). However, some of the above species – e.g. other, hippo, etc. – are only associated with the Okavango River. The most important species expected to occur in the Ncaute-Karukuvisa area would be the African wild dog (*Lycaon pictus*) and pangolin (*Smutsia (Manis) temminckii*).

The most important bird species expected to occur in the general area are those classified as endangered (hooded vulture, white-backed vulture, tawny eagle, martial eagle, bateleur, southern ground-hornbill), vulnerable (secretarybird, white-headed vulture, lappet-faced vulture and) and near threatened (marabou stork, peregrine falcon, kori bustard) from Namibia (Simmons *et al.* 2015) as well as those classified by the IUCN (2018) as critically endangered (hooded vulture, white-headed vulture, white-backed vulture), endangered (lappet-faced vulture), 4 vulnerable (secretarybird, tawny eagle, martial eagle, southern ground-hornbil) and near threatened (bateleur, kori bustard).

The most important larger tree/shrub species expected to occur in the general area are *Baikiaea plurijuga* (Protected F#; LR-nt), *Burkea africana* (Protected F#), *Guibourtia coleosperma* (Protected F#), *Dialium engleranum* (Protected F#), *Philenoptera violacea* (Protected F#), *Pterocarpus angolensis* (Protected F#; LR-nt), *Schinziophyton rautanenii* (Protected F#), *Sclerocarya birrea* (Protected F#) and *Strychnos* species (Protected F#). The most important grasses those commonly used for thatching – *Eragrostis pallens* and *Cymbopogon* species – i.e. economic value. If herbs and “lower” plants (e.g. algae, lichens, etc.) were to be included, this would undoubtedly increase the floral composition of the area tremendously – e.g. more than 100 lichen species are known from coastal Namibia. Although, the focus for this desktop study was limited to the bigger and thus more obvious species of trees, shrubs and grasses, the importance other species such as lichens, ferns, Lithops, etc. is also acknowledged.

Plate 4.1: Timber harvesting in PEL 73.

Plate 4.2: Wood and grasses harvesting for rural housing and homestead.

Plate 4.3: Wood harvesting communal farms fencing.

Plate 4.4: Subsistence agriculture of slash and burn.

Plate 4.5: Forestry clearing for the newly allocated communal leaseholds.

Plate 4.6: Bush encroachment after the abandonment of an unproductive allotment that was subjected to a slash and burn rural subsistence agriculture practices. A slashed and burned portion can only be used for period of two (2) years planting seasons before moving to new a plot after all the soil nutrients are leached out.

4.3.6 Fauna and Flora Diversity Recommendations

All human induced activities (including the proposed exploration) may affect local fauna and flora depending on the extent of the operations. Assessing potential impacts is occasionally obvious, but more often difficult to predict accurately. Such predictions may change depending on the scope of the activity – i.e. once initiated, may have a different effect on the fauna and flora as originally predicted. Thus continued monitoring of such impacts during the exploration phase(s) is imperative. Overall, however, the proposed petroleum exploration activities (drilling of multiple stratigraphic wells in PEL 73) are likely to affect only a very localised and limited areas and over a shorter period linked to the widening of the accesses, campsites and actual drilling sites. Mitigation measures that will minimise the likely impacts on fauna and flora are provided in the EMP Report Vol. 3 of 3.

4.4 Socioeconomic Settings

Nkurenkuru is the capital of the Kavango West Region and it's situated about 140 km west of Rundu the regional Capital of Kavango East region. The boundary between Kavango East and West generally follows the Omatako-Omuramba River (Fig. 4.2 and Annex 3).

The Kavango West Region covers an area of 24,591.27 km² and lies directly south of Angola and the Kavango River and east of Ohangwena and Oshikoto Regions, north of Otjozondjupa Region and west of the Kavango East Region. Kavango West Region is subdivided into eight electoral constituencies namely: Kapako, Mankumpi, Mpungu, Musese, Ncamangoro, Ncuncuni, Nkurenkuru, and Tondoro (Annex 3).

Kavango East Region covers an area of 23,987 km² and is bordered by the Kavango West, Otjozondjupa and Zambezi Regions. The constituencies in Kavango East Region include: Rundu Urban, Rundu Rural, Mashare, Mukwe, Ndiyona and Ndonga Linena (Annex 3).

Both regions and the project area are characterised by an extremely uneven population distribution. The interior of the regions are very sparsely inhabited, while the northernmost strip, especially along the Kavango River, has a high population concentration (National Planning Commission, 2012 and Fig. 4.2). According to Mendelsohn *et al.* (2006), the general livelihood of the people in the two regions is derived from small-scale agro-pastoralism, supported by fishing along the Okavango River. Overall, subsistence agriculture comprising animal husbandry (cattle and goats), cultivation of millet and maize and timber logging are an integral part of the day to day survival of the rural population within the project.

Based on the results of the socioeconomic assessment undertaken as part of the EIA and EMP process, the following is the summary of the socioeconomic settings of the proposed project area (Fig. 4.2 and Annex 3):

- ❖ The population of Ncamangoro Constituency is 7043 people, which is 8.1% people of Kavango West Region. Mashare Constituency has 8885 people, which is 11.2% of Kavango East population;
- ❖ Inter-Census growth rates are 1.6% for Kavango East Region and 0.6% for Kavango West Region;
- ❖ Gender distribution is slightly inclined towards higher female shares. Mashare Constituency had 52% of female and 48% of male population and Ncamangoro Constituency had 51.9% female and 48.1% male population;

- ❖ The population density in both regions is above national average. 6.2 people for km² in Kavango East was and 3.6 people for 1 km² in Kavango West;
- ❖ Inter-census recorded that both Kavango Regions have high proportion of persons with disabilities, particularly high was in Kavango West (7.6%). This is the highest in Namibia. East recorded 6.0% of persons with disabilities;
- ❖ Ncamangoro Constituency falls within the Mbunza Traditional Authority and Mashare Constituency falls within Sambyu Traditional Authority;
- ❖ Rukavango-speaking people constitute the largest language group in Kavango (79.4% of the population), and San constitute 0.4% of the region's population;
- ❖ Mashare Constituency's adult literacy rate stood at 72% and Ncamangoro recorded only 63.3% of people being literate. Literacy rates in both constituencies are not only below their respective regional average rates, but they are among lowest in Namibia;
- ❖ Kavango Regions (East and West) has the largest population of unemployed youth aged 15-35 and the highest unemployment rates. Unemployment in Kavango East is 39.6% and in Kavango West stands at 36.4 %. Unemployment in Ncamangoro Constituency stood at 52.2%. Unemployment rate for female is higher than for male;
- ❖ Kavango regions have highest incidence of poverty, 53% of all population. Poverty is defined as the number of households who are unable to afford sufficient resources to satisfy their basic needs;
- ❖ The main employment industries in Kavango East and Kavango West is agriculture, forestry and fisheries. Around 45.95% of employed in Kavango East are in the agriculture, forestry and fisheries sector and in Kavango West the share is even larger 80.04%;
- ❖ The Kavango West and East Regions are relatively well covered with a network of roads; unfortunately, most of these roads are gravel or sandy roads that make travel difficult. Kavango East Region has one airport, at Rundu, that accommodates national flights. Several smaller airstrips cater for the tourism sector especially in the eastern part of the region;
- ❖ Nevertheless, people living deep in the interior of both regions are far from social infrastructure, thus access to education and medical treatment is difficult;
- ❖ The communities living in the northern part of the Kavango West and Kavango East Regions along the road from Nkurenkuru to Rundu and Rundu to Divundu road are relatively well connected to the national electricity grid. The remainder of the rural communities situated away from the river and the main road are connected mostly with off-grid facilities that utilise either solar power systems or diesel power systems;
- ❖ The Okavango River is the main source of water for the people living along the river, and for their livestock, whereas villages away from river depend entirely on groundwater from boreholes supplied by MAWF and in some cases from seasonal pans. The urban areas - settlements and towns are provided with water by the NamWater;
- ❖ The main economic activities of both Kavango Regions are agriculture, mainly small-scale mahangu farming, providing some food self-sufficiency but little food security;

aquaculture; timber harvesting; tourism, particularly in Kavango East Region; and some minor mining activities;

- ❖ There are a number of community forests within the Kavango East and Kavango West Regions Two (2) community forests in Kavango West and ten (10) community forests in Kavango East. The proposed project's drilling sites are not located within the community forest areas, however they are very close to Gcwatjinga and Mbeyo community forests. Illegal harvesting of timber in Kavango Regions is on rise and attributed to the high demand for timber worldwide, and;
- ❖ Tourism is mainly in Kavango East Region. In Kavango West Region it is limited and undeveloped. Tourism in the Kavango East Region is mostly focused on the eastern part of the region around Divundu, to some extent in the central part of the region next to the Kavango River and in Rundu. This is associated with the fact that most of the biodiversity, wildlife and scenic areas are found in the eastern part of the region. Kavango East Region falls within the Kavango Zambezi Transfrontier Conservation Area (KAZA TFCA).

Proposed drilling sites for PEL 73 Blocks 1819 and 1820 are very remotely located with limited accessibility. The development will have mainly positive impacts on the surrounding areas. Below table presents potential positive and negative impacts and offers enhancement measures for positive impacts. The associated negative impacts could be mitigated with mitigation measures as provided in Annex 3 and the EMP Report Vol. 3 of 3.

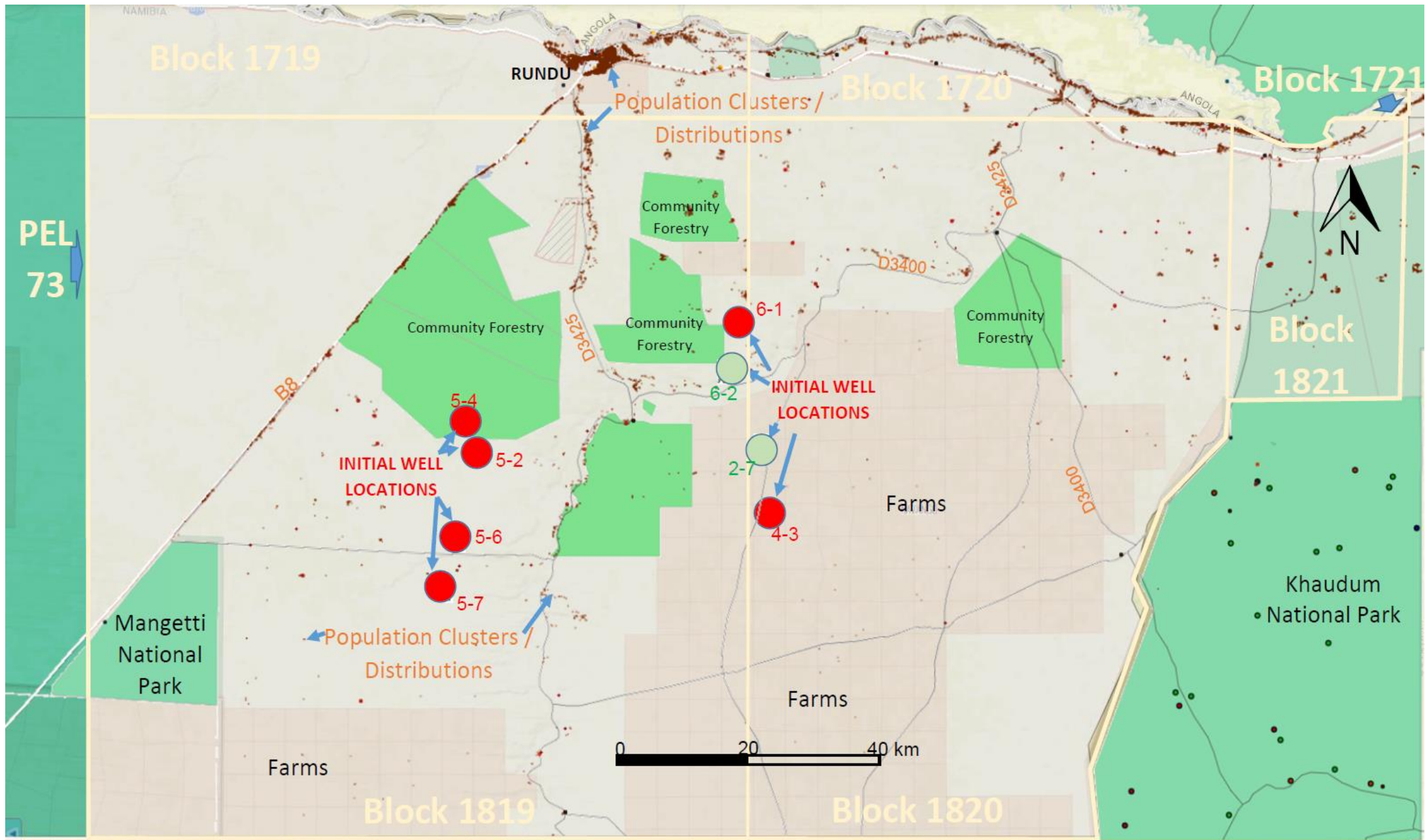


Figure 4.2: Population density, roads and socioeconomic setting around PEL 73 covering Block 1719, 1720, 1721, 1819, 1820 and 1821 and the well locations (Data Sources: www.kavangozambezi.org/en/- arcgis Accessed, March 2019).

4.5 Geology and Petroleum System

4.5.1 Regional Overview

Reconnaissance Energy Namibia (Pty) Ltd, the Proponent and operator of PEL 73 is targeting equivalent rocks to the hydrocarbon prone unconventional deposits within the Karoo Group of the main Karoo Basin in South Africa (Fig. 4.5).

The main producing formations within the Main Karoo Basin are the Prince Albert, Whitehill and Collingham, and all of the Lower Ecca Group.

The Prince Albert Formation within the Karoo Basin of South Africa is composed of mudstones with shales and some small sandstone units. The overlying Whitehill Formation is comprised of fine grained, finely laminated black organic rich shale.

The shales contain dolomite lenses near the base. The Collingham Formation is comprised of dark grey mudstones, intercalated with thin yellow clay like layers of ashfall tuff. At the top of the formation, the mudstone grades into sandstone.

