ENVIRONMENTAL
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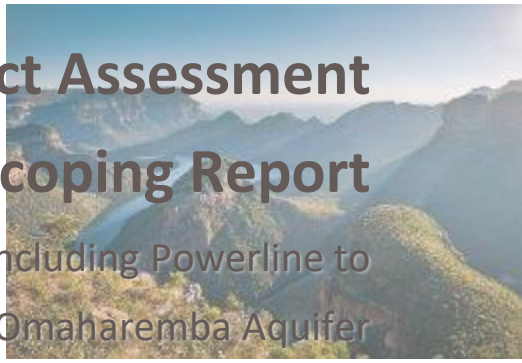

Environmental and Social Impact Assessment

Scoping Report

Water Supply Pipeline and Ancillary Works Including Powerline to Okanguati from the Omaharemba Aquifer

Kunene Regional Council

April 2018

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Confidentiality

ENVIRONMENTAL COMPLIANCE CONSULTANCY

DECLARATION OF INDEPENDENCE OF THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

I, **Stephan Bezuidenhout**, declare that –

General declaration:

- I act as the independent environmental practitioner in this application/tender
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting environmental impact assessments, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- I will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- I will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the competent authority may be attached to the report without further amendment to the report;
- I will keep a register of all interested and affected parties that participated in a public participation process; and
- I will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not
- All the particulars furnished by me in this form are true and correct;
- I will perform all other obligations as expected from an environmental assessment practitioner in terms of the Regulations

1st January 2018

SIGNATURE **DATE**

EXECUTIVE SUMMARY

There is currently a critical shortage of available portable water for the residents of Okanguati in the Kunene Region due to the reduced water quality of the existing resource and the projected population increase in the area. Ohamaremba Aquifer approximately 15km to the south-east of Okanguati has been identified as having sufficient capacity to provide fresh water to the town for approximately 30 years. In order to supply the water to the town, a water pipeline approximately 20km long, a 33kv overhead power line approximately 2.45km long, water pumps and boreholes are required to distribute water to the community (the proposed project).

The proposed project triggers two Listed Activities under the Environmental Management Act, 2007 (Act No. 7 of 2007), therefore an Environmental Clearance Certificate is required. As part of the Environmental Clearance Certificate application, an environmental and social impact assessment has been undertaken to satisfy the requirements of the Environmental Management Act, 2007.

Okanguati and Ohamaremba are in the north-west of Namibia, in the Kunene Region, the second largest geographical region in Namibia. Kunene has a population of 87,019 and is projected to increase to 162,453 by 2041, over double in 30 years. The Kunene Region is relatively underdeveloped compared to the rest of Namibia. This is due to the mountainous inaccessible geography and the dryness that significantly hinders agriculture.

Okanguati is a small town located directly off the C43 Regional Road, a gravel road also known as the D3700. The C43 links Okanguati to the Angola border to the north and Opuwo to the south. Okanguati is approximately 840km north-west of Windhoek and 100km north-west and Opuwo, the capital of the Kunene Region. Various kraal settlements are sparsely distributed in the area, including Ohamaremba, a small settlement 20km to the south of Okanguati spread along the Otjitango River (known as the Ohamaremba River to the locals).

The north-west of Namibia is known to have an extended archaeological record of human occupation, and several sites have been uncovered. Various burial sites and monuments are found in the area, and evidence of historical settlements have been discovered in the area.

The average rainfall in the area is approximately 200 – 250mm per year, with an average annual temperature of 20-22^{o}C. The Okanguati area in in the Western Highlands, with the Zebra Mountains to the north-east, Baynew Mountains to the north-west and the Steilrand Mountains to the south. The main vegetation structure is sparse shrub land. The rock type of the area falls into the Epupa Complex. The Ombuka River, an ephemeral river runs in a south-westerly to north-east direction through Okanguati. The Otjitango River and the Ombuka River are part of the Kunene River Basin.

The proposed project's construction activities will involve site preparation along the water pipeline and overhead line alignments; installation of laydown areas and access roads; ground excavation including some blasting; installation and construction of pipeline, overhead line, pumping station and infrastructure; and backfill over the pipeline and compaction of ground. The construction phase will take approximately ten months and will require around 50 workers. The lifetime of the pipeline is expected to be around 30 to 50 years, the pump station 30 years, electrical and mechanical equipment 16 years; concrete reservoir 30 – 50 years; and sectional steel tanks 15 – 20 years. All infrastructure will require annual checks and some maintenance.

Throughout the development of the proposed project, various stakeholder engagement has been undertaken to ensure the local communities and relevant stakeholders have been included in the design and assessment process, so that meaningful feedback is provided, and concerns and questions have been addressed. Three community meetings have been held, two in 2017 and one in 2018, and various other means of communication between the local community have been conducted.

The environmental and social impact assessment was undertaken using a methodology developed by Environmental Compliance Consultancy which is based on the International Finance Corporation approach. The key issues associated with the proposed project were the potential impacts on local ecology, groundwater and surface water, and cultural

heritage. Therefore, to ensure a streamlined proportionate approach was taken, the assessment focused on these receptors.

The key environmental and social concerns as a result of the construction and operation of the proposed project are as follows:

- Loss of vegetation / protected species during vegetation clearance;
- Injury or mortality of birds from the presence of the overhead line;
- Injury or mortality of mammals from the presence of the overhead line;
- Disturbance, loss or destruction of heritage remains during construction activities;
- Insufficient supply for a sustainable future due to lack of historical data on water level reactions;
- Impacts to community perception of the natural changes to the local springs (water source) during droughts;
- During operations, contamination from various sources could enter the groundwater and thus reduce water quality to a standard that is not consumable; and
- Improved services to local communities, enhancing society.

To avoid and minimise the perceived impacts listed previously, the following mitigation measures have been proposed:

- Identify and protect and avoid protected species of flora;
- Minimise blasting activities;
- Overhead line to have avoidance mechanisms installed, for example light green rectangles on the line and anti-perching devices;
- Set the overhead line at least 5.9m high;
- Set the water pipeline underground, at least 1m deep;
- Apply the Chance Finds procedure to heritage remains;
- Implement a monitoring system prior to abstraction;
- Monitor water levels, abstraction rate, rainfall and periods of flow I the river should be undertaken during operations;
- Regularly sample and test extracted water;
- Engage with the local community on a regular basis; and
- Apply an aquifer protection zone along the fault zone of 150m, width.

The assessment is considered to be comprehensive and sufficient to identify impacts, and it is concluded that no further assessment is required.

A summary of recommendations made throughout the report are as follows:

- The bulk water supply pipeline must not be permitted for any cattle watering
- Water level monitoring system to be installed in the production bores prior to construction commencing
- Permits to remove vegetation and clear land must be obtained from the MAWF prior to construction
- Cultural heritage exclusions zone must be compiled with

- An aquifer protection zone (fenced or demarcated) must be in place to prevent potential contamination of the aquifer (no kraals, housing or sewerage waste to be developed within the aquifer protection zone and grazing within the protection zone should be prohibited)
- The construction contractor must wherever possible hire local labour. Performance of local employees can be guided and enforced by Headman who are requesting local input.

On this basis, it is of the opinion of ECC that an environmental clearance certificate could be issued, on conditions that the management and mitigation measures specified in the ESMP are implemented and adhered to.

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DEFINITIONS AND ABBREVIATIONS

EAP	Environmental Assessment Practitioner
ECC	Environmental Compliance Consultancy
ESIA	Environmental and Social Impact Assessment
EMA	Environmental Management Act
ESMP	Environmental and Social Management Plan
IFC	International Finance Corporation
I&AP	Interested and affected parties
MAWF	The Ministry of Agriculture, Water and Forestry

1. INTRODUCTION

1.1. PROPOSED PROJECT

There is currently a critical shortage of available portable water for the residents of Okanguati in the Kunene Region. Ohamaremba Aquifer approximately 15km to the south-east of Okanguati has been identified as having sufficient capacity to provide fresh water to the town for approximately 30 years. In order to supply the water to the town, a water pipeline, overhead power line, water pumps and boreholes are required to distribute water to the community (the proposed project). The location of the proposed project is illustrated on Figure 1.

Figure 1 – Location of proposed project

1.2. ENVIRONMENTAL REQUIREMENTS

The Environmental Management Act, 2007 (Act No. 7 of 2007) stipulates that an Environmental Clearance Certificate is required to undertake Listed Activities under the Act and associated Regulations. Listed activities triggered by the proposed project are as follows:

ENERGY GENERATION, TRANSMISSION AND STORAGE ACTIVITIES

- 1 (b) The transmission and supply of electricity

INFRASTRUCTURE

- 10.1 (a) The construction of oil, water, gas and petrochemical and other bulk supply pipelines

As part of the Environmental Clearance Certificate application, an environmental and social impact assessment has been undertaken to satisfy the requirements of the Environmental Management Act, 2007.

1.3. PURPOSE OF THIS REPORT

The findings of the Environmental and Social impact assessment (ESIA) undertaken for the proposed project for Kunene Regional Council are presented in this Scoping Report, both of which have been undertaken in accordance with the requirements of the Environmental Management Act, 2007 and the Environmental Impact Assessment

Regulation, 2007 (No. 30 of 2011) gazetted under the Environmental Management Act, (EMA), 2007 (Act No. 7 of 2007) (referred to herein as the EIA Regulations). This Scoping Report and appendices will be submitted to the Directorate of Environmental Affairs (DEA) at the Ministry of Environment and Tourism (MET) for review as part of the Environmental Clearance Certificate application.

This report has been prepared by Environmental Compliance Consultancy (ECC). ECC's terms of reference for the assessment is strictly to address potential effects, whether positive or negative, and their relative significance, and explore alternatives for technical recommendations and identify appropriate mitigation measures for the proposed project.

The report has been prepared to provide information to Authorities, the public and stakeholders to aid in the decision-making process for the proposed project. The objectives of this report are to:

- Provide a description of the proposed activity and the site on which the activity is to be undertaken, and the location of the activity on the site;
- Provide a description of the environment that may be affected by the activity;
- Identify the laws and guidelines that have been considered in the assessment and preparation of this report;
- Provide details of the public consultation process;
- Describe the need and desirability of the activity;
- Provide a high level environmental and social impact assessment on feasible alternatives that were considered;
- Report the assessment findings, identifying the significance of effects, including cumulative effects; and
- Conclude if further investigation is required and if not required, a justification for the approval of an Environmental Clearance.

In addition to the ESIA, an Environmental and Social Management Plans (ESMP) (Appendix A) is also required under the Environmental Management Act, 2007. An ESMP has been prepared to provide a management framework for the planning and implementation of construction activities and provides construction and operational standards and operating arrangements so that potential environmental and social impacts of the proposed project are mitigated, prevented and minimised as far as reasonable practicable, and that statutory requirements and other legal obligations are fulfilled.

1.4. The Proponent of the Proposed Project

The proponent for the proposed project is Kunene Regional Council:

Table 1 - Proponent

The Regional Council
P/Bag 502 – Opuwo, Nambia
Ms Ludmilla Doeses, The Planning Director, Ludmilladoeses@yahoo.com
Mr K. Sinvula – Planning, 081 144 6460, ksinvula@gmail.com

1.5. Environmental Consultancy

ECC, a Namibian consultancy (registration number Close Corporation 2013/11401), has prepared this Scoping Report on behalf of the proponent. ECC operates exclusively in the environmental, social, health and safety fields for clients across Southern Africa in the public and private sector. ECC is independent to the proponent and has no vested or financial interested in the proposed project.

All compliance and regulatory requirements regarding this assessment document should be forwarded by email or post to the following address:

Consultant:

Environmental Compliance Consultancy
PO BOX 91193
Klein Windhoek, Namibia
Tel: +264 81 262 7872 or Tel: +264 81 653 1214
Email: info@eccenvironmental.com

The individuals who contributed to the ESIA and this report are provided in Table 2. The CVs of Mr Stephanus Bezuidenhout, Ms Jessica Mooney and Ms Rachel Moore are contained in Appendix B.

Table 2 - ESIA Project Team

Name	Role
Mr Stephanus Bezuidenhout (ECC)	ESIA Project Team Member
Ms Jessica Mooney (ECC)	ESIA Project Team Member
Ms Rachel Moore (ECC)	ESIA Project Team Member
J Kinahan	J & J Kinahan, Archaeologists, QRS
Frank Bockmuhl	Frank Bockmuhl, Geohydrology and Farming
Dr Diganta Sarma	Namib Hydrosearch
Peter L Cunningham	Environment and Wildlife Consulting

1.6. Report Structure

The ESIA Scoping Report is structured as per the contents set out in Table 3.

Table 3 - ESIA Report Sections

SECTION	TITLE	CONTENT
-	Executive Summary	Executive summary of the ESIA
-	Acronyms	A list of acronyms used during the report
1	Introduction	This section introduces the ESIA and provides background information on the proposed project, proponent and purpose of the report
2	Regulatory Framework	This chapter describes the Namibian environmental regulatory framework applicable to the project and how is has been considered in the ESIA and the ESIA Scoping Report and ESMP.
3	Project Description	Presents a technical description of the proposed project, alternatives considered and the context of the surrounding environment, and how the proposed project will be constructed, operated and decommissioned.
4	Consultation	This chapter outlines the public participation undertaken for the proposed project and presents stakeholder feedback.
5	Impact Assessment and Mitigation	This chapter presents the predicted potential environmental and social effects arising from the proposed project, and the mitigation and management strategies to be applied to avoid or reduce the effects.
6	Conclusions	Concludes the findings of the ESIA
7	References	A list of reference used for this report

The ESIA Report has the following supporting appendices:
A – Environmental and Social Management Plan
B – Environmental Practitioners CV
C – Ecological Study Report
D – Hydrogeology Study Report 2017
E – Cultural Heritage Study Report
F – Hydrological Studies (2012, 2014, 2015 and 2016)
G – Hydrological Study 2018
H – Correspondence with MAWF
I – Letter Communication with the Roads Authority
J – Headman Ohamaremba Community Letter
K – Stakeholder Engagement Evidence
L – Letter to the Headman Ohamaremba Community regarding monument
M – Above-ground pipelines as wildlife barriers in the Namib Desert
N – Background Information Document

2. REGULATORY FRAMEWORK

2.1. INTRODUCTION

The Constitution of the Republic of Namibia, 1990 clearly defines the Country's position in relation to sustainable development and environmental management. The Constitution refers that the State shall actively promote and maintain the welfare of the people by adopting policies aimed at the following:

"Maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis for the benefit of all Namibians, both present and future; in particular, the Government shall provide measures against the dumping or recycling of foreign nuclear and toxic waste on Namibian territory." ***The Constitution of the Republic of Namibia Article 95 (l)***

This section of the report outlines the regulatory framework applicable to the proposed project. The proponent holds their responsibilities and commitments made in line with this framework in the highest regard and provides this statement of commitment to comply with the provisions of the regulatory framework set out below.

KUNENE REGIONAL COUNCIL

DECLARATION OF COMMITMENT

We, the proponent representatives for the Water Supply Pipeline project, hereby declare our unwavering commitment to comply with all national laws, international protocols and policies as set out below.

Furthermore, we will ensure relevant management plans, procedures and internal policies are established for the project and we hereby offer our commitment to ensure protection to the environment and community in doing so.

Yours Sincerely,

Signed by the Proponent Representatives:

_____

Date: April 2018

Figure 2 – Kunene Regional Council Declaration of Commitment

2.2. NATIONAL STATUTES

Environmental and social national Statutes, which are applicable to the proposed project or have been considered in the assessment and are summarised in Table 4.

Table 4 – National Statutes

NATIONAL REGULATORY REGIME	SUMMARY	APPLICABILITY TO THE PROJECT
Environmental Management Act, 2007 (Act No. 7 of 2007) and associated regulations, including the Environmental Impact Assessment Regulation, 2007 (No. 30 of 2011)	The Act aims to promote sustainable management of the environment and the use of natural resources by establishing principles for decision-making on matters affecting the environment. It sets the principles of environmental management as well as the functions and powers of the Minister. The Act requires certain activities to obtain an environmental clearance certificate prior to project development. The Act states an EIA may be undertaken and submitted as part of the environmental clearance certificate application. The MET is responsible for the protection and management of Namibia's natural environment. The Department of Environmental Affairs under the MET is responsible for the administration for the EIA process.	This ESIA report (and ESMP) documents the findings of the ESIA process undertaken for the proposed project, which will form part of the environmental clearance application. The ESIA and report have been undertaken in line with the requirements under the Act and associated regulations.
Water Act, 1956	This Act provides for the control, conservation and use of water for domestic, agricultural, urban and industrial purposes; to make provision for the control, in certain respects, of the use of sea water for certain purposes; and for the control of certain activities on or in water in certain areas. The Ministry of Agriculture, Water and Forestry (MAWF) Department of Water Affairs is responsible for administration of the Water Act.	The Act stipulates obligations to prevent pollution of water. A hydrological study has been undertaken and the conclusions applied in the ESIA. The ESMP sets out measures to avoid polluting the water environment.
National Heritage Act 27 of 2004	The Act provides for the protection and conservation of places and objects of heritage significance and the registration of such places and objects. It also makes provision for archaeological 'impact assessments'.	A heritage desk study has been undertaken, and the findings of which concludes heritage remains may be found during the construction of the proposed project. Pre-colonial archaeological sites are governed by the National Heritage Act (27 of 2004) and can only be investigated or destroyed under a permit issued by the National Heritage Council.