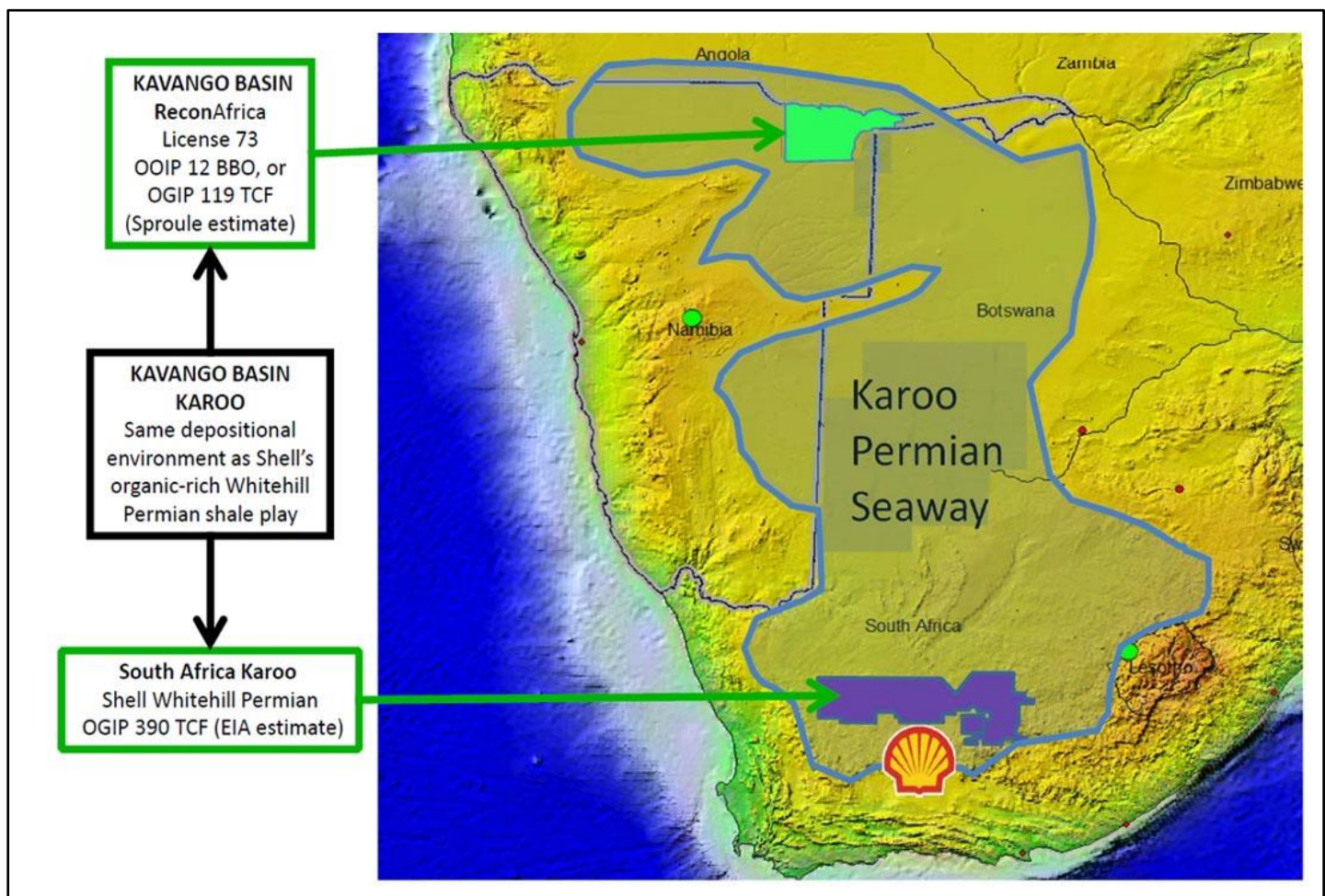


Figure 4.3: Extent of the Karoo Rocks in Southern Africa (Source: Reconnaissance Energy Namibia <http://reconafrika.com>, Accessed June 2019).

4.5.2 PEL 73 Potential Active Petroleum System Opportunities

Reconnaissance Energy Namibia (Pty) Ltd has interpreted high resolution aero magnetic data documenting a very deep untested Kavango Basin with optimal conditions for preserving a thick interval of organic rich marine shales in the lower portion of the Karoo Super Group (Fig. 4.4). Maximum depth to basement is estimated at over 9 kilometres (Fig. 4.5). The company has also completed structural and geological interpretations of magnetic inversion profiles, backfilling the basin with stratigraphic section of Precambrian, Permian and Cretaceous sediments (Fig. 4.6).

Reconnaissance Energy Namibia (Pty) Ltd.'s interpretation strongly suggests that the formational equivalents to the Lower Ecca Group will be preserved in the untested deeper portions of the Kavango Basin. The company believes that these target sediments lie in a previously unrecognized Karoo Basin along major trans African lineaments that link northeast Namibia to the better known Karoo rift basins in eastern Africa.

Reconnaissance Energy Namibia (Pty) Ltd.'s geologic team has defined a beneficial structural framework and depositional basin configuration utilising a high-resolution aero-magnetic database. The company has developed a fully integrated structural inversion model for the entirety of the Kavango Basin defining a pull-apart basin with targetable half grabens capable of housing substantial thickness of Karoo-aged sediments and reef-prone Lower Paleozoic Units. Regional geologic investigations of the Permian Karoo Seaway, including main Karoo Basin, Botswana Kalahari Basin and Namibian basins Karasburg, Nama, Waterberg, Huab and Owambo support potential for adequate thickness of resource-prone sediments. Preliminary analyses indicate basin depths supportive of oil and gas thermal maturation levels (Figs. 4.4- 4.6).

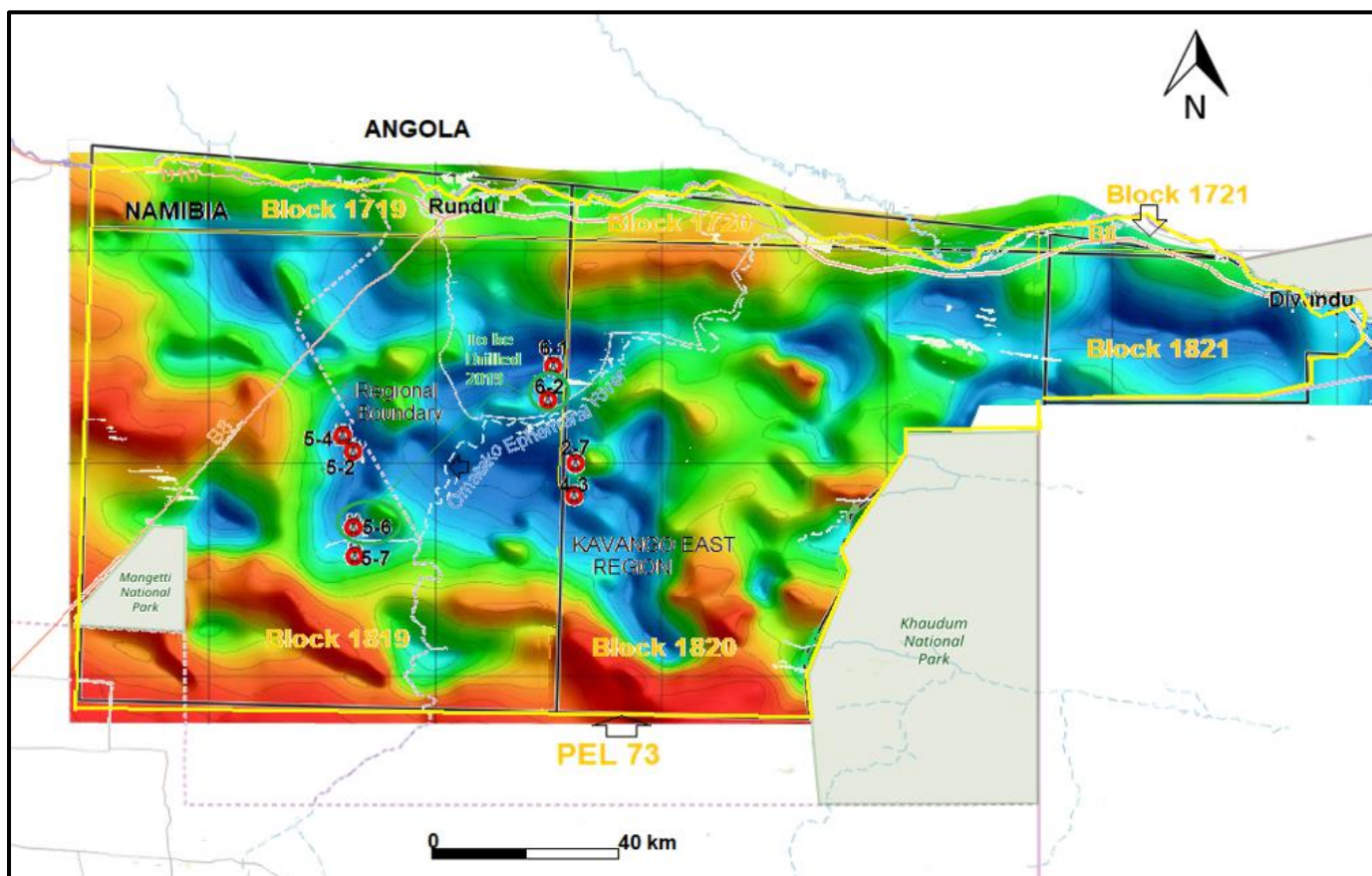


Figure 4.4: PEL 73, Kavango Basin and well locations (Source: Reconnaissance Energy Namibia <http://reconafrica.com>, Accessed June 2019).

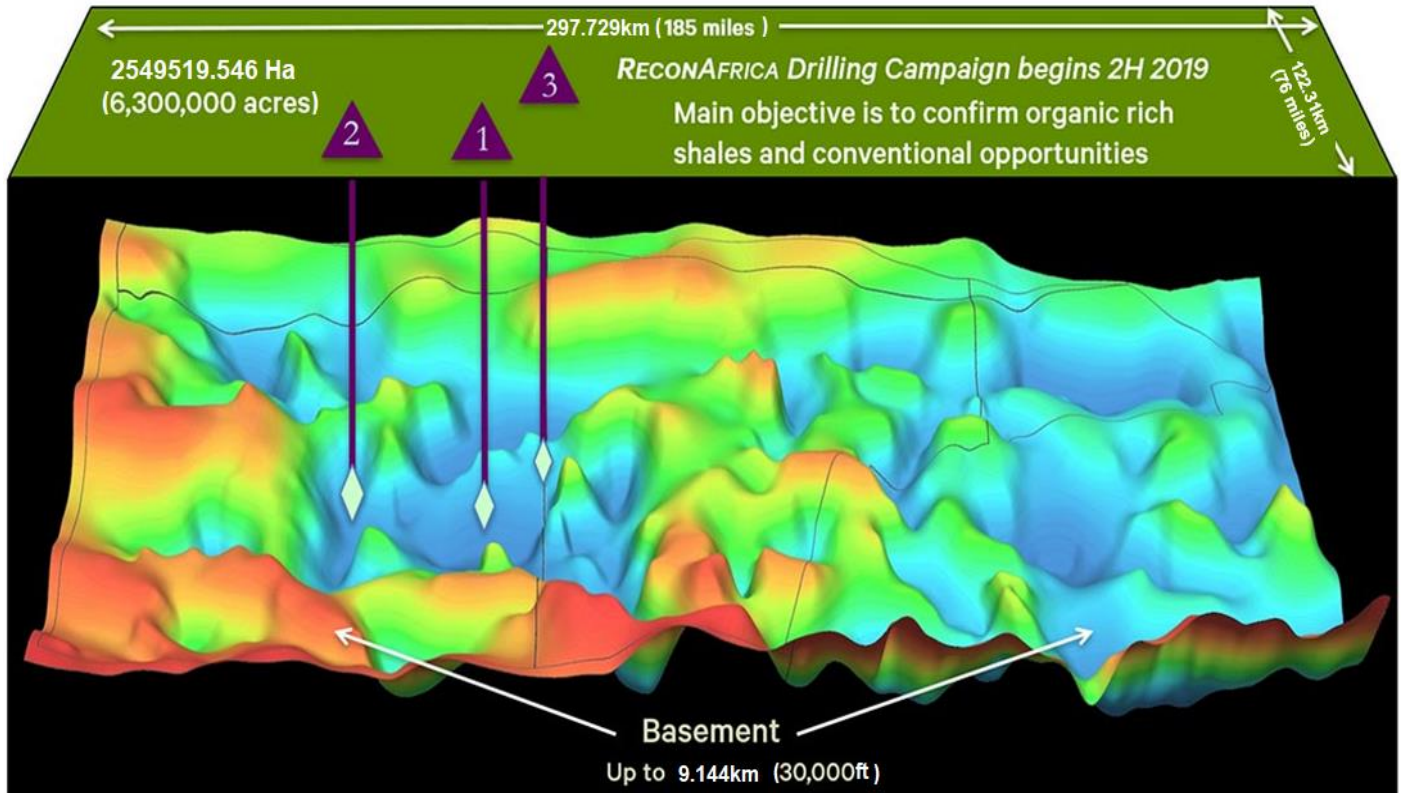


Figure 4.5: 3D model representation of PEL 73 and the Kavango Basin based on the interpretation and integration of the geophysical, structural and geological data sets (Source: Reconnaissance Energy Namibia <http://reconafrika.com>, Accessed June 2019).