NATIONAL REGULATORY REGIME	SUMMARY	APPLICABILITY TO THE PROJECT
		If applicable, the relevant permits will be obtained before disturbing or destroying a heritage site as set out in the Act, however this is unlikely as sites have been avoided through design development. Any heritage resources discovered would require a permit from the National Heritage Council for relocation.
Burial Place Ordinance (27 of 1966)	Act enforced to prohibit the desecration or disturbance of graves in burial places and to regulate matters relating to the removal or disposal of dead bodies.	The proposed project will comply with this Act at all times. Burial places have been identified, alignments have been shifted to avoid affects and sites will be communicated to the project team to avoid disturbance. The ESMP provides measures to avoid impacts.
Forest Act, 2001 (12 of 2001) And associated Regulations	This Act provides for the establishment of the Forestry Council, and presents laws relating to the management and use of forests and forest produce. It also presents provisions for the protection of the environment and the control and management of forest fires.	Ecological impacts may occur as a result of the proposed project due to some site clearance requirements. The project will ensure the Act is complied with, in particular: Tree species and any vegetation within 100m from a watercourse may not be removed without a permit (S22(1). Protected species will be identified prior to construction works and measures to protect them, as set out in the ESMP. Permits for protect species under the Act must be obtained from MAWF prior to any disturbance. The clearing of vegetation is prohibited (subject to a permit) 100m either side of a river – the project has been designed to ensure this is adhered to, and specific provisions stipulated in the ESMP The proponent will obtain the required vegetation clearing permits from MAWF prior to construction commencing

3. METHODOLOGY

3.1. PURPOSE OF AN ESIA

The EIA process in Namibia is governed and controlled by the Environmental Management Act, 2007 and the EIA Regulations No. 30 of 2012, which is administered by the Office of the Environmental Commissioner through the DEA of the MET.

An ESIA is the process of identifying, predicting, evaluating and mitigating the potential effects of a proposed project on the natural and human environment. The aims of the ESIA process and subsequent report are to apply the principles of environmental management to proposed activities; reduce the negative and increase the positive effects arising from a proposed project; provide an opportunity for the public to consider the environmental impacts of a proposed project through meaningful consultation; and to provide a vehicle to present the findings of the assessment process to competent authorities for decision making.

The ESIA process can aid the design development process through incorporating design changes early on into the project planning to avoid or reduce environmental impacts, as well as design aspects such as siting, technology and scale. Mitigation measures and recommendations are identified through collaborative working between the ESIA team and the proponent's team, including engineers, architects and project managers.

3.2. THE ASSESSMENT PROCESS

ECCs EIA methodology applied to this ESIA has been developed using the International Finance Corporation (IFC) standards and models, in particular Performance Standard 1, *'Assessment and management of environmental and social risks and impacts*' (International Finance Corporation, 2017) (International Finance Corporation, 2012); Namibian Draft Procedures and Guidance for EIA and EMP (Republic of Namibia, 2008); international and national best practice; and over 25 years of combined EIA experience.

3.3. THE ASSESSMENT PROCESS FOLLOWED BY ENVIRONMENTAL COMPLIANCE CONSULTANCY

This Section describes the process of the ESIA undertaken by ECC, as summarised in Figure 3.

The subsequent sections provide further detail of each step and what has been or will be undertaken for each one.

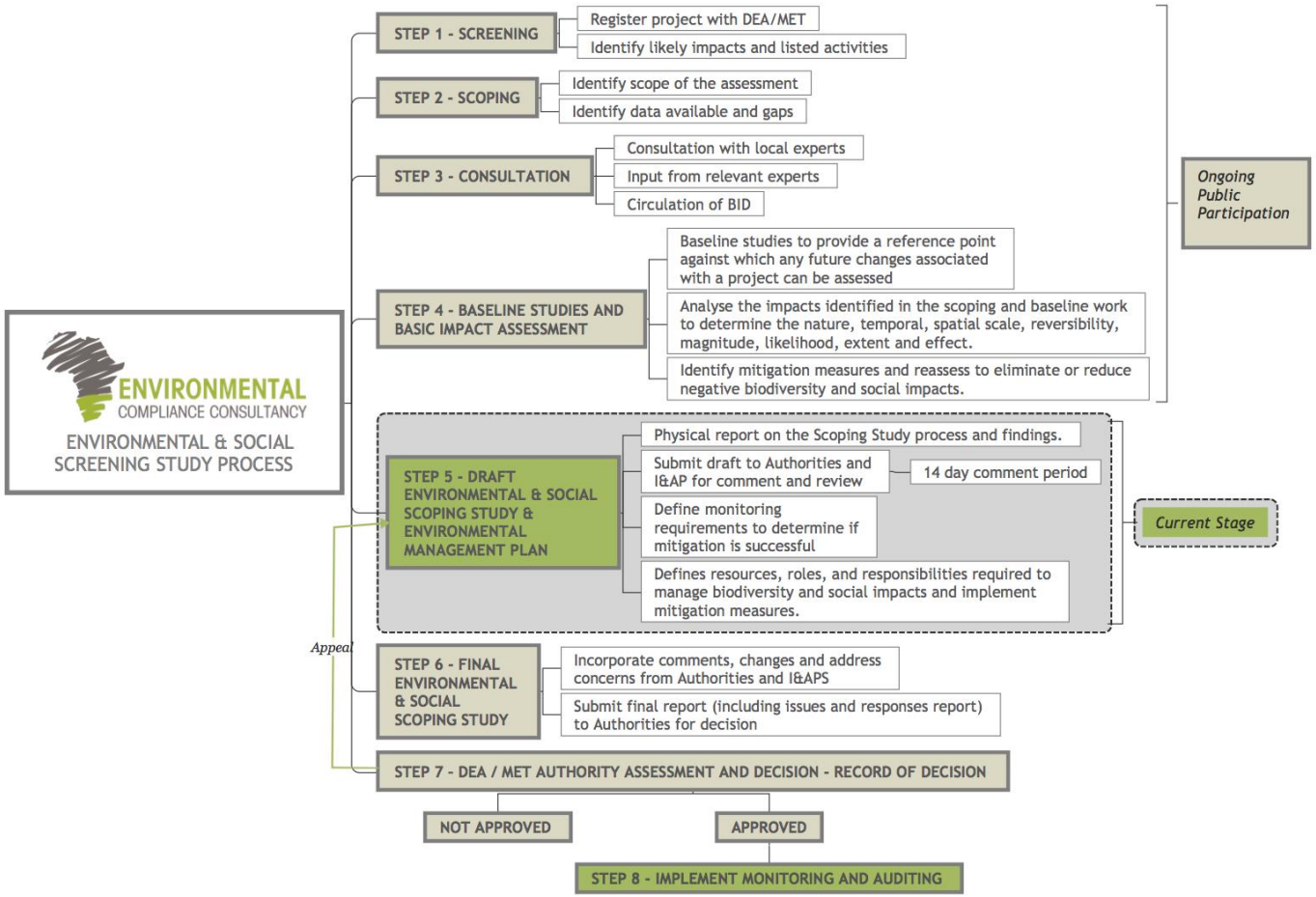

Figure 3 – Environmental Scoping Process

3.3.1. SCREENING OF THE ESIA

STATUS: COMPLETE

The first stages in the ESIA process is to register the project with the DEA/MET and undertake a screening exercise to determine whether it is considered as a listed activity under the Environmental Management Act, 2007 and associated Regulations and if significant impacts may arise from the project.

The screening exercise concluded that the proposed project is considered as a Listed Activity (see Section 1.2), however it is considered unlikely that significant environmental or social effects are likely to be caused as a result of the proposed project. Therefore, as part of the Environmental Clearance Certificate Application, a scoping report (this report) was deemed appropriate to present the assessment of potential effects and suitable mitigation measures, and whether there are any significant issues and/or effects that require further investigation.

3.3.2. SCOPING OF THE ESIA

STATUS: COMPLETE

To ensure the assessment was concise and focussed, a scoping exercise was undertaken to identify environmental and social receptors that may be affected by the proposed project. This exercise was undertaken through a preliminary high-level assessment of the proposed project against the receiving environment. A source-pathway-receptor model was applied:

- Source of potential impact - where does the impact come from, e.g. the activity, ground excavation, which emits dust.
- The potential pathway – how can the pollution / impact travel through the environment e.g. wind direction and speed.
- The receptor and effect – what can be affected and how e.g. water body, sedimentation, water quality affected.

In determining a potential effect, a link between each element needs to be identified. Where a link was found to be absent, the topic or receptor was scoped out and was not taken forward for further consideration in the assessment. Where links are present, that topic or receptor was taken forward for assessment where there was potential for the effect to be significant. Section 6.1 provides further information on the scoping of the proposed project.

3.3.3. AVAILABLE DATA

A desk-top review of available baseline data was undertaken during the second half of 2017. The aim of this activity was to identify what, if any, data is missing to form a robust baseline to be used in the assessment. The review focussed on the environmental and social topics and sub topics that would most likely be significantly affected by the proposed project. Several data gaps were identified and as a result, surveys and studies were commissioned:

- **Site Walkover:** A site walk over was undertaken by ECC on the 21st and 22nd September 2017.
- **Ecological Study:** Undertaken by Peter L Cunningham, Environment and Wildlife Consulting, Namibia in October 2017 (Cunningham, 2017). This study is included in Appendix C.
- **Hydrogeology Study:** Undertaken by Frank Bockmuhl and Dr Diganta Sarma in July 2017 (Bockmuhl, 2017). This study is included in Appendix D.
- **Cultural Heritage Study:** Undertaken by J & J Kinahan in October 2017. This study is included in Appendix E.

3.3.4. CONSULTATION

STATUS: COMPLETE

One of the objectives of the ESIA process is to provide an opportunity for stakeholders, including the public, to consider the proposed project and potential environmental and social impacts. Through the provision of meaningful consultation, the proposed project could benefit in various ways, for example, environmental or social receptors of importance to the local community could be identified; the design of the proposals could be enhanced; and environmental or social impacts could be avoided or minimised. Consultation was undertaken for the proposed project, details and the outcome are presented in Chapter 5.

3.4. ASSESSMENT METHODOLOGY

3.4.1. LIMITATIONS, UNCERTAINTIES AND ASSUMPTIONS

The following limitations and uncertainties associated with the assessment methodology were observed:

- Topic specific assessment guidance has not been developed in Namibia. A generic assessment methodology was applied to all topics using IFC guidance and professional judgement.

3.4.2. DETERMINATION OF SIGNIFICANCE

The evaluation and prediction of environmental and social impacts requires the assessment of the project characteristics against the baseline of environmental and social characteristics, and ensuring all potentially significant impacts are identified and assessed.

The significance of an impact was determined by taking into consideration the combination of the sensitivity and importance/value of environmental and social receptors that may be affected by the proposed project; the nature and characteristics of the impact; and the magnitude of potential change. The magnitude of change (the impact) is the identifiable changes to the existing environment which may be direct or indirect; temporary/short term, long term or permanent; and either beneficial or adverse. These are described as follows.

- The **sensitivity and value of a receptor** is determined by identifying how sensitive and vulnerable a receptor is to change, and the importance of the receptor (internationally, nationally, regionally and locally).
- The **nature and characteristics of the impact** is determined through consideration of the frequency, duration, reversibility and probability and the impact occurring.
- The **magnitude of change** measures the scale or extent of the change from the baseline condition, irrespective of the value. The magnitude of change may alter over time, therefore temporal variation is considered (short- term, medium-term; long-term, reversible, reversible or permanent)

The significance of impacts has been derived using professional judgment and applying the identified thresholds for receptor sensitivity and magnitude of change (as discussed above), and guided by the matrix presented in Figure 4. The matrix is applicable for impacts that are either positive or negative. The distinction and description of significance and whether the impact is positive or negative is provided in Table 5.

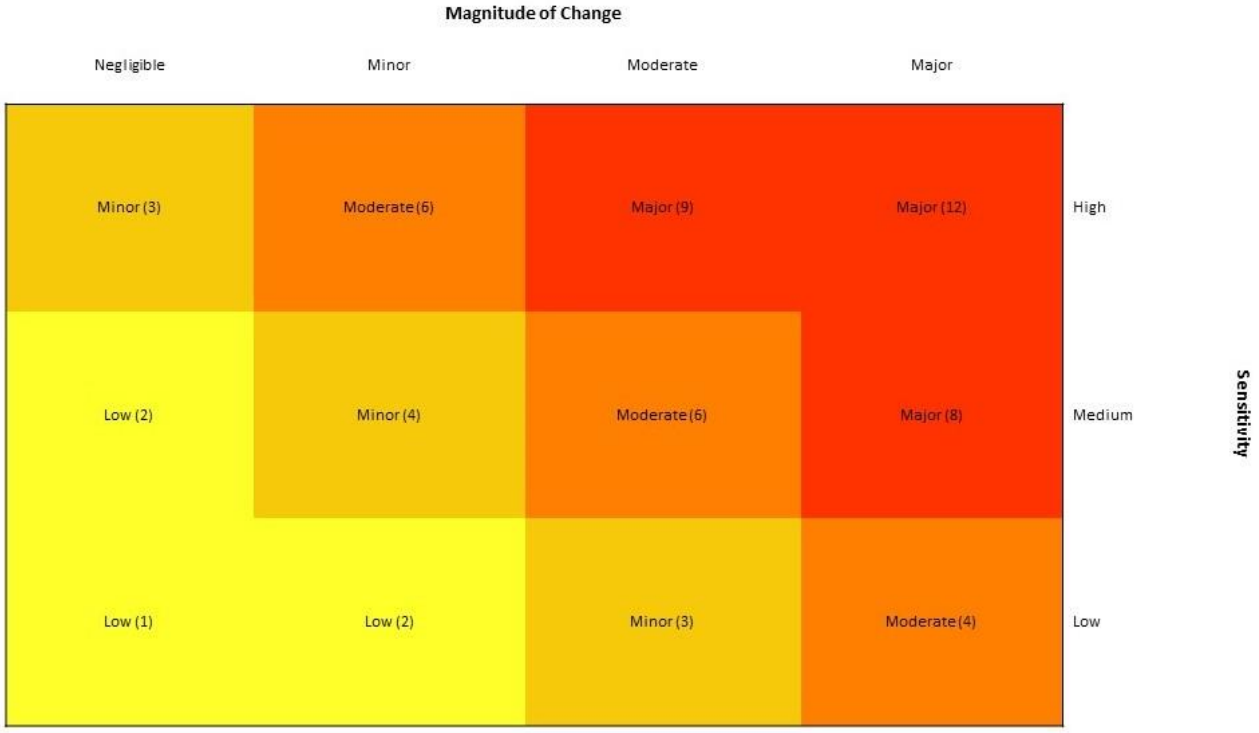

Figure 4 – Guide to significance ratings

Significance is not defined in the Namibian EIA Regulations, however the Draft Procedure and Guidance for EIA and EMP states that the significance of a predicted impact depends upon its context and intensity. Accordingly, definitions for each level of significance has been provided in Table 5. These definitions were used to check the conclusions of the assessment of receptor sensitivity, nature of impact and magnitude of impact was appropriate.

Table 5 – Significance Description

SIGNIFICANCE OF IMPACT	DESCRIPTION
Major (negative)	Impacts are considered to be key factors in the decision-making process that may have an impact of major significance, or large magnitude impacts occur to highly valued/sensitive resource/receptors. Impacts are expected to be permanent and non- reversible on a national scale and/or have international significance or result in a legislative non- compliance.
Moderate (negative)	Impacts are considered within accepted limits and standards. Impacts are long term, but reversible and/or have regional significance. These are generally (but not exclusively) associated with sites and features of national importance and resources/features that are unique and which, if lost, cannot be replaced or relocated.
Minor (negative)	Impacts are considered to be important factors but are unlikely to be key decision-making factors. The impact will be experienced, but the impact magnitude is sufficiently small (with and without mitigation) and well within accepted standards, and/or the receptor is of low sensitivity/value. Impacts are considered to be short term, reversible and/or localized in extent.
Low (negative)	Impacts are considered to be local factors that are unlikely to be critical to decision-making.
Low – Major (Beneficial)	Impacts are considered to be beneficial to the environment and society:

It most instances, moderate and major adverse impacts are considered as significant, however there may be some instances where impacts are lower than this but are considered to be significant. The following thresholds were therefore used to double check the assessment of significance had been applied appropriately; a significant impact would meet at least one of the following criteria:

- It exceeds widely recognized levels of acceptable change;
- It threatens or enhances the viability or integrity of a receptor or receptor group of concern; and
- It is likely to be material to the ultimate decision about whether or not the environmental clearance certificate is granted.