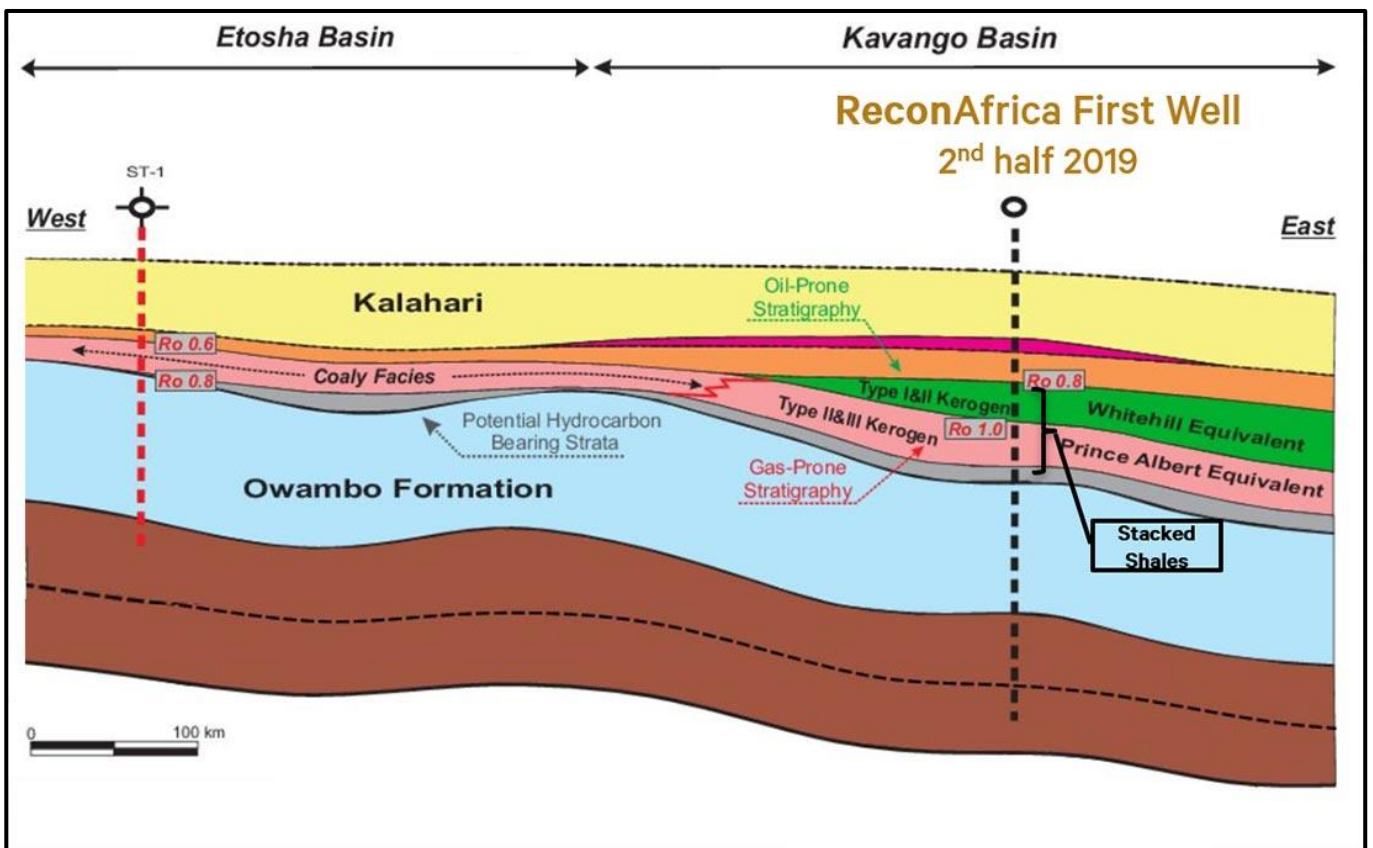


Figure 4.6: Kavango deep basin resource opportunity (Source: Reconnaissance Energy Namibia <http://reconafrika.com>, Accessed June 2019).

4.6 Water

4.6.1 Overview

The study area is located in northern Namibia straddling portions of the East and Western Kavango Regions. By virtue of its location the study area forms part of a low lying peneplain of the Omatako, Cubango-Cuito and Okavango surface water Basins (Annex 4). The land surface gently slopes in the north easterly direction from an elevation of 1200 mamsl in the south western corner to about 1029 mamsl in the north eastern corner of PEL 73.

In view of the target exploration sites, it is important to note that sites 5-4, 5-6, 5-2 and 5-7 are situated on the western fringe of a drainage active zone; whereas sites 6-1, 6-2, 2-7 and 4-3 are slight out of the active zone of the Omatako River and are potentially areas of surface water ponding, infiltration and groundwater through flow (Fig. 4.7).

Further south of the PEL No. 73 particularly covering Block 1818, water supply is from groundwater resources associated with the Kalahari Group. According to CSIR (1982), there are three (3) hydrogeological units in the Kalahari Group: namely the upper, middle and lower Kalahari (Table 4.1). Of the three units shown in Table 4.1, the middle Kalahari sandstone is recognised as the most promising aquifer of the three units, whereas the lower Kalahari is reported to be argillaceous and of poor water quality.

The deep and regional groundwater flow system equivalent to the lower Kalahari aquifer unit benefits from direct recharge around the rim of the basin and from elevated outcrops, would characteristically artesian (marl and clay confining layer) with elevated total dissolved solids (TDS) due a long resident times, and therefore prone to poor water quality (Fig. 4.8). This system is not expected to be shallower than 160 m except where elevated by igneous intrusions.

Project falls within the rural, communal areas where water supply is provided by the Rural Water Supply Division within the Department of Water Affairs (DWA) in the Ministry of Agriculture, Water and Forestry (MWAFF). In private commercial farmland, individual farm owners provide for all their water needs through the application for abstraction permits from the Department of Water Affairs. A detailed assessment of the surface and groundwater situation within the project area is highly recommended.

Table 4.1: Conceptual hydrogeology characteristics of the study area.

GROUP / SEQUENCE	STRATIGRAPHIC UNIT	DESCRIPTION	
		Nature Type	Aquifer Potential
Kalahari	Fine and Silt	Aquitard, leaky	Low Yielding, locally high Yielding
	Sandstone, Sand & Clay	Aquifer	Low Yielding
	Marl and Clay	Confining Layer	None
	Conglomerate & Gravel	Aquifer	High Yielding
Karoo	Basalt/Sandstone	Aquitard/Weathered	Conditional
Damara	Schist/Quartzite/dolomite	Aquitard/Fractured	Conditional

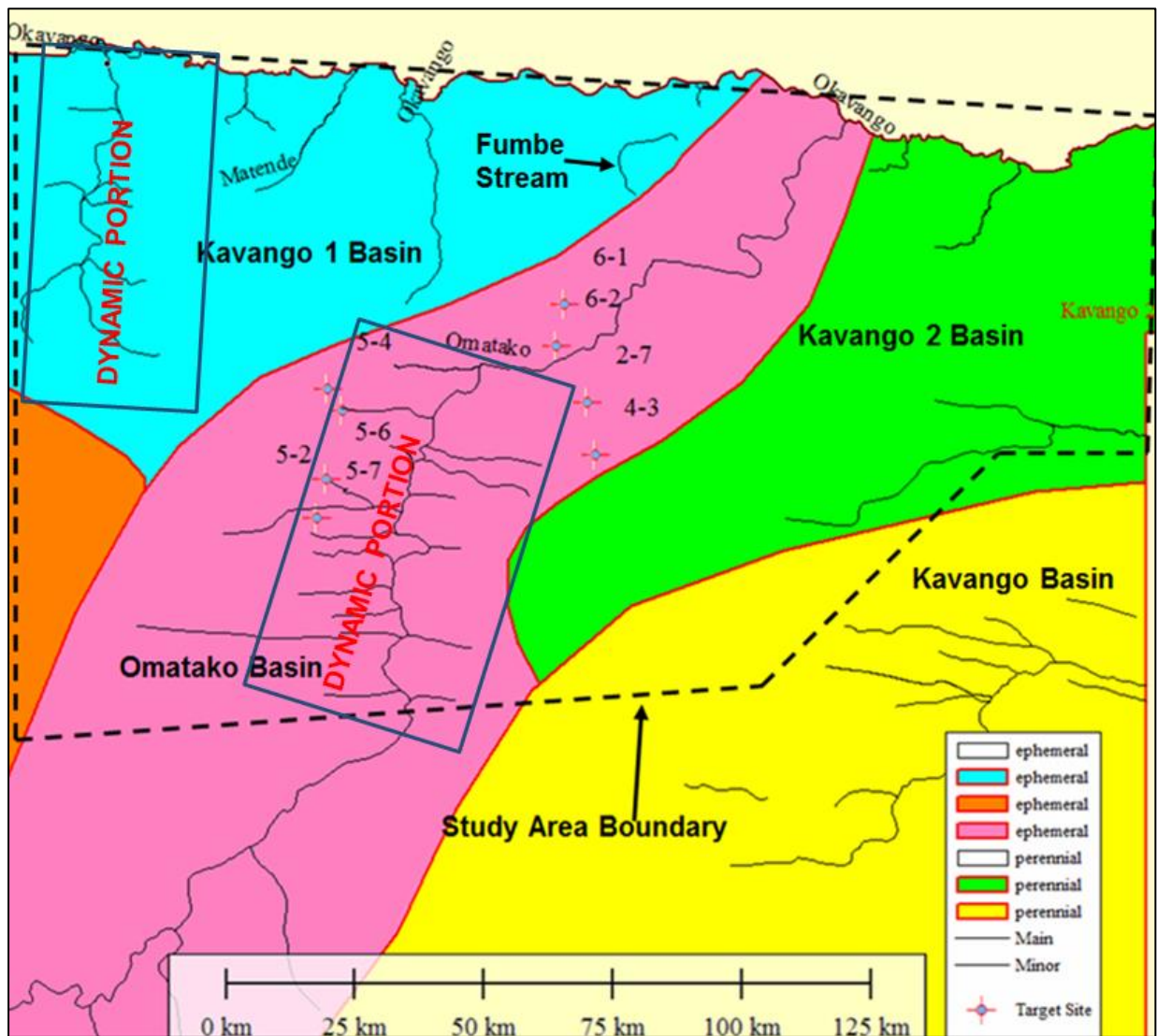


Figure 4.7: Key local drainage system around PEL 73.

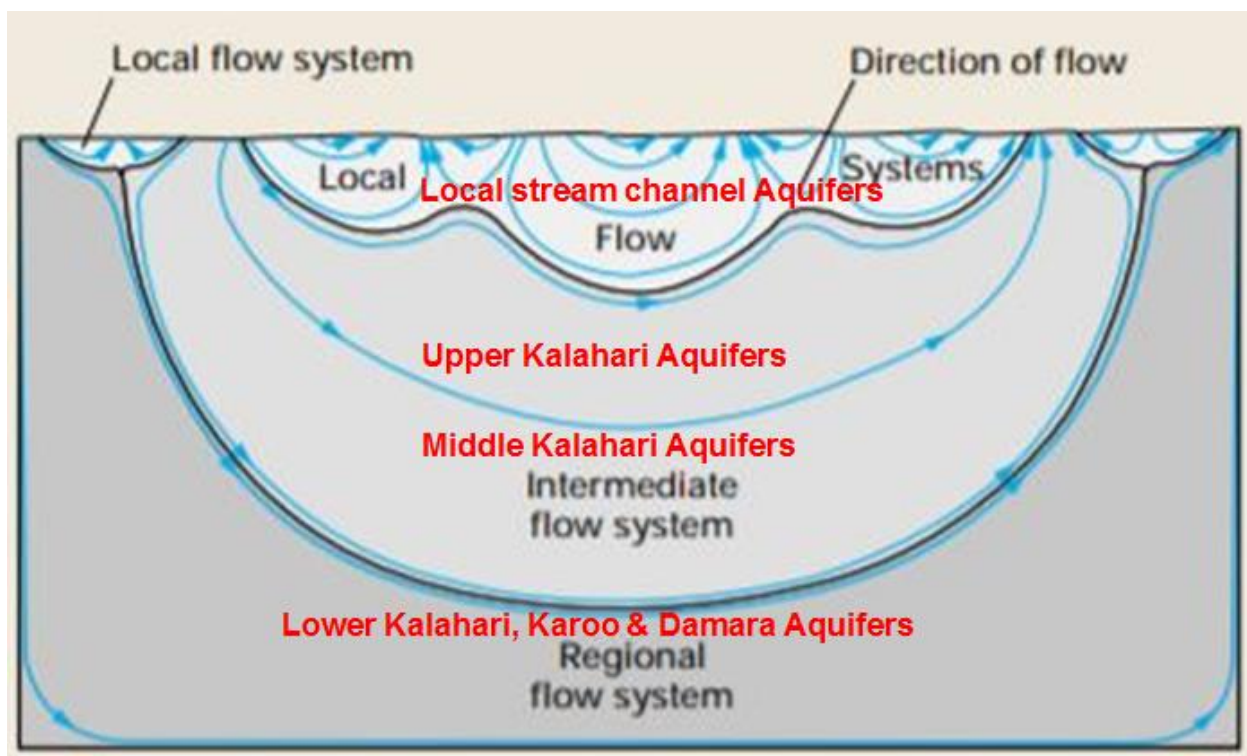


Figure 4.8: Conceptual groundwater flow components around PEL 73.

4.6.2 Summary of the Impact and Risk Assessment on Water

Detailed assessments of the potential negative impacts that proposed multiple stratigraphic well drilling operations in PEL 73 will have on the surface and groundwater are provided in Annex 4. Detailed mitigation measures are also provided in Annex 4 and the EMP Report Vol. 3 of 3. The following is the summary of the impact and risk assessment associated with the proposed activities on the surface and groundwater (Annex 4):

- (i) Aquifer pollution vulnerability (APV): On the basis of aquifer pollution vulnerability (APV) evaluation, it can be concluded that the aquifer pollution vulnerability of the upper Kalahari in study area is extremely high due to elevated groundwater levels of some times less than 10 m. This vulnerability largely relates to ground based activities which have the potential of polluting both surface and groundwater. In the context of the expected exploration drilling care should be exercised not to allow pollutants in this zone of the stratigraphy;
- (ii) Increased risk of flooding: The risk of flooding considering the paucity of the geographic footprint of the proposed drilling in combination with the low topographic slope of the area is low and can however turn into the moderate risk zone with low impact between November and March in view of duration and area-coverage risk measures;
- (iii) Impacts due to contaminated water discharge: Drilling rigs maintain cleanliness by washing oil remnants and other forms of dirty every now and then, and this waste should be collected in moveable chambers and disposed-off safely, but should this oil contaminated waste-water find other ways to either groundwater or surface water bodies, remedial actions are usually difficulty and expensive. However, sometimes oil spills occur and these can pose very high contamination risks to both surface and groundwater resources. In the study area, this risk increases during wet months of year from November to March and due to low topographic and groundwater gradients as well as the possible impact on water resources, vegetation and on aquatic life this risk is rated high and needs concerted attention;
- (iv) Impacts due to oil tank bursts or/and pipe breaks: Although the likelihood of this risk is low, the impact if it happens is significant, for this reason, the risk is highlighted as a going concern of high priority and therefore special attention should be associated with efforts to make sure it does not happen;
- (v) Impacts due to vehicle fuel leaks: This risk is associated with leaks and fuel emissions from cars either parked or fuelling at the drilling site, these emissions and leaks have the potential of reaching both groundwater and surface water if there are active pathways. Even though the pathways to groundwater resources are not significant, those to surface water (during wet periods) taking into consideration the proximity of these sites to streams needs attention. However, this risk scores moderate due to its paucity and likelihood;
- (vi) Impacts due to backwash water: This risk is closely related to the impacts due to contaminated water discharge, and scores high due its nature, and magnitude given that machines and cored samples need to be cleaned with considerable amounts of water. Another measure of significance is the reversibility of impacts if such incidents take place. It is common knowledge that polluted soil and polluted-water pollute water, and complete remedial is usually impossible and costly to the environment and in monetary terms;

- (vii) Impacts due to loss of drainage area: This risk has moderate impact, in most measures it scores low, but if it occurs it is permanent. For this reason, it is rated moderate for this proposed drilling in that the site is within the immediate catchment of a stream;
- (viii) Impacts due to Increased or reduced runoff: This risk scores moderate due to its nature and its low reversibility if it happens, however it scores low in all other aspects. Vegetation clearing and paved area increases runoff and largely contribute to flood risk even during rainfall event which would otherwise pose no risk in natural environments. For this reason, this risk is considered low, and should be treated as such in monitoring and management plans;
- (ix) Impacts due to drainage pattern disturbances: This risk is almost negligible due to its small impacts with regard to extent, and duration if it happens; it has low magnitude and reversibility impacts;
- (x) Impacts due to Increase suspended load: This risk is almost negligible, and this is because there is little or no mobilization of suspended load in the long term, but should be considered during construction stage of proposed project;
- (xi) Impacts due to increased risk of salinization: This risk of high concern and particular attention should be paid to manage and mitigate it. Salinisation generally speaks to increasing total dissolved solids (TDS) in water resources. In general, petroleum and gas contain high content of carbon, nitrogen, sulphur and metals like copper, nickel and vanadium. Therefore, exposure of petroleum/gas waste to water bodies raises the risk of elevated TDS and elevated content of heavy metals in water;
- (xii) Impacts due to disrupted groundwater flow/pathways: There are limited to no obvious groundwater flow/pathways in the study area, therefore, this risk is negligible, and;
- (xiii) Impacts due to elevated or reduced groundwater levels: It is envisaged that apart from the serious nature of the risk, the impact is low due to small extent, magnitude and reversibility of the risk should it occur. Groundwater withdrawal for drilling and other activities should be at the safe yield of production boreholes; therefore proper pump testing and data.

4.6.3 Conclusions and Recommendations on Water

The endorheic drainage system in combination with drying and episodic rainfall climatic conditions created at the onset of the break-up of the Gondwanaland super-continent provided the coarse sediment river/stream channel bedload which forms the present day aquifers of the lower Karoo and lower Kalahari Groups of geological formations (Figs. 4.6 and 4.7). At a local scale; the reactivation of old tectonic faults and the associated intrusion of basaltic igneous materials provided the impetus for high mass transport capacity of recent drainage system which forms the coarse stream channel bedload sediments relating to aquifers of the upper Kalahari Group.

In the context of the impact assessment of the risk posed by the proposed oil and gas exploration drilling in the study area, it is concluded that most of the risk categories are moderate to negligible if proposed measures are adhered to. However, the risks associated with: aquifer pollution vulnerability, impacts due to contaminated water discharge, impacts due

to tank bursts or/and pipe breaks and that associated with impacts due to backwash water have high to moderate impacts with regard to water resources negative impacts in the study area. It is therefore recommended that the proposed mitigation measures be considered as integral part of the environmental management plan (EMP).

Long term and cumulative impacts will be limited if the exploration holes will have cement casing up to the Base of Groundwater Protection (BGWP) which is regarded as the depth at which groundwater quality changes from non-saline to saline (4000 mg/l). This principle also applies to saline stratigraphic horizons in sections above the BGWP. In essence, the exploration hole should be materially isolated from the rest of its immediate surround by cement casing/grouting. Should it happen that the exploration hole still has a role to play after the exploration exercise, it should be properly closed on top; else total plugging of the exploration hole is recommended.

4.7 Archaeology

4.7.1 Overview of Archaeological Resources in PEL 73

A specialist desktop archaeological assessment was undertaken as part of the EIA and EMP process covering PEL 73 (Annex 5). Previous systematic archaeological investigations of the Kavango East and West Regions revealed human occupations that predate the pre-colonial farming settlements. In addition to archaeological heritage, modern heritage of Kavango East and West Regions is characterised by remnants of numerous historic, sacred cultural sites as well as present-day community graves and cemeteries mainly along the Omatako River basin that are to be avoided (Annex 5).

4.7.2 Archaeological Baseline Findings

The desk archaeological heritage impact assessment study has only identified a group of archaeological heritage sites within the footprint of the proposed project. These are located between 12 and 28k km from proposed drilling sites and are located along the Omatako River basin between Ncaute and Taratara villages, near the drilling site 6-2, (Table 4.2 and Fig. 4.9). Additionally, a group of other sites whose quantity has not been established are also found south west of Omatako River basin. These sites will not be impacted by the proposed oil explorations development neither are they vulnerable nor sensitive. However, it cannot be ruled out that other significant archaeological evidence of pre-colonial occupation will likely be found along the tributaries of the Omatako River basin mainly due to the presence of fresh water in the immediate area.

If they do occur, the nature of anticipated archaeological materials along the Omatako river course will likely be of diagnostic nature from Late Stone Age period due to the spread of the industry in this area (Annex 5). However, such surface artefacts will have no archaeological values because they will likely be disturbed and in secondary depositions/context.

Table 4.2: List of archaeological sites identified within the footprints of the proposed project.

Site No.	GPS location	Region	Constituency
1	18°13'54.72"S / 19°44'9.88"E	Kavango East	Mcuma/Chimpanda
2	18°21'50.17"S / 19°49'53.12"E	Kavango East	Shikambu
3	18°21'48.47"S / 19°51'24.65"E	Kavango East	Baramasono
4	18°11'1.21"S / 20°10'15.72"E	Kavango East	Baramasono
5	18°10'59.89"S / 20°11'18.68"E	Kavango East	Taratara

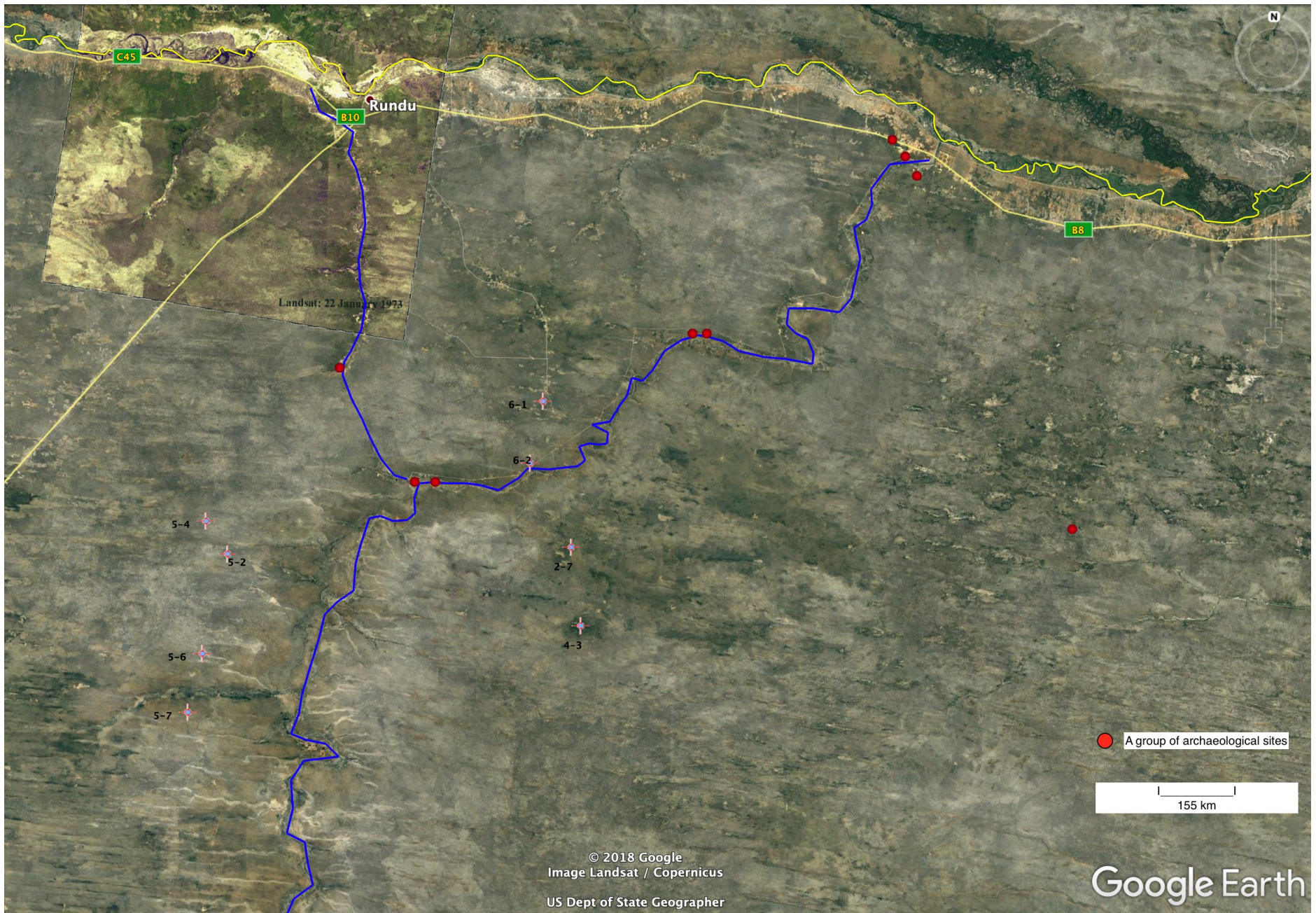


Figure 4.9: A group of archaeological sites (red, quantities not established) in relation to the proposed oil exploration drilling sites. The blue lines indicate the river systems from the main Okavango River.

4.7.3 Archaeological Impact Assessment Results

In the unlikely event that archaeological sites are exposed during site works, the expected nature of impact would be in the form of direct physical disturbance or destruction. The expected magnitude of this impact would be LOW. Due to the fact that impacts on archaeological sites are irreversible, these would be HIGH, with a LOCAL spatial scale (Annex 5). The consequence of the impact would be LOCALIZED, and its significance would be LOW. The interpretation of this assessment would indicate a LOW significance, indicating that the risk of archaeological impact is so low as to have no influence on the project decision.

Furthermore, this assessment has not located any historical or sacred sites in vicinity of the proposed drilling sites, but caution must be exercised since there are existing modern villages. In the case of the “no-go” alternative, no disturbance of the sites would occur at the group of identified archaeological sites and therefore the impact on archaeological would not occur, and so the “no go” alternative has not been assessed here. From the cumulative impact perspective and low sensitivity of the sites, it is expected that the project will not have a negligible cumulative impact on Namibia’s archaeology resource base on the known archaeological sites (Annex 5).

4.8 Stakeholder Consultations and Engagement

4.8.1 Overview

According to the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 and the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007), a person conducting a public consultation process must give notice to all potential Interested and Affected Parties (I&APs) of the application for ECC which is subjected to public consultation and participation process. The EIA Regulations clearly state that potential interested and affected parties must be provided with a reasonable opportunity to comment on the application under section 21(6) of the EIA Regulations.

Consultation of the Interested and Affected Parties (I & APs) has been part of the EIA process for this project in line with the environmental regulatory requirements. Due to the specialised nature of the proposed project activities (Petroleum Exploration-Drilling of multiple stratigraphic wells within PEL 73) and situated in remote communal areas, the project team focused heavily on working with the regional, local and traditional leaders who have been responsible for informing their local communities about the proposed activities.

Continuous consultation and updating of the political (Governors and local Councillors) and traditional leaders of the Kavango West and East Regions about the proposed activities shall continue to be undertaken in order to make sure that the local community are kept up to date on the ongoing activities and do not feel afraid if they happen to come across the exploration team in area.

4.8.2 Stakeholders Consultation Process Undertaken

Prior to the implementation of the public and stakeholder consultation processes as part of the formal project registration with the Government, a Draft Scoping Report with Terms of Reference for the EIA and EMP phases was prepared and on the 3rd April 2019 submitted to the Environmental Commissioner in the Ministry of Environment and Tourism through the Petroleum Commissioner in the Ministry of Mines and Energy. An approval of the project Scoping Report was issued by the Environmental Commissioner dated 27th May 2019 (Fig. 1.9).

Public and stakeholder consultations process covering all the Interested and affected Parties (I&APs) were conducted during the months of March and May 2019. Copies of the Environmental Assessment Reports were distributed to the following key the institutional stakeholders including the Offices of the Governors of Kavango West and Kavango East Regions as well as the Ministry of Safety and Security (MSS) in both regions with respect to the assessment of unexploded ordnances around the proposed drilling localities.

Furthermore, copies of the reports were also distributed at Public Libraries in Windhoek, Kavango West and Kavango East Regions. Public notices were published in the local newspapers inviting all I&APs to registered as stakeholders. Additional local consultation outreach process were undertaken through the Offices of Governors for Kavango West and Kavango East Regions. Well attended public /stakeholder meetings were held in Nkurenkuru, Kavango West Region and Rundu, Kavango East Regions on the 9th and 10th May 2019 respectively (Plates 4.7 and 4.8). Minutes of the meetings are provided in Annex 6.

Public notices were published in the Confidante Weekly Newspaper dated 16th – 22nd May 2019 and Namibian Daily Newspaper dated Tuesday 21st May 2019 (Figs. 5.10 and 5.11 and Annex 6). A feature article was also published in the Namibian Sun dated Monday 27th May 2019 (Figs. 5.12 and 5.13) in order to complement the two (2) notices. The feature article was based on information provided to the Journalist. The closing date for submission of written inputs /comments /objection is Friday 31st May 2019.

4.8.3 Dangers of Unexploded Ordnances

As part of the stakeholders consultation process, contacts were with the Police Regional Commanders for Kavango West and East Regions under the Ministry of Safety and Security (MSS). Letters were send to the two (2) Police Regional Commanders requesting for advice with the respect to the dangers / risk for potential unexploited ordnances with respect to the proposed drilling locations (Annex 6). Invitations to attend the organised meetings in Nkurenkuru and Rundu on the 9th and 10th May 2019 respectively, were also extended to the two (2) Police Regional Commanders.

Representatives from the Police Regional Offices attended the meetings in Nkurenkuru and Rundu (Annex 6). A response from the Police Inspector General directing the Regional Commander for Kavango West Region to provide support to Reconnaissance Energy Namibia (Pty) Ltd was received dated 31st May 2019 (Fig. 5.14).



Plate 4.7: Nkurenkuru meeting 9th May 2019, Kavango West Region.



Plate 4.8: Rundu meeting 10th May 2019, Kavango East Region.

PUBLIC NOTICE FOR APPLICATION FOR ENVIRONMENTAL CLEARANCE CERTIFICATE (ECC)

GeoPartners Ltd (Proponent) Application for Environmental Clearance Certificate (ECC) for the Proposed Regional 2D Seismic Survey covering the Walvis Basin (Central Offshore) and the Namibe Basin (Northern Offshore up to the Angolan Border) and Application made under the Environmental Impact Assessment Regulations No. 30 of 2012 of the Environmental Management Act, 2007, (Act No. 7 of 2007)

The Ministry of Mines and Energy (MME) and National Petroleum Corporation of Namibia, (NAMCOR) have signed an agreement with GeoPartners Ltd UK (the Proponent) for the acquisition of widely spaced regional 2D offshore seismic survey covering the Walvis Basin (central offshore Namibia) and the Namibe Basin (Namibian northern offshore up to the Angolan border). The proposed survey extends from -200m into the deep water (averaging -3000m). Although offshore seismic surveying in Namibia began in 1988, a lot more still need to be done in order to have a full understanding of the petroleum systems offshore Namibia. The data sets from the proposed 2D seismic survey will provides critical insight into the subsurface geologic evolution, offshore basin architecture and depositional and structural history of the petroleum systems within the two basins (Walvis and Namibe Basins). Seismic survey is a key tool that resources companies exploring for hydrocarbons (oil and natural gas) use either on land (onshore) or in the sea (offshore).