Where significant impacts are predicted, further investigation may be required to identify the type of effects and appropriate mitigation.

3.4.3. ENVIRONMENTAL MITIGATION

Mitigation comprises a hierarchy of measures ranging from preventative environmental effects by avoidance, to measures that provide opportunities for environmental enhancement. The mitigation hierarchy is: avoidance; reduction at source; reduction at receptor level; repairing and correcting; compensation; remediation; and enhancement.

Mitigation measures can be split into three distinct categories, broadly defined as:

1. **Embeded Mitigation:** Actions undertaken by the ESIA process that influence the design process, through implementing design measures that would entirely avoid or eliminate an impact, or modifying the design through the inclusion of environmental features to reduce the magnitude of change.
2. **Best Practice Mitigation:** Standard construction practices and other best practice measures for avoiding and minimizing environmental impacts. .
3. **Additional Mitigation:** Specified additional measures or follow-up action to be implemented to further reduce adverse impacts that remain after the incorporation of embeded mitigation.

Embedded mitigation and good practice mitigation have been taken into account in the assessment. Additional mitigation measures have been identified when the significance of impact requires it and causes the impact to be further reduced. Where additional mitigation has been identified, a final assessment of significance of impacts (residual impacts) was carried out taking into consideration the additional mitigation. The ESMP (Appendix A) provides the good practice measures and specified additional measures or follow-up action.

4. PROJECT DESCRIPTION

4.1. NEED FOR THE PROJECT

The population of Okanguati in estimated to reach 4,000 individuals by 2019, including informal residents. This is predicted to continue to increase, resulting in the town's population to be around 6,500 individuals by 2034 (calculations predicted by Felix Friedrich Kuchling, Kuchling Consulting Engineers Inc. using the Kunene Development Plan (Windhoek Consulting Engineers, 2001). Okanguati's water supply is currently supplied with water from boreholes that have been drilled to the north-east of the town along the course of the Omuhonga River (see Figure 5). In addition to the water being very saline and thus quality worsening, the existing infrastructure is old and not working efficiently. Several leaks have been identified and only two of several boreholes are operational intermittently. Without a new water supply and new infrastructure, the expanding community would be without suitable drinking water in the immediate to long-term future.

The Government has made firm commitments to enable communities to operate and maintain their own water supplies, and also to rehabilitate the existing water points as necessary before handling them over to communities. In addition, the rural water supply network is being improved so that more people have access to improved water supplies (Windhoek Consulting Engineers, 2001).

4.2. ALTERNATIVES AND DESIGN EVOLUTION

During design evolution of the proposed project, alternatives have been considered and decision-making has been supported through environmental assessment work. Alternatives considered include identification of a suitable groundwater resource (water quality and quantity), pipeline routes and technology.

4.2.1. HYDROLOGICAL SURVEY & SITE IDENTIFICATION

In 2012, Mr. Frank Bockmuhl (geohydrology specialist) was commissioned to investigate potential groundwater sources surrounding Okanguati, with a preference to the area towards the Zebra Mountains (see Appendix F). Between 2012 and 2016, various site investigations were undertaken surrounding the existing boreholes; south and east of Okanguati; and north of Okanguati in the Ombuka river (see Figure 5). The data and results concluded that to the west of Okanguati, saline groundwater is prevalent which extends to the south and percolates downstream along the Omuhongo river (see Figure 5); and lavas to the north and north-east would unlikely provide sufficient water resources for the medium to long term future for Okanguati. For further information, see Appendix F.

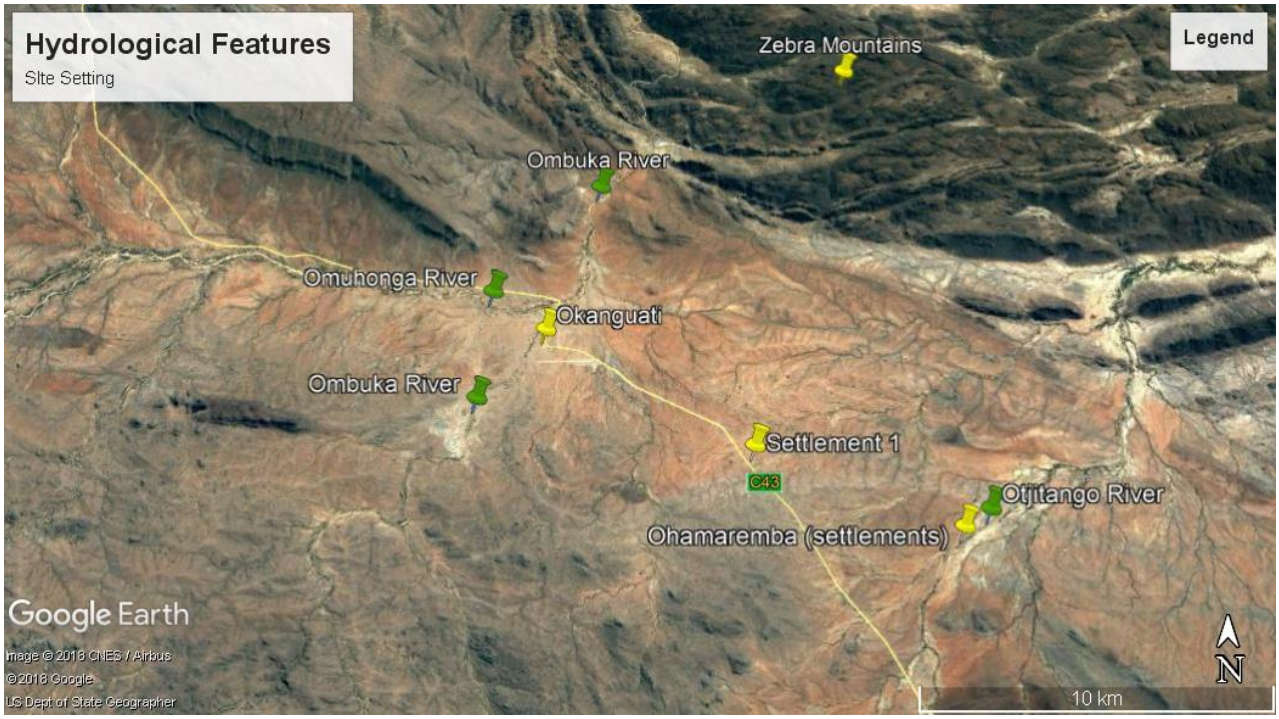

Figure 5 – Hydrological Features in the Okanguati area

During consultation between 2014 and 2016, feedback from counsellors, the Kunene Regional Council and local communities raised concerns that poor water quality would be found to the north of the town, and "stronger" and fresher water would be found at Ohamaremba along the Otjitango river. Subsequently, Mr. Frank Bockmuhl was tasked by the Council to investigate the area around the Otjitango river. In 2016 the installation of new survey boreholes at Ohamaremba was undertaken, with the aim of developing a model of the Ohamaremba Aquifer. Appendix D provides the findings of the drilling and pumping results of the survey boreholes and Appendix H provides the correspondence between the proponent and the MAWF with regards to the permit application.

The findings of this survey concluded that the Ohamaremba area seemingly has abundant groundwater and exceeds expectations. Therefore, further investigations were commissioned for this preferred site as the source of water for Okanguati. These are discussed further in Section 4.3.3.

4.2.2. Route Alternatives

Four routes were identified for the proposed new water pipework are as follows, and presented in Figure 6:

- **Option 1:** Route southwards from Okanguati in parallel to the C43 District Road on the north side, for approximately 10km, before routing approximately 4.5km in an easterly direction away from the road, until joining the pump station.
- **Option 2:** Following the same alignment as Option 1 for approximately 7km, this route then cuts across the land in a south-easterly direction for approximately 2.5km, and then routes in an easterly direction for approximately 2.5km until the pump station.
- **Option 3:** For approximately 2km, this option runs parallel to the C43 on the north side, where it then crosses the road, and continues a south-easterly direction away from the road, cutting across the land. Where the alignment and road meet, this option crosses the road once again and alters to a more southerly alignment, parallel to the road for approximately 1.5km, before routing eastward for approximately 4.5km to the pump station.

- **Option 4:** Runs parallel to the C43 on the south side until it crosses the road approximately 8km south of Okanguati, where it cuts across the land in a south-easterly direction for approximately 2.5km, and then routes in an easterly direction for approximately 2.5km until the pump station.