The basic principle of all seismic methods is the controlled generation of sound / acoustic waves by a seismic source in order to obtain an image of the subsurface. The generated acoustic waves that travels into the earth, is reflected by the various rock formations of the earth and returns to the surface where it is recorded and measured by a receiving devices called hydrophones. The airguns release compressed air to generate seismic signals at regular intervals. Signals reflected from geological interfaces below the seafloor are recorded by multiple hydrophones and transmitted to the seismic vessel for electronic processing. By analysing the time it takes for the seismic waves to travel between the rock formations and the surface, geophysicists, geologists and petroleum engineers use sophisticated software to create subsurface maps showing potential subsurface geological structures called reservoirs that may contain hydrocarbons. The proposed survey will be conducted using the vessel Nordic Explorer. The proposed survey size will be approximately 9545 km comprising 37 survey lines, single source, 25 m short interval, 8m (+/- 0.5m) source depth, 18m fat (+/- 1 m) cable depth, 12.5m group interval, 12,000m acid streamer length, 960 channels per streamer, 240 nominal fold, 14 sec (continuous recording) record length and 2 ms sample interval.

The proposed activities (2D Seismic Survey) cannot be undertaken without an Environmental Clearance Certificate (ECC) as required by the Environmental Management Act, 2007, (Act No. 7 of 2007) and the Environmental Impact Assessment (EIA) Regulations 30 of 2012. In fulfillment of the environmental requirements, GeoPartners has appointed Risk-Based Solutions (RBS) CC as the Environmental Consultant and led by Dr. Sindile Mweya as the Environmental Assessment Practitioner (EAP) to undertake the Scoping, EIA and EMP in order to support the application for ECC. All Interested and Affected Parties (I&APs) are hereby invited to register and submit written comments / objections / inputs with respect to the proposed 2D seismic survey operations.

REGISTER BY EMAIL: hrtd@rbs.com.na or Contact Dr. Sindile Mweya (PhD, PG Cert, MPH, BEng (Hons), Pr Eng) for more information: smweya@rbs.com.na Mobile: +264-811413229

DEADLINE FOR WRITTEN SUBMISSIONS IS: FRIDAY 31st MAY 2019, date for the lodgement of the application for Environmental Clearance Certificate (ECC) is MONDAY 3rd JUNE 2019

Risk-Based Solutions (RBS) CC (URL: www.rbs.com.na)
Your Resources (Oil, Gas, Minerals & Energy Exploration, Production & Mining) and Environmental Assessments (SEA, EIA, EMP, EMS) Specialist Consultants

PUBLIC NOTICE FOR APPLICATION FOR ENVIRONMENTAL CLEARANCE CERTIFICATE (ECC) FOR RECONNAISSANCE OIL AND GAS (Pty) Ltd FOR PETROLEUM EXPLORATION IN PEL No. 73, KAVANGO WEST AND KAVANGO EAST REGIONS

Reconnaissance Oil and Gas (Pty) Ltd (the Proponent and Operator) hold petroleum exploration and production rights under the Petroleum Exploration License (PEL) No. 73 granted by the Ministry of Mines and Energy (MME). Reconnaissance Oil and Gas (Pty) Ltd is a subsidiary of an international company, Reconnaissance Oil and Gas Corporation, a Canadian and UK dually listed public company. PEL No. 73 covering Blocks 1719, 1720, 1721, 1819, 1820 and 1821 fall within the eastern Etosha Basin covering parts of the Kavango West and Kavango East Regions of northern Namibia. As part of the ongoing petroleum exploration programme, a total of eight (8) potential stratigraphic Petroleum (oil and gas) wells drilling locations were initially identified.

Currently, the company intend to drill only two (2) stratigraphic wells Nos. 5-6 and 6-2 falling within Blocks 1819 and 1820. The two (2) stratigraphic wells will be drilled to estimated depths of 2.5 km (2500m) each. The proposed initial operations is scheduled to start in the last quarter (Q4) of 2019 between the months of October and December 2019. The proposed drilling operations will be undertaken using a larger oil and gas drilling rig. The various components of the rig will be transported to site by a truck and the rig will be built onsite. A standard single well site for conventional onshore oil or gas drilling will typically affect a surface area measuring 150 m by 150 m. The well site will typically hold the drilling rig and additional equipment along with supervisory containerised accommodation and material storage. To prepare for proposed drilling, the access roads/tracks and the well sites will require limited bush clearing, staking and levelling. The drilling localities are accessible with sparse larger trees and as such no cutting down of larger trees will take place. Once all the drilling activities have been completed the affected area will be reclaimed to minimise surface disturbance. The rig will be disassembled and the various components will be packed and transported to the next drilling location or final destination.


The proposed petroleum exploration activities (drilling of the two (2) stratigraphic wells) cannot be undertaken without an Environmental Clearance Certificate (ECC) as required by the Environmental Management Act, 2007, (Act No. 7 of 2007) and the Environmental Impact Assessment (EIA) Regulations 30 of 2012 and other related permits. In fulfillment of the environmental requirements and the need to apply for additional permits, Reconnaissance Oil and Gas (Pty) Ltd has appointed Risk-Based Solutions (RBS) CC as the Environmental Consultant and led by Dr. Sindile Mweya as the Environmental Assessment Practitioner (EAP) to undertake the Scoping, EIA and EMP in order to support the application for ECC and other related permits. All Interested and Affected Parties (I&APs) are hereby invited to register and submit written comments / objections / inputs with respect to the proposed exploration activities (drilling of the two (2) stratigraphic wells Nos. 5-6 and 6-2) falling within Blocks (Degree Square) 1819 and 1820 in Kavango West and Kavango East Regions.

REGISTER BY EMAIL: hrtd@rbs.com.na or Contact Dr. Sindile Mweya (PhD, PG Cert, MPH, BEng (Hons), Pr Eng) for more information: smweya@rbs.com.na Mobile: +264-811413229

DEADLINE FOR WRITTEN SUBMISSIONS IS: FRIDAY 31st MAY 2019, date for the lodgement of the application for Environmental Clearance Certificate (ECC) is MONDAY 3rd JUNE 2019

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Your Resources (Oil, Gas, Minerals & Energy Exploration, Production & Mining) and Environmental Assessments (SEA, EIA, EMP, EMS) Specialist Consultants

Figure 5.10: Copy of the Public Notice published in the Confidante Newspaper dated 16th – 22nd May 2019.



Enlarged priority Stratigraphic Oil and Gas Well drilling sites 5-6 and 5-2

PUBLIC NOTICE FOR APPLICATION FOR ENVIRONMENTAL CLEARANCE CERTIFICATE (ECC) FOR RECONNAISSANCE OIL AND GAS (Pty) Ltd FOR PETROLEUM EXPLORATION IN PEL No. 73, KAVANGO WEST AND KAVANGO EAST REGIONS

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Currently, the company intend to drill only two (2) stratigraphic well No. 5-6 (18°34'10.37"S, 18°34'21.34" E) falling in Block 1819 in Ncamagoro Constituency, just north of Siyusu and Ngacasawa Areas in Kavango West Region and well No. 5-2 (18°20'20.80"S, 19°58'27.55" E) in Block 1820 Mashare Constituency, around Kawe area along the D3400 road in Kavango East Region. The two (2) stratigraphic wells will be drilled to estimated depths of 2.5 km (2500m) each. The proposed initial operations is scheduled to start in the last quarter (Q4) of 2019 between the months of October and December 2019. The proposed drilling operations will be undertaken using a larger oil and gas drilling rig. The various components of the rig will be transported to site by a truck and the rig will be built onsite. A standard single well site for conventional onshore oil or gas drilling will typically affect a surface area measuring 150 m by 150 m. The well site will typically hold the drilling rig and additional equipment along with supervisory sanitatised accommodation and material storage. To prepare for proposed drilling, the access roads/tracks and the wells sites will require limited bush clearing, widening and leveling. The drilling localities are accessible with sparse larger trees and as such no cutting down of larger trees will take place. Once all the drilling activities have been completed the affected area will be reclaimed to minimise surface disturbance. The rig will be disassembled and the various components will be packed and transported to the next drilling location or final destination.

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REGISTER BY EMAIL: frontdesk@rbs.com.na or Contact Dr. Sindila Mwiya (PhD, PG Cert, MPH, BEng (Hons), Pr Eng) for more information: smwiya@rbs.com.na, Mobile: +264-811413229

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PUBLIC NOTICE FOR APPLICATION FOR ENVIRONMENTAL CLEARANCE CERTIFICATE (ECC)

GeoPartners Ltd (Proponent) Application for Environmental Clearance Certificate (ECC) for the Proposed Regional 2D Seismic Survey covering the Walvis Basin (Central Offshore) and the Namibe Basin (Northern Offshore up to the Angolan Border) and Application made under the Environmental Impact Assessment Regulations No. 30 of 2012 of the Environmental Management Act, 2007, (Act No. 7 of 2007)

The Ministry of Mines and Energy (MME) and National Petroleum Corporation of Namibia, (NAMCOR) have signed an agreement with GeoPartners Ltd UK (the Proponent) for the acquisition of widely spaced regional mapping of the Aptian Source Kitchen (ASK) Namibia 2019 2D offshore seismic survey covering the Walvis Basin (central offshore Namibia) and the Namibe Basin (Namibian northern offshore up to the Angolan border). The Aptian geological interval is an important potential hydrocarbons source rock for Namibian petroleum exploration opportunities. The overall aim of the proposed survey is to map the entire length of the Aptian, extending from ~200m into the deep water (averaging ~3000 m). Although offshore seismic surveys operations in Namibia began as far back as 1988, a lot more still need to be done in order to have a full understanding of the petroleum systems offshore Namibia. The data sets from the proposed ASK Namibia 2019 2D seismic survey will provide critical insight into the subsurface geologic evolution, offshore basin architecture and depositional and structural history of the petroleum systems within the two basins (Walvis and Namibe Basins).

Seismic survey is a key tool that resources companies exploring for hydrocarbons (oil and natural gas) use to map the subsurface and kilometres below the ground either on land (onshore) or in the sea (offshore). The basic principle of seismic survey method is the application of controlled generation of sound / acoustic waves by a seismic source in order to obtain an image of the subsurface. The generated acoustic wave that travels deep into the earth, is reflected by the various rock formations of the earth and returns to the surface where it is recorded and measured by receiving devices, called hydrophones. In offshore environment, the airguns release compressed air to generate seismic signals at regular intervals. Signals reflected from geological interfaces below the seafloor are recorded by multiple ship towed hydrophones and transmitted to the seismic vessel for electronic processing. By analysing the time it takes for the seismic waves to travel between the rock formations and the surface, geophysicists, geologists and petroleum engineers uses sophisticated software to create subsurface images (maps showing potential drill-ready subsurface geological structures called reservoirs that may contain hydrocarbons).

The proposed ASK Namibia 2019 2D seismic survey will be conducted using the vessel Nordic Explorer and the survey will have the following specifications: ~8645 km comprising 37 survey lines, single source, 25 m short interval, 8m (+/- 0.5m) source depth, 18m flat (+/- 1 m) cable depth, 12.5m group interval, 12.000m solid streamer length, 960 channels per streamer, 240 nominal fold, 14 sec (continuous recording) record length and 2 ms sample interval. The proposed activities (ASK Namibia 2019 2D Seismic Survey) cannot be undertaken without an Environmental Clearance Certificate (ECC) as required by the Environmental Management Act, 2007, (Act No. 7 of 2007) and the Environmental Impact Assessment (EIA) Regulations 30 of 2012. In fulfillment of the environmental requirements, GeoPartners has appointed Risk-Based Solutions (RBS) CC as the Environmental Consultant and led by Dr. Sindila Mwiya as the Environmental Assessment Practitioner (EAP) to undertake the Scoping, EIA and EMP in order to support the application for ECC. All interested and Affected Parties (I&APs) are hereby invited to register and submit written comments / objections / inputs with respect to the proposed ASK Namibia 2019 2D seismic survey operations.

REGISTER BY EMAIL: frontdesk@rbs.com.na or Contact Dr. Sindila Mwiya (PhD, PG Cert, MPH, BEng (Hons), Pr Eng) for more information: smwiya@rbs.com.na, Mobile: +264-811413229

DEADLINE FOR WRITTEN SUBMISSIONS IS: FRIDAY 31st MAY 2019, date for the lodgement of the application for Environmental Clearance Certificate (ECC) is **MONDAY 3rd JUNE 2019**

Risk-Based Solutions (RBS) CC (URL: www.rbs.com.na)
Your Resources (Oil, Gas, Minerals & Energy Exploration, Production & Mining) and Environmental Assessments (SEA, EIA, EMP, EMS) Specialist Consultants

Figure 5.11: Copy of the Public Notice published in the Namibian daily Newspaper dated Tuesday 21st May 2019.

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Let's MINGLE



Editor's corner

Banning imports not so simple

We laid the instruction by finance minister Calle Schlettwein that public entities may only procure locally and that this must include production north of the red line for consumers north of the red line. The announcement, although 29 years late, is good news. Gone, finally, will be the days of Nestle mineral water in parliament and other government institutions. The directive is much like capital projects where the state ploughs tax dollars back into the local economy. And yes, it will provide a much-needed injection into our stagnating economy and will certainly provide incentive to invest in businesses, especially knowing that there are lucrative orders coming from government. One can imagine the impact of a local order of consumables by the health or education ministries, for example. However, we agree with experts that unless there is support to local small businesses from government, this may backfire on us. Are we sure that we are able to substitute imports with local products? Are our production levels, not forgetting levels of quality, good enough to supply the demand? And probably most importantly, are our skills levels at the standard in manufacture and supply? Possibly not. And then, what of the Namibian Defence Force? Their procurement is a private matter altogether not even having to disclose their chicken imports? A matter of security, we are told. And it is the ministry that receives one of the biggest budgets annually. Will they procure locally too? And then of course, the piece de resistance... what of construction? While Schlettwein explained that there were no local bidders for the Swapo headquarters, it is a tad ironic that on the day he bans all imports, the news breaks that the party's headquarters will be constructed by a Chinese firm. China has made millions, if not billions, off our construction in our little corner of the world and Namibian companies have seen very little of that. We are hoping to see this change under the new directive.

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Namibian Sun is a publication of Namibia Media Holdings Pty Ltd and is printed by Newsprint Namibia ISSN 1997-4876

NAMIBIA Today's weather: Windhoek 25°/25° Araras 25°/24° Gobabis 26°/24° Reheboth 26°/26° Otjinene 24°/24° Okonjo 26°/26° Swakopmund 26°/26°

Haikali

CONTINUED FROM PAGE 1

During 2015, he says it came to his attention that 935008 expenditures had been incurred without the board's approval. A court matter was launched and although settled, the agreement never came to fruition Haikali says because the process of the valuation of his shares was frustrated to such a degree that the auditors tasked with completing the process resigned. He and Van der Merwe then began to rebuild their relationship and he said he "agreed to dispose of the majority shareholding in Saffland in order to establish an equal shareholding on the basis of company dealings". "It was always my understanding that Van der Merwe would never use his position to commit or participate in any prejudicial, unjust or inequitable conduct aimed at me or to the detriment

of the company, nor that he would take unfair advantage of the equal shareholding". He says both Van der Merwe and Rossouw "unscrupulously took advantage of the situation" that he could no longer veto decisions or remove any director. Any suggestion he made or wish he had he says were opposed or simply outwitted and he says he was sidelined. Several correspondences in this regard were attached to the filed documents in the court. Haikali said he had formally asked the auditors for account information, employee costs and management fees after he had discovered payments made to unrelated entities including the Nguni Property Fund and moreover, that funds due to the company were being used to pay salaries of employees at Saffland International. He eventually received the company's bank statements which were delivered to his counsel's offices on 9 April. It was here,

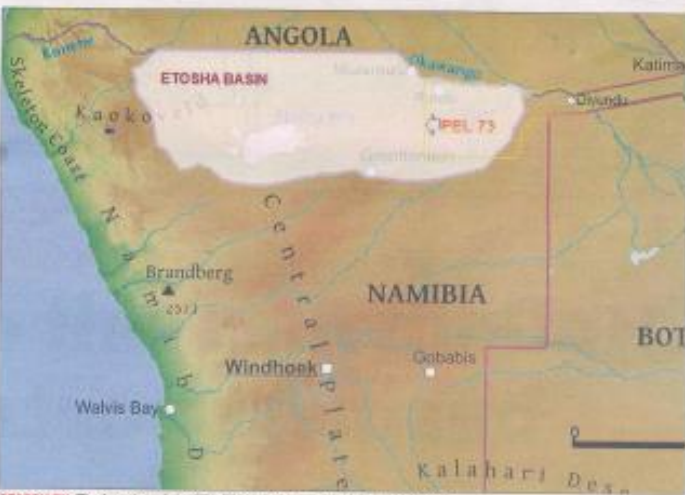
he says, he discovered payments of N\$13 124 635 made by Saffland Namibia to Saffland International. These amounts, he says, were "unlawfully" paid to the company. "It is also of significance that in as far as I could establish, both Karel and Maerinda van der Merwe are shareholders and directors of Saffland International". Moreover, he says that Karel van der Merwe and Rossouw are signatories on the bank accounts of both Saffland Namibia and Saffland International. Following several enquiries, Haikali says he received in response and said that it has become clear to him that the "funds to the credit of Saffland Namibia at Saffland International may be quickly depleted by Van der Merwe and Rossouw" to the detriment of Saffland Namibia and himself. "It is also clear to me that Van der Merwe has something to hide as such disclosure (account information) would result in the inescapable conclusion that he has

been guilty of serious misappropriation of monies belonging to Saffland (Namibia), as well as unauthorised transactions so perpetrated which may amount to a breach of his fiduciary duties towards the company. "It is also evident from the aforesaid that Van der Merwe has been treating the company's property and funds as his own and that he is doing everything within his power to deny me my rights as shareholder, both in respect of being able to know what is happening in the company as well as to be able to determine the true value of the company as such". On Friday, before Judge Thomas Mawani, the parties agreed to settle the matter and in a bid to reach a settlement, the matter was postponed to Wednesday of this week. Mares de Klerk of De Klerk, Horn and Coetzee appears for Haikali while Stephen Vlieghe of Koep and Partners appears for the respondents.

Oil and gas

CONTINUED FROM PAGE 1

PEL No 73
Reconnaissance Energy Namibia, the Namibian-registered subsidiary of Reconnaissance Oil & Gas, holds petroleum exploration licence (PEL) No 73, which covers blocks 1719, 1720, 1721, 1819, 1820, and 1821 in the Etosha Basin, which forms part of the greater Kalahari Basin. The two drilling areas fall within the boundaries of the Mbunza and Sambyu traditional authorities, and according to Risk-Based Solutions, these areas are situated in remote and sparsely populated areas. The proposed drilling is to establish the possibility of the Etosha Basin's potential for economically viable hydrocarbon (oil and gas) reserves. Water needed for the drilling project will be drawn from groundwater sources that are recharged by the Omatako ephemeral river channel. Risk-Based Solutions indicated that the drill locations are accessible and no large trees will be cut down in the process. Once the drilling is complete (anticipated to take between 20 and 30 days per well), the affected areas will be reclaimed to minimise surface disturbance. By 2016 the Institute for Public Policy Research (IPPR) listed 42



SEARCH ON: The location of the PEL 73 oil and gas licence. PHOTO COURTESY

companies holding on- and offshore petroleum exploration licences (PELs). According to that information (Transparency.org) Reconnaissance Oil & Gas owns 90% of the licence; Namcor holds the remaining 10%. Offshore search
The ministry of mines and energy and Namcor have also signed an

agreement with another UK-based company, GeoPartners UK, for the acquisition of widely spaced regional mapping of the Agstian Source: Kitchen (ASK) Namibia 2019 2D offshore seismic survey. The survey covers the Walvis Basin (in the central offshore area) and the Namibe Basin (offshore close to the Angolan border). Offshore seismic surveys in Namibia started as early as 1968, but

Risk-Based Solutions said a firm survey needs to be done to have a full understanding of the petroleum systems offshore. The ultimate aim is to identify potential drill-ready subsurface geological structures called reservoirs that could contain hydrocarbons. The Naudic Explorer will be used as the vessel from which the survey is to be conducted.

Cattle

CONTINUED FROM PAGE 1

"Boreholes are getting damaged due to the added pressure and we also expect a high risk of environmental degradation and erosion because of exceeding the carrying capacity." Ndawana says some people have driven their livestock into Angola and the Karungo regions, but there are still too many cattle in Ohangwena. The cattle are now competing for the available water and sometimes go days without drinking.

"We have requested the government to assist us with drought-relief money to drill additional boreholes so that we can assist farmers to get through the drought. It is not that there is enough grass in the region, but only bushes and shrubs which farmers feel will help their livestock. "There are some boreholes that were drilled but are not used because of salty water. I think these boreholes can still be used for animals during this drought," Ndawana says. The government has allocated N\$572.7 million to drought relief in communal areas. The money is earmarked for food assistance, water tanks, livestock manage-

ment incentives, livestock transport subsidies to and from grazing areas, transport of fodder, lease of grazing areas, subsidies for crop farmers, lick supplements and fodder subsidies. This will be done on the condition that farmers bring down their herds to 25 cows and one bull per farmer. Ndawana says the region has mandated the Directorate of Veterinary Services (DVS) to register livestock owners for the drought assistance programme. The problem is that cattle flocking in from other regions are making the identification process difficult. The Omusati Regional Council chairperson, Mesiasus

Amuse, says the regional government is urging farmers to sell their livestock. "We have an operational abattoir in the region. We are therefore advising farmers to reduce their livestock by selling some of them to the abattoir. We have already engaged with the abattoir management to fast-track the process for farmers who want to sell," Amuse says. "The issue at hand is just the market that we are currently busy setting out to ensure that the abattoir is empowered to assist farmers." Amuse calls on farmers not to panic, but to do all they can to survive the drought.

Figure 5.12: Copy of the Front Page Oil and Gas that was published in Namibian Sun daily Newspaper dated 27th May 2019 based on information provided to the Journalist by the EAP.

Inside

It's Monday and we bring you the best of the best and the worst of the worst in sporting action as well as market news galore!

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A N\$730-million gamble in uncertain times

The requirements of the Swapo headquarters tender were too big a financial risk for local contractors in the current economic environment, says Barbel Kirchner, the consulting general manager of the Construction Industries Federation of Namibia (CIF). According to Kirchner, the first payments would have been delayed and the contractor would have had limited control over interest claims for late payments or non-payment. "This is not a risk that local companies under the current economic conditions can take, especially as they are already struggling financially."



Desperate cattle flood Ohangwena

DISASTER LOOMS: Farmers are exploring all avenues to make sure their livestock survive the devastating drought. PHOTO: ELANI NANGAJATO

ELANI NANGAJATO

The Ohangwena Regional Council is concerned about environmental damage as large numbers of livestock enter the region from as far as Kaokoland and other areas seeking better pastures.

Council chairperson Erickson Ndawantia says many farmers are driving their livestock into Ohangwena in the hope of surviving the drought.

"Every day we are getting a large number of cattle flocking in from other areas, as far as Okavango in the Kunene Region, Oshana, Omusati and Oshana. The side of Okavango has become the recipient of all these livestock. We are now experiencing challenges of managing grazing and infrastructure," Ndawantia says.

CONTINUED ON PAGE 2

ALLEGES SAFLAND MONEY IS BEING SIPHONED OFF

Haikali files suit against business partners

YANNA SMITH

The co-owner of Safland Property Services Namibia wants the High Court to freeze the company's accounts.

Businessman Ranga Haikali has brought an urgent High Court application against Safland Property Services Namibia.

In his documents, he asks the court to instruct the deputy sheriff to attach all monies held in the company's First National Bank account until the finalisation of another matter he has against the company in the High Court.

In that matter Haikali asks the High Court to relieve him from "oppressive and unfairly prejudicial conduct of the trustees of the Matador Trust and in the alternative, the winding up of the company".

The other respondents include Safland International, First National Bank Namibia, Karel van der Merwe, Jeremy Rossouw and Mariënda van der Mer-

we. Haikali is a 50% shareholder of Safland Property Services Namibia. The Matador Trust holds the other 50%. Karel van der Merwe is a director at Safland Namibia and a trustee of the trust, while Rossouw and Mariënda van der Merwe are trustees of the trust.

Haikali alleges that his counterparts in the company, South African shareholders, have been siphoning off funds from the company and transferring these to Safland International.

In his papers before the court on Friday, Haikali writes that the other matter "is directly relevant to the merits of this application".

Essentially, Haikali seeks the court to either attach the company account or to halt any payments made unless expressly approved by him in writing. He also asked for the attachment of N\$13 134 635 held in Safland International's bank account. Safland Namibia, he says, specialises in property management and development in the country, adding that its main business involves managing the portfolio of the Government Institutions Pension Fund (GIPF), holding a small share, 1%, as an investor participant in that portfolio which is worth around N\$1 billion.

Moreover, Safland is also the exclusive appointed fund manager for Frontier Property Trust (FPT). "Through its trustees, the FPT manages, administers and controls the fund, being the aggregate of all portfolio investments and other assets held on behalf of investor participants, GIPF and Safland are the only investor participants in FPT" to date, Haikali writes.

At the outset in 2008, Haikali held 51% shares while Safland International held the remaining 49%. In 2010, Van der Merwe was appointed director for the Namibian company and Haikali tells the court that their business relationship was good and the company affairs were always agreed upon by mutual discussion. Haikali was chair of the board and a non-executive director.

"The trust and confidence we had in each other, in my view at the time, made it unnecessary to formally discuss and conclude a shareholders' agreement."

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"The trust and confidence we had in each other, in my view at the time, made it unnecessary to formally discuss and conclude a shareholders' agreement."

CONTINUED ON PAGE 2



BETTER DAYS: Ranga Haikali and Karel van der Merwe pictured in October 2017 at the ground-breaking ceremony of the River Mall at Orange-Band. PHOTO: NADA

Search for oil and gas resumes

CATHERINE SASMAN

A British and Canadian company, Reconnaissance Oil and Gas, is has applied for an environmental clearance certificate (ECC) to drill for oil and gas on state land in the communal areas of Kawango West and Kawango East.

Written comments on this application must be submitted before 30 May to the environmental consultant on the project, Risk-Based Solutions.

The final environmental impact assessment (EIA) and environmental management plan (EMP) will be submitted to the Ministry of Environment and Tourism on 31 May. Once the ECC and other permits - like freshwater and wastewater permits, explosives import permits and radiation sources permits - have been issued, drilling will start. The proposed drilling is to start in November and December.

Two of the wells planned in Kawango West are just north of the Sreen and the Ngcasawa areas; the one planned for Kawango East is around the Kame area along the D3400 road.

If the ECC is granted, two wells will be drilled to depths of between 2.5 and 3.5 kilometres. The environmental consultant on the project, Risk-Based Solutions, which has recommended that an ECC be issued to the company, said in the event of discovery of an active petroleum system, the socio-economic landscape of the two Kawango regions and Namibia as a whole will be "immensely and positively transformed for the benefit of all Namibians".

CONTINUED ON PAGE 2

Figure 5.13: Copy of the page 2 of the Front Page Oil and Gas feature article that was published in Namibian Sun daily Newspaper dated 27th May 2019 based on information provided to the Journalist by the EAP.

Figure 5.14: Copy of the letter confirming the directive given to the Kavango West Region Regional Police Commander of Explosives to support Reconnaissance Energy Namibia (Pty) Ltd with site surveys in order to make sure that the proposed drilling locations are safe with respect to the danger for unexploded ordnances.

4.8.4 Discussion of Inputs / Issues Raised by Stakeholders

Overall, the proposed project activities has received greater positive support from I&APs because if the results of the proposed petroleum drilling operations proves positive, it will tremendous and positively transform the local, regional and national socioeconomic landscapes of Kavango West Region, Kavango East Region and Namibia as whole.

The following is the summary of the key Corporate Social Responsibilities (CSR) recommendations / suggestions that were raised by the participants from the two meetings held in Nkurenkuru and Rundu with aim of raising the living standard of rural poor:

- (i) Drilling of new water boreholes at each of the proposed well location because it will be difficulty to get water for the proposed stratigraphic well drilling operations in the general area from the existing boreholes. Once the proposed stratigraphic well drilling operations have been completed the new water boreholes shall be handed over to the Regional Councils for the greater benefits of the rural communities;
- (ii) If resources allows, Reconnaissance Energy Namibia (Pty) Ltd could also add a cattle drinking point and a veterinary vaccination fence to at least one of the water boreholes drilled in support of the local subsistence rural framers, and;
- (iii) Access to the well 5-6 location particularly for the movement of equipment from Windhoek to site could use the sandy track road turn-off just after Mangetti National Park along the tarred B8 Road to Rundu. This will require de-bushing and widening of this track and such a move will greatly benefit the local communities in long run in terms of improve road access and connectivity to the national road network.