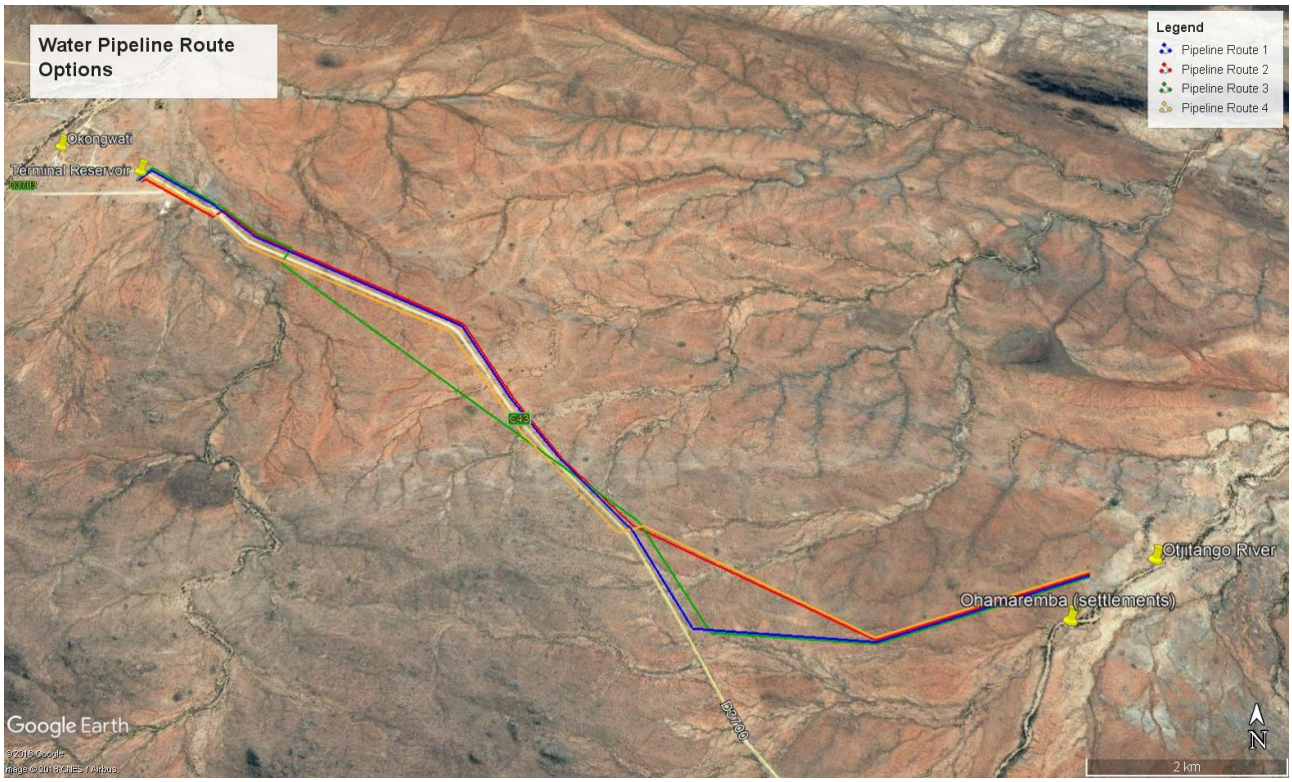

Figure 6 – Pipeline Route Options

A comparison of these options is presented in Table 6. The length of each route option is based on the most direct route alignment that does not consider potential obstructions or receptors. These lengths are crude, for use in the comparison and do not reflect the final route alignment.

Table 6 – Comparison of Water Pipeline Route Options

OPTION	DIFFERENTIATORS
Route Option 1	14km long Crosses the road once Runs in close proximity to the Landfill Site Runs in close proximity to a settlement
Route Option 2	13.5km long Crosses the road once Approximately 4km section away from the road - potentially new access roads and greater bush clearance Runs in close proximity to a settlement
Route Option 3	14km long Crosses the road twice Runs in close proximity to the Landfill Site Furthest away from the road (4.5km section) – potentially new access roads and greater bush clearance
Route Option 4	13.5km long

OPTION	DIFFERENTIATORS
	Crosses the road once Approximately 4km section away from the road - potentially new access roads and greater bush clearance

The key differentiator between the options is the distance of the alignment from the existing road and thus the potential requirement for the installation of new access tracks during construction. Option 1 was therefore identified as the preferred option as it follows the road alignment more than the other three, thereby minimising the need to make new access roads and remove vegetation, as well as minimising additional ecological barriers being introduced into the environment.

4.2.3. Water Pipeline Technology

Two options are available for the setting of the pipeline: above-ground or underground (shallow). Due to the potential risk of elephants breaking the water pipework and the pipeline causing a wildlife barrier (see Appendix H), the above-ground option is less preferable, and it has been recommended to the proponent and contractor that an underground pipeline is preferable.

Namwater have also recommended an underground pipeline. However, if placed above-ground, the recommendations in Appendix H should be applied to ensure the pipeline does not become a barrier to animal movements.

4.2.4. Other considerations

During the design development process and through stakeholder consultation in 2017 (see Section 5.2), there were requests to install take off points from the pipeline to provide water to communities along the pipeline route. This option was considered during design development; however, was not deemed economically or technically feasible. The mandate of the project is to provide a bulk water supply line from Ohamaremba to Okanguati, that complies to the bulk water supply specifications as set out by NamWater, and not that of a rural water supply pipeline. Should community take-off points be required in the future, the council must apply to Rural Water Supply for approval, as this function falls within their mandate.

4.3. Preferred Option

4.3.1. Project Optimisation

Through site walkovers and integrated work between the environmental team, designers and engineers, the preferred route alignment was altered from the initial preliminary design and optimised to minimise the effects on the environment and society. For example, the alignment was altered to avoid rock outcrops (potential ecological receptors) and grave sites (heritage and social receptors).

4.3.2. Project Design

The proposed project includes the following elements, the locations of which are illustrated on Figure 7:

- **Two Production Boreholes:** already drilled, approximately 57 and 33m deep located in the Ohamaremba area (boreholes KuRC 2017-1 (1069.8) and KuRC 2017-6 (1067.57) (see 4.3.3 and Figure 8);
- **Two Monitoring Boreholes:** already drilled (boreholes KuRC 2017-3 (1069.69) and KuRC-8 (1068.15)) (see 4.3.3 and Figure 8);
- **Water Pipeline:** 160mm diameter water pipeline, approximately 20km in length (due to positioning and final route alignment) and buried approximately 900mm under the surface. Starting from the pump station in Ohamaremba and routing to Okanguati;

- **Water pump stations:** located in a fenced area (approximately 50m by 50m) at either end of the pipeline. Infrastructure includes a pump house, balancing tank and transformer. Depending on demand (population increase and climatic conditions), approximately 200 to 800 cubic litres of water will be supplied per day (2019 157m^3/day, and by 2035, it is anticipated to be 576m^3/day);
- **Take-off point:** A take-off point at the school will provide approximately 50m^3/day. A water meter in a secured cage and the water pipe may be connected to the existing water tank (to be determined) (metered and billed by NAMWATER); and
- **Overhead power line:** Approximately 2.45km long 33kv overhead power line connecting to the existing overhead line. The powerline shall be greater than 5.9m.

Where the water pipeline routes in parallel to the C43, it will be sited at least 32m on either side of the road centre line, ensuring that the 30m road reserve is not compromised and there is available space for any potential road upgrades (see Appendix I for communications with the Roads Authority). Where the pipeline crosses the road, existing culverts will be optimised, thereby minimising the need for trenching across the road. The exact location of the pumps is yet to be determined.

The proposed project shall provide communities in Ohamaremba with power as a result of the new overhead line. This is considered a benefit to the communities who currently do not have a power supply. Power will be metered and billed to residents.

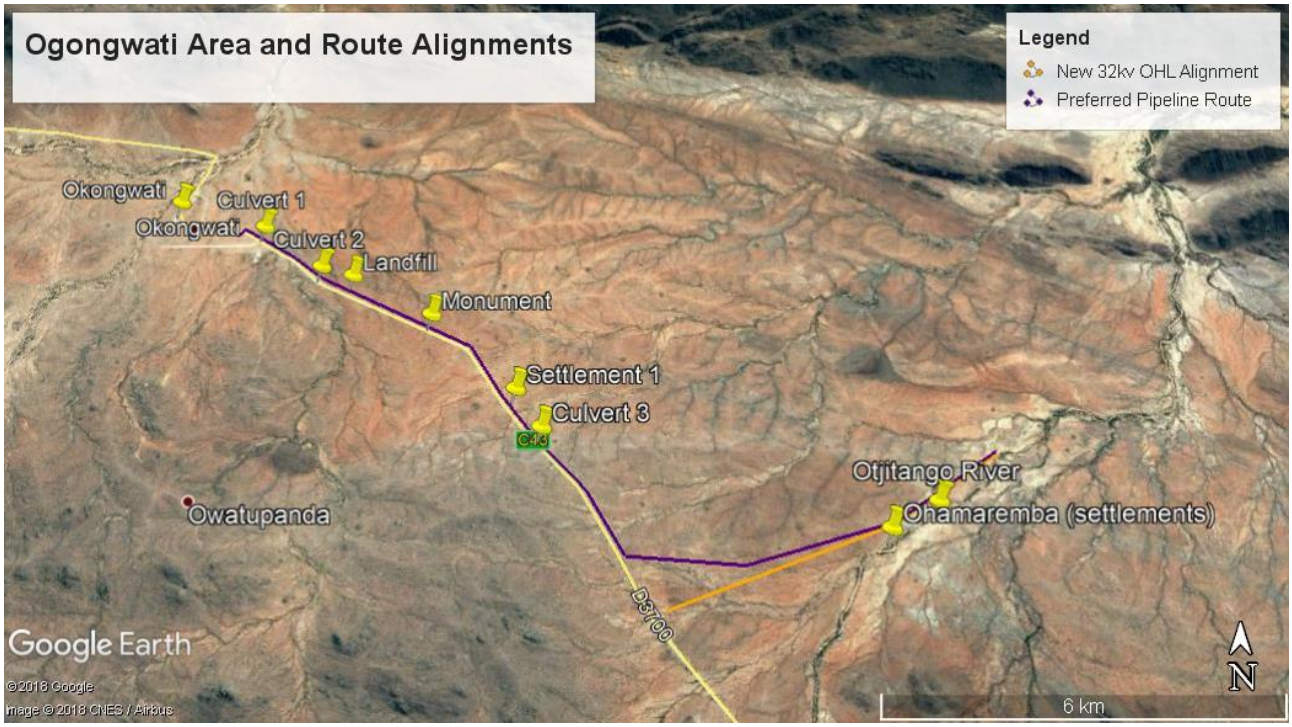

Figure 7 – Okanguati Area

4.3.3. PRODUCTION BOREHOLES

Five monitoring boreholes were drilled in May 2017, which were tested with a pumping test evaluation. The boreholes illustrate intense sub-vertical fracture zone in gneiss, resulting in water strikes being encountered within 6 and 43m below surface. The shallow groundwater level is approximately 5m below ground level. Water from the aquifer is expected to be of good quality (determined as Class B – *water with acceptable quality* (Department of Water Affairs)) (see Appendix D for further information).

Appendix G provides the interpretation of test pumping data from the survey boreholes, as well as the interpretation and recommend yield from a production borehole. The test pumping data provides the initial estimate for pumping rates. Recommendations are as follows:

- Borehole KuRC2017-6 and KuRC2017-1 have been recommended for pumping while KuRC2017-8 and KuRC2017-3 are to be kept for monitoring purposes; and
- The maximum pumping rate from borehole KuRC2017-1 is estimated at 293 m³/day or 16 m³/h, pumping 18 hours a day.

Monitoring water level, abstraction rate and rainfall should be initiated together with pumping. The abstraction rate should be assessed after a year of monitoring and adjusted if necessary. Monitoring data should be evaluated subsequently on a yearly basis. The ESMP (Appendix A) provides the monitoring arrangements.

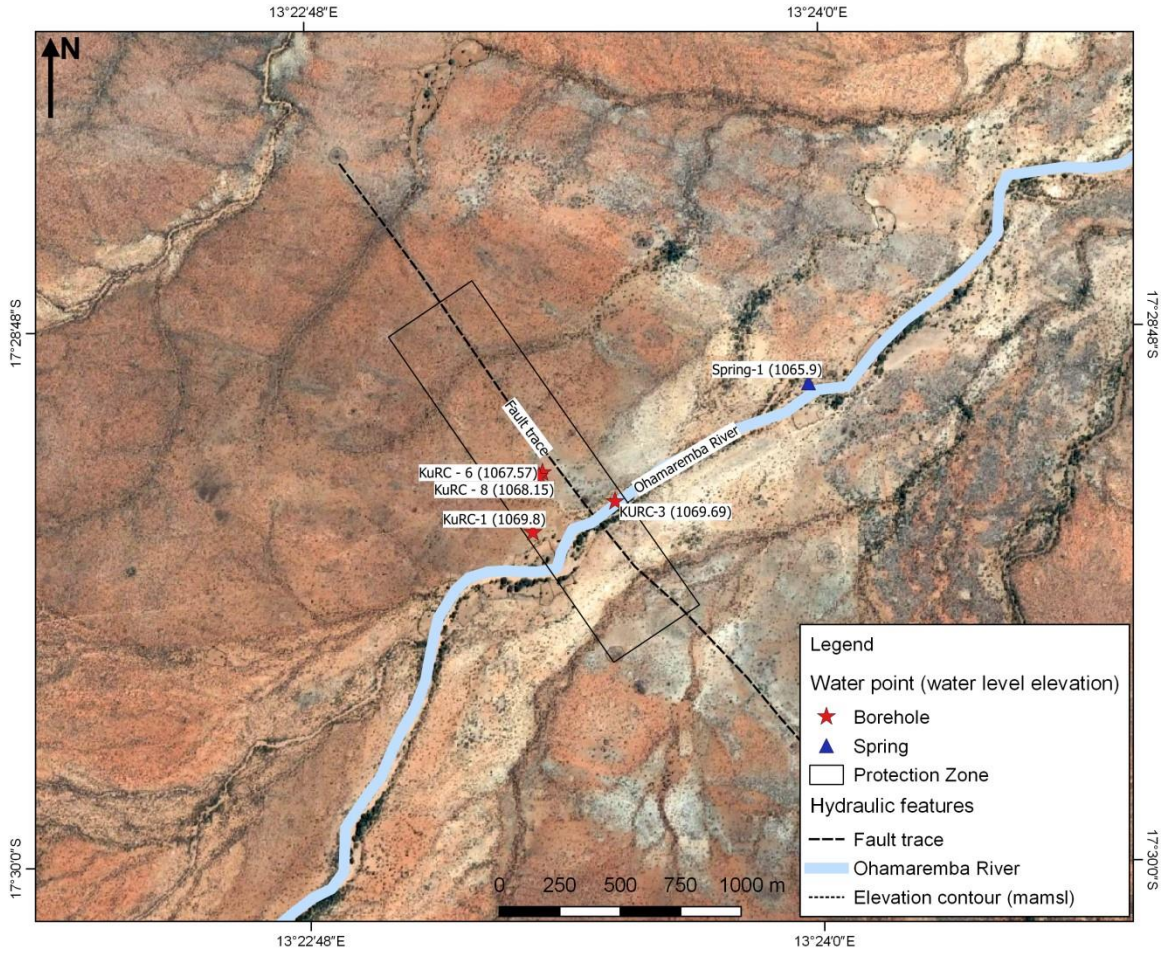

Figure 8 – Borehole Locations and Fault Line (Appendix G)

4.3.4. SITE AND SURROUNDINGS

Okanguati and Ohamaremba are in the north-west of Namibia, in the Kunene Region, the second largest geographical region in Namibia. Kunene has a population of 87,019 (Republic of Namibia, 2011), and is projected to increase to 162,453 by 2041, over double in 30 years. The Kunene Region is relatively underdeveloped compared to the rest of Namibia. This is due to the mountainous inaccessible geography and the dryness that significantly hinders agriculture. The Himba is the main ethic group of the area.

Okanguati is a small town located directly off the C43 Regional Road, a gravel road also known as the D3700. The C43 links Okanguati to the Angola border to the north and Opuwo to the south. Okanguati is approximately 840km north-

west of Windhoek and 100km north-west and Opuwo, the capital of the Kunene Region. Various kraal settlements are sparsely distributed in the area, including Ohamaremba, a small settlement 20km to the south of Okanguati spread along the Otjitango River (known as the Ohamaremba River to the locals).

Okanguati has a landing strip, military base, school and other amenities to accommodate the small town and surrounding area. In 2016, the population of the town was recorded to be 758, however this does not include informal residents. The population is predicted to increase to 1,415 by 2034 (not including informal) (figures provided by Kuchling Consulting Engineers Inc.).