Following the completion of the public and stakeholder consultation process, all the key inputs / comment / objections received from the public and stakeholders were incorporated in the Final EIA and EMP Reports.

4.8.5 Recommendations on Stakeholder Consultations Outcomes

It's hereby recommended that the drilling of water boreholes to supply water for the proposed oil and gas drilling operations be considered by Reconnaissance Energy Namibia (Pty) Ltd.

Once the drilling operations have been completed the water boreholes shall be equipped and cattle drinking points and a veterinary vaccination fence.

The new water boreholes shall be handed over to the Regional Councils in order to make sure that it provides wider greater benefits to not only the owner of the land where the borehole has been drilled but for all the nearby rural communities.

Additionally, and as part of the Corporate Social Responsibilities (CSR), Reconnaissance Energy Namibia (Pty) Ltd, shall provide de-bushing and access widening support for the sandy track road linking the D3425 to the B8 tarred Road from Grootfontein to Rundu for the benefits of the wider local rural community.

Whenever a project team goes to the field as part of the preparatory, implementation, operation, closure or abandonment the political (Governors and local Councillors) and traditional leaders of the Kavango West and East Regions shall be informed and kept updated on the progress. The following is summary of the recommended key contact person:

4.8.6 Recommendations on Dangers of Unexploded Ordnances

Reconnaissance Energy Namibia (Pty) Ltd shall prepare detailed maps of the drilling locations areas of interest showing access passing through untouched areas, drilling locations and all supporting areas such as the campsite. The maps shall be provided to the Regional Commander Kavango West Region, Chief Inspector lithete, Namibian Police, Ministry of Safety and Security (MSS) in order for the explosive team to be able to go in field and undertake detailed field-based site-specific surveys of the areas of interest before drilling mobilisation can be implemented (Fig. 4.13). Reconnaissance Energy Namibia (Pty) Ltd exploration team shall accompany the Namibian Police Explosive team when conducting the field-survey in order to make sure that key areas of interest are cleared

4.8.7 Recommended Useful Contacts

The following is list of key selected contact details of key persons as maybe required:

1. Ms. Maggy Shino, Petroleum Commissioner, Ministry of Mines and Energy +264-812882182, Tel: +264 61 2848209, Fax: +264 61 2848200, Email: Maggy.Shino@mme.gov.na;
2. Mr. Tupa Iyambo, Chief Inspector of Petroleum Affairs, Ministry of Mines and Energy Cell: +264 81 240 2183 Telephone, +264 61 284 8300, Fax: +264 61 284 8200; Tupa.lyambo@mme.gov.na;
3. Dr Fredrick Mupoti Sikabongo, Deputy Environmental Commissioner, Office of the Environmental Commissioner, Ministry of Environment and Tourism (MET), 0812930537, Tel: +264 61 284 2751, Email: freddy_sikabongo@yahoo.co.uk;
4. Mr. Colgar Sikopo, Director of Parks and Wildlife Management, Ministry of Environment and Tourism (MET), Tel: +264 61 2842528, Email: colgar.sikopo@met.gov.na;
5. Mr. Immanuel Mulunga, Managing Director, National Petroleum Corporation of Namibia (Pty.) Ltd (Namcor), +264-811277267, +264 61 204 5000 +264 61 204 5061/30/92; info@namcor.com.na
6. Hon. Governor Sirkka Ausiku, Kavango East Region Email: sausiku@kavangowestog.gov.na;
7. Hon. Johannes Kahonzo Sikondo, local councillor of Ncamagoro Constituency Kavango West Region where the well 5-6 is located, Email: sauyemwaservicestation@gmail.com, Mobile +264-811 545 417;
8. Hon. Ambassador Dr. Samuel Mbambo, Governor of Kavango East Region (Contact Ms. Muyenga Sophia, PA, sophiamuyenga@yahoo.com);
9. Hon. Councillor Michael Shipandeni Shikongo, Kavango East Region local Councillor where the well 6-2 is situated Mobile +264-811 564177/ 812398 701;
10. Mr. Stefanus Sitoka, Owner of the Communal Farm where the well 5-6 is located, Mobile Phones: +264816055218/813120998, Email: sitoka.sitoka@gmail.com;
11. Chief Inspector lithete, the Regional Commander Kavango West Region, Namibian Police, Ministry of Safety and Security (MSS) (+264-812721814).

5. IMPACT ASSESSMENT

5.1 Assessment Procedure

The Environmental Assessment process for the EPL No. 5469 has been undertaken in accordance with the provisions of the Environmental Impact Assessment (EIA) Regulations No. 30 of 2012 gazetted under the Environmental Management Act, (EMA), 2007, (Act No. 7 of 2007).

5.2 Assessments of Alternatives and Key Issues

5.2.1 Summary of Alternatives

The following alternatives have been considered:

- (i) **Location of the PEL and Proposed Wells:** The PEL No. 73 and the proposed well locations falls within the Kavango Basin situated in north-eastern Namibia. The Kavango Basin an important newly discovered basin with great potential for an active petroleum system with opportunity for hydrocarbons (oil and gas) occurrences and hence the need to undertake exploration in this specific area. However, the location of the proposed well locations has taken into considerations alternative locations mainly based on the availability of the already existing access tracks to conduct the drilling operations;
- (ii) **Other Alternative Land Uses:** The PEL area fall within the sparsely populated communal land of the Kavango East and West Regions. Communal subsistence agricultural land uses are dominated by cattle, goats, timber harvesting and seasonal crop farming practices. Due to the limited scope and site-specific nature of the proposed exploration activities, there are no conflicts anticipated and the proposed activities will coexist with the current and future uses in the area;
- (iii) **Ecosystem Function (What the Ecosystem Does):** There are wildlife habitats, carbon cycling or the trapping of nutrients and characterised by the physical, chemical, and biological processes or attributes that contribute to the forested self-maintenance of the ecosystem in this area. The proposed exploration activities will not affect the ecosystem function due to the limited scope and site-specific nature of the proposed exploration activities;
- (iv) **Ecosystem Services:** Food chain, harvesting of animals or plants, and the provision of clean water or scenic views are some of the local ecosystem services associated with the PEL area. However, the proposed exploration activities will not affect the ecosystem services due to the limited scope and site-specific nature of the proposed exploration activities;
- (v) **Use Values:** The PEL area has direct use for other land uses such as subsistence agriculture and its wildlife, food chain linkages that sustains the complex life within this area and bequest value for future generations to enjoy. The proposed exploration activities will not destroy the current use values due to the limited scope and site-specific nature of the proposed exploration activities as well as the adherence to the provisions of the EMP;
- (vi) **Non-Use or Passive Use:** The PEL area has an existence value that is not linked to the direct use / benefits to current or future generations. The proposed exploration

activities will not affect ecosystem current or future non or passive uses due to the limited scope and site-specific nature of the proposed exploration activities;

- (vii) **Potential Land Use Conflicts:** Considering the current land use practices (subsistence farming) as well as potential other land uses including petroleum exploration, it's likely that the economic spin-off from any positive exploration outcomes leading to the discovery of economic petroleum resources in the general area can co-exist with the existing and potential future land use options of the general area. However, much more detail assessment of any likely socioeconomic impacts will need to be undertaken as part of the full oilfield development and production EIA that must be undertaken if economic resources are discovered. The use of thematic mapping thereby delineating zones for specific uses within the PEL area will greatly improve and promote the multiple land use practices and coexistence opportunities;
- (viii) **The No-Action Alternative** - A comparative assessment of the environmental impacts of the 'no-action' alternative (a future in which the proposed exploration activities do not take place) has been undertaken. An assessment of the environmental impacts of a future, in which the proposed exploration and possible discovery of economic petroleum resources does not take place, may be good for the receiving environment because there be no any form of negative environmental impacts due to proposed exploration or possible petroleum production operations will take place in the PEL area. The environmental benefits will include no negative environmental impacts on the receiving environment. However, it is important to understand that even if the proposed exploration activities do not take, to which the likely negative environmental impacts is likely to be low and localised, the current and other future land uses will still have some negative impacts on the receiving environment. The likely negative environmental impacts of other current and future land uses that may still happen in the absence of the proposed petroleum exploration activities includes:
- Illegal logging;
 - Wood and grasses for rural housing and homestead / communal farms fencing;
 - Unseasonal and too frequent fires;
 - Poaching;
 - Subsistence agriculture of slash and burn;
 - Forestry clearing for the ever increasing settlements in key habitat areas including pristine forested areas that are now being allocated to the local communities as new leaseholds;
 - Erosion;
 - Bush encroachment, and;
 - Overgrazing.

Furthermore, it's also important to understand what benefits might be lost if the proposed exploration activities do not take place. Key loses that may never be realised

if the proposed project activities do not go-ahead include: Loss of potential added value to the unknown underground potential petroleum resources that maybe found within the PEL No. 73, socioeconomic benefits derived from current and future exploration and possible petroleum production capital investments, license rental fees, royalties payable to Government, direct and indirect contracts and employment opportunities, export earnings, foreign direct investments and various taxes payable to the Government.

5.3 Identification of Likely Positive Impacts

5.3.1 Overview

The following are the key likely positive impacts that maybe realised and have been evaluated in this EIA for the proposed multiple wells drilling operations:

- ❖ Increased earnings to the State Revenue through annual petroleum rights rentals and local taxes payable;
- ❖ Increased temporal contracts and employment opportunities for local services providers and local revenue circulation from ancillary (industrial support) service demands;
- ❖ Demand for some public services may increase;
- ❖ In event of discovery, unemployment may decrease;
- ❖ Utility payment increase and infrastructure may be expanded, and;
- ❖ Improved knowledge on the natural resources and in particular the deeper subsurface profile of the Etosha Basin.

As part of the EIA process, a socioeconomic specialist study was undertaken focusing on assessing the likely actual positive socioeconomic contributions that the proposed drilling operations will have on the economy particularly in an event of a discovery (Annex 3).

5.4 Identification of Likely Negative Impacts

5.4.1 Summary of Sources and Likely Key Negative Impacts

The likely key sources of negative environmental (physical, biological and socioeconomic/cultural/ archaeological) impacts have been divided into the following two (2) main categories:

(1) Routine and physical presence operational activities:

- (i) Pre-construction and drilling requirements;
- (ii) Construction phase;
- (iii) Mobilisation;
- (iv) Spudding and Conductor casing;
- (v) Drilling surface / intermediate and setting casing and cementing process through up 900 m;

- (vi) Drilling and continuous coring from 900 meters (2953') to 1900 meters (6234');
- (vii) Drilling below 1900 meters to total depth, estimated at 2500 meters (+/- 8202');
- (viii) Plug and abandon hole;
- (ix) Rehabilitate all surface disturbances and clear the site of any debris, and;
- (x) Camp removal, site closure / abandonment.

(2) Unplanned accidental events:

- (i) Major land accidental incidence such as diesel / oil spill / fire / explosion.

5.4.2 Summary of Receptors Likely to be Negative Impacted

Based on the findings of this EIA inclusive of the findings and recommendations of the specialist studies, the following is the summary of the key environmental receptors that may be negatively impacted by the proposed activities with mitigation measures to be provided in the EMP Report Vol. 3 of 3:

(i) Physical environment:

- ❖ Water quality;
- ❖ Physical infrastructure and resources;
- ❖ Air quality, noise and dust;
- ❖ Landscape and topography;
- ❖ Soil quality, and;
- ❖ Climate change influences.

(ii) Biological environment:

- ❖ Habitat;
- ❖ Protected areas and resources;
- ❖ Flora;
- ❖ Fauna, and;
- ❖ Ecosystem functions, services, use values and non-use or passive use.

(iii) Socioeconomic, cultural and archaeological environment

- ❖ Local, regional and national socioeconomic settings;

- ❖ Subsistence agriculture;
- ❖ Community forestry;
- ❖ Tourism and recreation, and;
- ❖ Cultural, biological and archaeological resources.

Based on the findings and recommendations of Scoping report (Annex 1), a fauna and flora specialist has been conducted (Annex 2) and provided a detailed overview of key resources / protected areas / resources / ecosystems that may be affected by the proposed multiple stratigraphic wells drilling operations in PEL 73.

5.5 Impact Assessment Criteria

5.5.1 Impact Definition and Screening

For the purpose of this report, a natural and/or human environmental impact is defined as: “Change to the environment, whether adverse or beneficial, wholly or partially resulting from an organisation’s environmental aspects.” (ISO 14001).

The proposed project activities (routine and non-routine) have been considered during the EIA terms of their potential to:

- ❖ Interact with the existing environment (physical, biological and social elements), and;
- ❖ Breach relevant national legislation, relevant international legislation, standards and guidelines, and corporate environmental policy and management systems.

Where a project activity and receptor has been considered to have the potential to interact with the natural receiving environment, the impact has been defined and ranked according to its significance. Table 5.1 provides the definition of different categories of impacts that have been identified and assessed in this EIA Report.

The EIA process has assessed the potential impacts resulting from routine project activities, assuming that the project activity that may cause an impact to occur but the impact itself is dependent on the likelihood (Probability) (Table 5.1).

Correct control measures through the implantation of the EMP and monitoring thereof has been prepared aimed at reducing any negative significant impacts on the receiving environment as the results of the proposed project activities.

The mitigation measures priority shall, however, be focused on measures aimed at preventing the occurrence of negative impacts. In the absence of specific information on receptors and mitigation measures, the precautionary approach and the environmental principles as outlined in the Environmental Management Act, 2007, (Act No. 7 of 2007) have been adopted with an allocation of a medium or high importance / sensitivity to such receptors.

Table 5.1: Definition of impact categories.

Nature of Impact	Adverse	Considered to represent an adverse change from the baseline, or to introduce a new undesirable factor.
	Beneficial	Considered to represent an improvement to the baseline or to introduce a new desirable factor.
Type of Impact	Direct	Results from a direct interaction between a planned or unplanned Project activity and the receiving environment.
	Indirect	Results from the Project but at a later time or at a removed distance or which may occur as a secondary effect of a direct impact.
	Cumulative	Results from (i) interactions between separate Project-related residual impacts; and (ii) interactions between Project-related residual impacts in combination with impacts from other projects and their associated activities. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.
Duration of Impact	Short-term	Predicted to last only for a limited period but will cease on completion of the activity, or as a result of mitigation/reinstatement measures and natural recovery typically within a year of the project completion.
	Medium-	Predicted to last only for a medium period after the Project finishing, typically one to five years.
	Long-term	Continues over an extended period, typically more than five years after the Project's completion.
	Permanent	Occurs during the development of the Project and causes a permanent change in the affected receptor or resource that endures substantially beyond the Project lifetime.
Scale of Impact	Local	Affects locally important environmental resources or is restricted to a single habitat/biotope, a single community.
	Regional	Affects nationally important environmental resources, or an area that is nationally important/protected or has macro-economic consequences.
	National	Affects nationally important environmental resources, or an area that is nationally important/protected or has macro-economic consequences.
	International	Affects internationally important resources such as areas protected by international Conventions
	Transboundary	Impacts experienced in one country as a result of activities in another.
Probability	Negligible	Possibility negligible
	Improbable	Possibility very low
	Probable	Distinct possibility
	Highly Probable	Most likely
	Definite	Impact will occur regardless of preventive measures

5.5.2 Sensitivity of Receptors

Potential environmental and social effects has been assessed in relation to the baseline conditions, i.e. the conditions that would prevail should the proposed project activities not proceed. For the purpose of this assessment, receptors are defined as elements of the natural or human environment which may interact with, or be interacted by, the proposed project activities.

Baseline conditions are those that existed at the time of the assessment. Impact identification have been considered in terms of receptors and resources sensitive to changes of the following environmental components (Table 5.2):

- ❖ **Physical environment** (Water quality, physical infrastructure and resources, air quality, noise and dust, landscape and topography, soil quality, and Climate change influences);

- ❖ **Biological environment** (Habitat, protected areas and resources, flora, fauna and ecosystem functions, services, use values and non-use or passive use), and;
- ❖ **Socioeconomic, cultural and archaeological environment** (Local, regional and national socioeconomic settings, subsistence agriculture, community forestry, tourism and recreation and cultural, biological and archaeological resources).

It is recognised that some receptors and resources may be more vulnerable to change or to have greater importance than others. Within the project area of influence, the importance and sensitivity of receptors (physical, biological and human) was determined based on professional judgement and taking into account the following:

- ❖ Relevant legislative or policy standards or guidelines;
- ❖ Relative importance/value assigned to existing social or environmental features and receptors;
- ❖ Capacity of the receptor to absorb change, and;
- ❖ Capacity of the receptor to recover from change.

In evaluating the severity of potential environmental impacts, the following factors have been taken into consideration:

- ❖ **Receptor/ resource characteristics:** The nature, importance and sensitivity to change of the receptors / target or resources that could be affected;
- ❖ **Impact Magnitude:** The magnitude of the change that is induced;
- ❖ **Impact Duration:** The time period over which the impact is expected to last;
- ❖ **Impact Extent:** The geographical extent of the induced change, and;
- ❖ **Probability of Occurrence:** Chance of an impact occurring;
- ❖ **Regulations, Standards and Guidelines:** The status of the impact in relation to regulations (e.g. discharge limits), standards (e.g. environmental quality criteria) and guidelines.

The overall impact severity has been categorised using a semi-quantitative scale as shown in Table 5.2 for sensitivity of receptors, Table 5.3 for magnitude, Table 5.4 for duration, Table 5.5 for extent and Table 5.6 probability.

Table 5.2: Overall Scoping phase sensitivity assessment matrix results for the proposed multiple stratigraphic oil and gas well drilling operations in PEL 73, Kavango Basin, Kavango West and Kavango East Regions.

SENSITIVITY			PHYSICAL ENVIRONMENT						BIOLOGICAL ENVIRONMENT				SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT						
SENSITIVITY RATING		CRITERIA	Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Subsistence Agriculture	Community Forestry	Tourism and Recreation	Cultural, Biological and Archaeological Resources	
1	Negligible	The receptor or resource is resistant to change or is of little environmental value.																	
2	Low	The receptor or resource is tolerant of change without detriment to its character, is of low environmental or social value, or is of local importance.																	
3	Medium	The receptor or resource has low capacity to absorb change without fundamentally altering its present character, is of high environmental or social value, or is of national importance																	
4	High	The receptor or resource has moderate capacity to absorb change without significantly altering its present character, has some environmental or social value, or is of district/regional importance.																	
5	Very High	The receptor or resource has little or no capacity to absorb change without fundamentally altering its present character, is of very high environmental or social value, or is of international importance.																	
SOURCES OF POTENTIAL IMPACT	ROUTINE AND PHYSICAL PRESENCE OPERATIONAL ACTIVITIES	1.	Pre-construction and drilling requirements	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	
		2.	Construction phase	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+
		3.	Mobilisation	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+
		4.	Spudding and Conductor casing	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+
		5.	Drilling surface / intermediate and setting casing and cementing process through up 900 m	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+
		6.	Drilling and continuous coring from 900 meters (2953') to 1900 meters (6234')	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+
		7.	Drilling below 1900 meters to total depth, estimated at 2500 meters (+/-8202')	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+
		8.	Plug and abandon hole	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+
		9.	Rehabilitate all surface disturbances and clear the site of any debris	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+
		10.	Camp removal, site closure / abandonment	-	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+
	UNPLANNED ACCIDENTAL EVENTS	11.	Major land accidental incidence such as diesel / oil spill/ fire / explosion (Note: Well Control arrangements and related Emergency Response Plan (ERP) are designed to bring the risk of any unplanned accidental event to ALARP (As Low As Reasonably Practicable) and tolerable	-	-	-	-	-	-	-	-	-	-	+	+	+	+	+	

Table 5.3: Scored on a scale from 0 to 5 for impact magnitude.

SCALE	DESCRIPTION
0	No observable effect
1	Low effect
2	Tolerable effect
3	Medium high effect
4	High effect
5	Very high effect (devastation)

Table 5.4: Scored time period (duration) over which the impact is expected to last.

SCALE	DESCRIPTION
T	Temporary
P	Permanent

Table 5.5: Scored geographical extent of the induced change.

SCALE	DESCRIPTION
L	Limited impact on location
O	Impact of importance for municipality;
R	Impact of regional character
N	Impact of national character
M	Impact of cross-border character

5.5.3 Likelihood (Probability) of Occurrence

The likelihood (probability) of the pre-identified events occurring has been ascribed using a qualitative scale of probability categories (in increasing order of likelihood) as shown in Table 5.6. Likelihood is estimated on the basis of experience and/ or evidence that such an outcome has previously occurred. Impacts resulting from routine/planned events (i.e., normal operations) are classified under category (E).

Table 5.6: Summary of the qualitative scale of probability categories (in increasing order of likelihood).

SCALE	DESCRIPTION
A	Extremely unlikely (e.g. never heard of in the industry)
B	Unlikely (e.g. heard of in the industry but considered unlikely)
C	Low likelihood (egg such incidents/impacts have occurred but are uncommon)
D	Medium likelihood (e.g. such incidents/impacts occur several times per year within the industry)
E	High likelihood (e.g. such incidents/impacts occurs several times per year at each location where such works are undertaken)

5.5.4 Significance Criteria

In order to assess the overall level of an impact, the following was established:

- ❖ The sensitivity or importance of the receptor (Table 5.2), and;
- ❖ The magnitude of the effect occurring and the change to the existing baseline conditions as a result of the project (Tables 5.3 – 5.6).

The assessment of the level of impacts has been based on a four-point scale, where adverse impacts identified as 'Major' or 'Moderate' are considered 'Significant' and 'Minor' adverse impacts are considered as 'Not Significant'. Positive impacts have been classified simply as 'beneficial', where applicable.

'None' is where a resource or receptor will not be affected in any way by a particular activity or the predicted effect is deemed to be 'negligible' or 'imperceptible', or is indistinguishable from natural background variations.

The framework for assessing the level of adverse significance impacts is outlined in Table 5.7 with the EIA matrix used in assessing the significance negative impact shown in Table 5.8.

A combination of the sensitivity of the receiving environment (Table 5.2) and the magnitude, duration, extent and probability (Tables 5.3 – 5.6) of the impact under consideration determines the significance of the impact (Tables 5.7 and 5.8). It is important to note that impacts have been considered / evaluated without the implementation of mitigation measures as detailed in the EMP Report Vol. 3 of 3.

Table 5.7: Summary of the significance negative impact rating.

IMPACT SEVERITY [Magnitude, Duration, Extent, Probability]	RECEPTOR CHARACTERISTICS (SENSITIVITY)				
	Very High (5)	High(4)	Medium (3)	Low (2)	Negligible (1)
Very High (5)	Major [5/5]	Major [4/5]	Moderate [3/5]	Moderate [2/5]	Minor 1/5
High (4)	Major [5/4]	Major [4/4]	Moderate [3/4]	Moderate [2/4]	Minor[1/4]
Medium (3)	Major [5/3]	Moderate[4/3]	Moderate[3/3]	Minor[2/3]	None[1/3]
Low (2)	Moderate [5/2]	Moderate[4/2]	Minor[3/2]	None[2/2]	None[1/2]
Negligible (1)	Minor [5/1]	Minor [4/1]	None [3/1]	None [2/1]	None [1/1]

Table 5.8: Summary of the EIA matrix used in assessing the significance negative impact of the proposed multiple stratigraphic oil and gas well drilling operations in PEL 73, Kavango Basin, Kavango West and Kavango East Regions on the receiving environment.

IMPACT SEVERITY [Magnitude, Duration, Extent, Probability]		RECEPTOR CHARACTERISTICS (SENSITIVITY)					PHYSICAL ENVIRONMENT					BIOLOGICAL ENVIRONMENT			SOCIOECONOMIC, CULTURAL AND ARCHAEOLOGICAL ENVIRONMENT							
		Very High (5)	High(4)	Medium (3)	Low (2)	Negligible (1)	Water Quality	Physical infrastructure and Resources	Air Quality, Noise and Dust	Landscape Topography	Soil Quality	Climate Change Influences	Habitat	Protected Areas	Flora	Fauna	Ecosystem functions, services, use values and non-Use or passive use	Local, regional and national socioeconomic settings	Subsistence Agriculture	Community Forestry	Tourism and Recreation	Cultural, Biological and Archaeological Resources
Very High (5)	Major [5/5]	Major [4/5]	Moderate [3/5]	Moderate [2 /5]	Minor 1/5																	
High (4)	Major [5/4]	Major [4/4]	Moderate [3/4]	Moderate [2/4]	Minor[1/4]																	
Medium (3)	Major [5/3]	Moderate[4/3]	Moderate[3/3]	Minor[2/3]	None[1/3]																	
Low (2)	Moderate [5/2]	Moderate[4/2]	Minor[3/2]	None[2/2]	None[1/2]																	
Negligible (1)	Minor [5/1]	Minor [4/1]	None [3/1]	None [2/1]	None [1/1]																	
SOURCES OF POTENTIAL IMPACT	ROUTINE AND PHYSICAL PRESENCE OPERATIONAL ACTIVITIES	1.	Pre-construction and drilling requirements			-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1
		2.	Construction phase			-3/2	-3/2	-3/2	-3/2	-3/2	-1/1	-3/2	-1/1	-3/2	-3/2	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1
		3.	Mobilisation			-3/2	-3/2	-3/2	-3/2	-3/2	-1/1	-3/2	-1/1	-3/2	-3/2	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1
		4.	Spudding and Conductor casing			-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1
		5.	Drilling surface / intermediate and setting casing and cementing process through up 900 m			-3/2	-1/1	-3/2	-3/2	-3/2	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1
		6.	Drilling and continuous coring from 900 meters (2953') to 1900 meters (6234')			-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1
		7.	Drilling below 1900 meters to total depth, estimated at 2500 meters (+/-8202')			-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1
		8.	Plug and abandon hole			-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1
		9.	Rehabilitate all surface disturbances and clear the site of any debris			-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1
		10.	Camp removal, site closure / abandonment			-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1
	UNPLANNED ACCIDENTAL EVENTS	11.	Major land accidental incidence such as diesel / oil spill/ fire / explosion			-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	-1/1	+1/1	-1/1	-1/1	-1/1	-1/1	

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

The overall significance negative impacts that the proposed project activities will have on the receiving environment will be localised, temporally for the duration of the drilling operations and will be of low significance without mitigations and negligible with mitigations. The following is the summary of the impact assessment results of the key components of the receiving environment:

1. Fauna and Flora: Campsite and drilling site physical disturbances, vehicles movements and actual drilling operations may affect the local fauna and the flora (*Assessment of negative Impacts localised Low, Significant Impact: Negligible*);
2. Water Pollutions: In the context of the impact assessment of the risk posed by the proposed oil and gas exploration drilling in the study area, it is concluded that most of the risk categories are *moderate to negligible* if proposed measures are adhered to. However, the risks associated with: aquifer pollution vulnerability, impacts due to contaminated water discharge, impacts due to tank bursts or/and pipe breaks and that associated with impacts due to backwash water have high to moderate impacts with regard to water resources negative impacts in the study area. The exploration hole will be materially isolated from the rest of its immediate surrounding by cement casing/grouting and properly closed on top; else total plugging of the exploration hole is recommended;
3. Noise and Dusts Generation – The proposed operations are likely to generate noise and dust from the campsite and drilling site physical disturbances, vehicles movements and actual drilling operations. Vehicle and other related noise will be limited around the operations based with no existing background noises (*Assessment of negative Impacts localised Low, Significant Impact: Negligible*);
8. Air Emissions: The main sources of air emissions are likely to be from combustion fuels from the vehicles, generators, and other equipment, vehicles and fugitive emissions (*Assessment of negative Impacts Localised Low, Significant Impact: Negligible*);
9. Solid Waste management: Although very limited for a very short period of time, various types of wastes are likely to be generated mainly around the proposed campsite and drilling locations. Waste management will not be an issue because necessary facilities and containers for waste management will be provided (*Assessment of negative Impacts Low, Significant Impact: Negligible*);
10. Liquid Waste management: Generated mainly around the proposed campsite and drilling locations. Liquid waste management will not be an issue because chemical toilets will be provided (*Assessment of negative Impacts Low, Significant Impact: Negligible*), and;
11. General Disturbances / Cultural and Social: Cultural Social issues will need to be considered seriously because the proposed survey area fall largely in communal land with different traditional authorities. However, the actually drilling locations do not have villages close nearby and the actual drilling locations are not fixed and can be shifted as maybe required (*Assessment of negative Impacts Localised Low, Significant Impact: Negligible*).

6.2 Recommendations

Based on the findings of this Environmental Assessment covering Environmental Scoping and Environmental Impact Assessment (EIA), it's hereby recommended that the proposed stratigraphic multi-well drilling operations in the PEL No. 73 covering Blocks 1719, 1720, 1721, 1819, 1820 and 1821 be issued with an new Environmental Clearance Certificate with the following key conditions:

- (i) The proponent must adhere to the provisions of all national legislation, regulations, policies, procedures and permits / authorisation requirements;
- (ii) The proponent shall adhere to all the provisions of the EMP and mitigation measures must be implemented and monitored as detailed in EMP Report Vol. 3 of 3, and;
- (iii) Villages / settlements and communal crop fields shall be avoided when choosing the access route, camp site, water well location and actual drilling location. A distance of 500 m to 1 km is hereby recommended between any local villages / settlements and the campsite / drilling locality.

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8. Annexes

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