Approximately 72km to the north lies the Epupa Falls on the on the Kunene River which proves the border line between Namibia and Angola. To access the falls, tourists travel along the C43 and route through Okanguati. There are plans and expectations for the town to develop to accommodate the increase in tourists staying in the town or stopping off and using facilities.

The Okanguati area is not part of the communal conservancy system in Namibia with the closest such conservancy being the Kunene River Conservancy to the east of Okanguati (Mendelsohn et al., 2003).

The north-west of Namibia is known to have an extended archaeological record of human occupation, and several sites have been uncovered. Various burial sites and monuments are found in the area, and evidence of historical settlements have been discovered in the area.

The average rainfall in the area is approximately 200 – 250mm per year, with an average annual temperature of 20-22^{o}C. The Okanguati area in in the Western Highlands, with the Zebra Mountains to the north-east, Baynew Mountains to the north-west and the Steilrand Mountains to the south. The main vegetation structure is sparse shrub land. The rock type of the area falls into the Epupa Complex (Mendelsohn et al., 2003). The Ombuka River, an ephemeral river runs in a south-westerly to north-east direction through Okanguati. The Otjitango River and the Ombuka River are part of the Kunene River Basin (Mendelsohn et al., 2003).

4.3.5. Proposed Project Route

The proposed water pipeline would run south from Okanguati in parallel to the C43 (see Figure 9 and Figure 10), on the north side, for approximately 10km where it would then route in a south-easterly direction away from the C43 for approximately 2km and then taking an easterly then north-easterly alignment in parallel to the Otjitango River, for approximately 4.5km to the pump station at Ohamaremba.

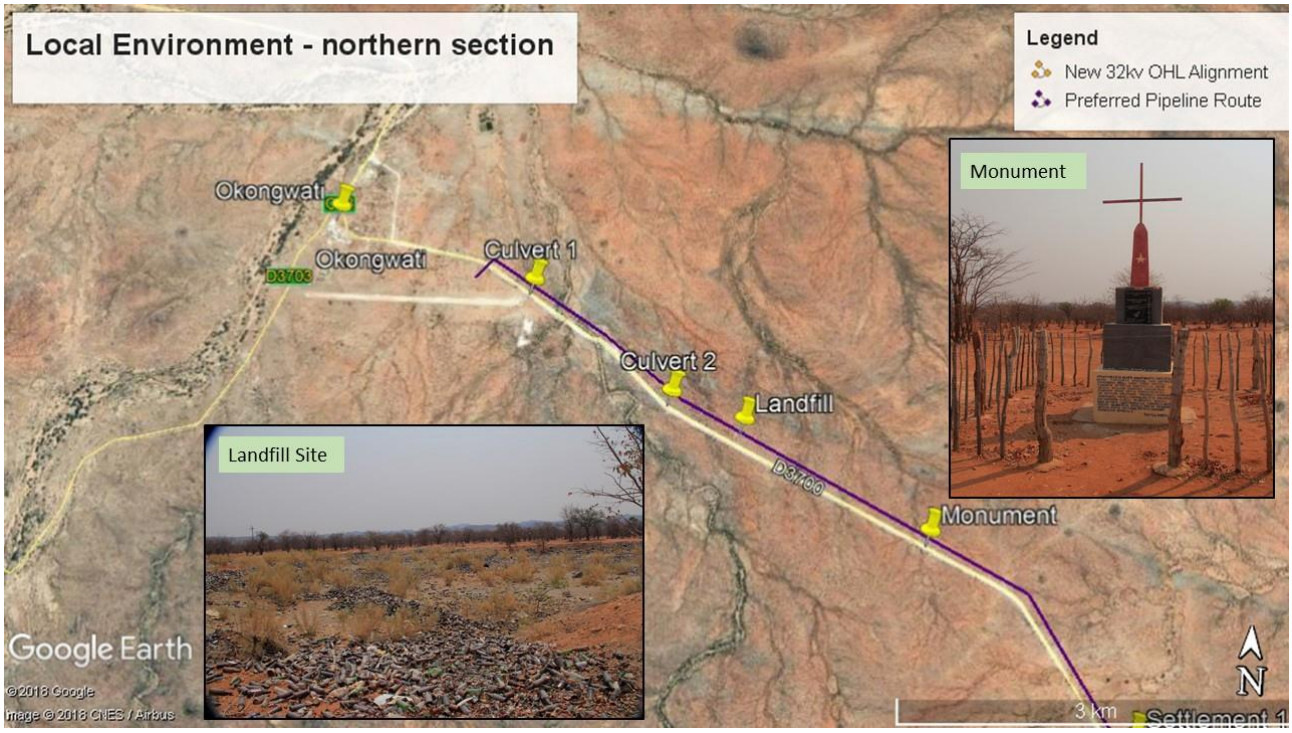

Figure 9 – Local Environment, northern section

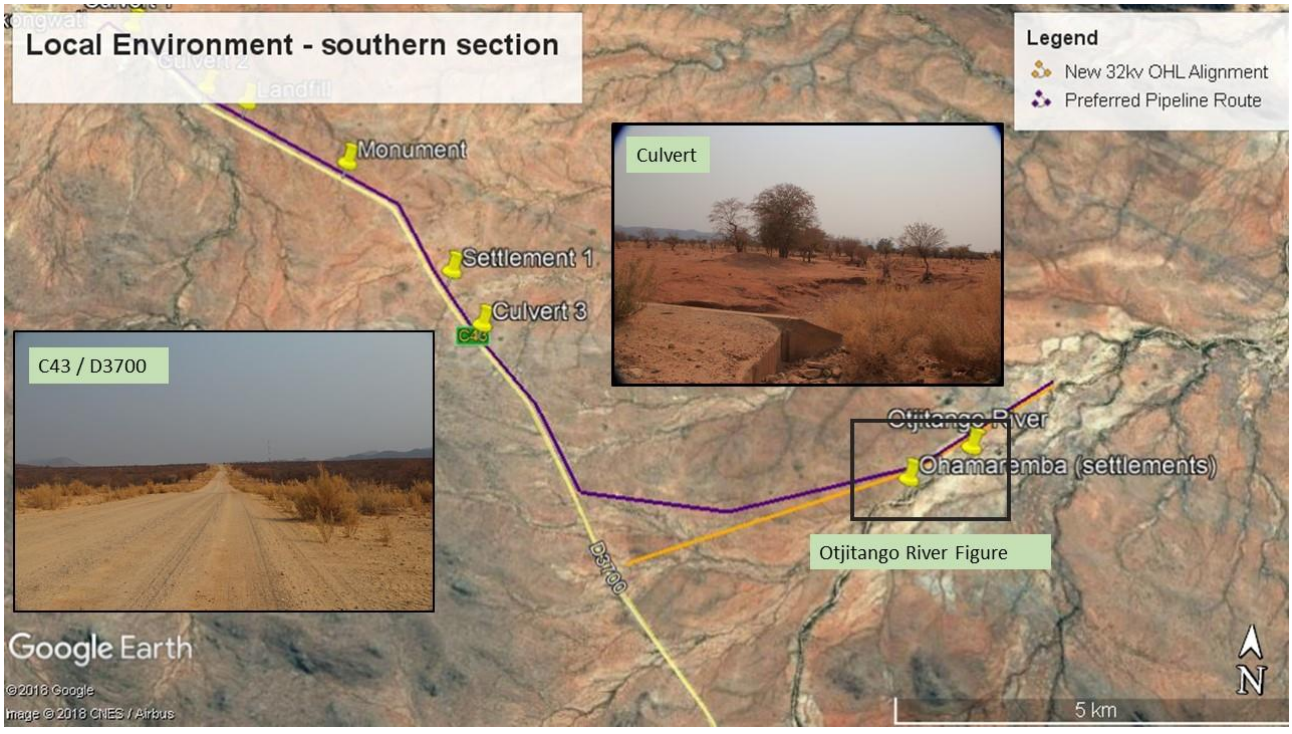

Figure 10 – Local Environment, southern section

Along the C43 is an existing landfill (see Figure 9) as well as a small settlement. The vegetation is sparse shrub land with the occasional bush or tree outside of the 30m road swathe area. Several culverts are on the C43 along the route and there are occasional penned areas for livestock (see Figure 11). An existing 32kv power line runs parallel (albeit at a distance in some areas) to the C43 (see Figure 12), and various tracks and paths are in the area (see Figure 11).

Figure 11 – Local vegetation

Figure 12 – Overhead line and local vegetation

The topography along the water pipeline route ranges from 1086m above sea level at Okanguati, to 1126m along the C43, and 1063m at Otjitango River. The Otjitango River is an important area as a water resource for local communities due to the low groundwater and natural springs in the alluvium (see Figure 13).

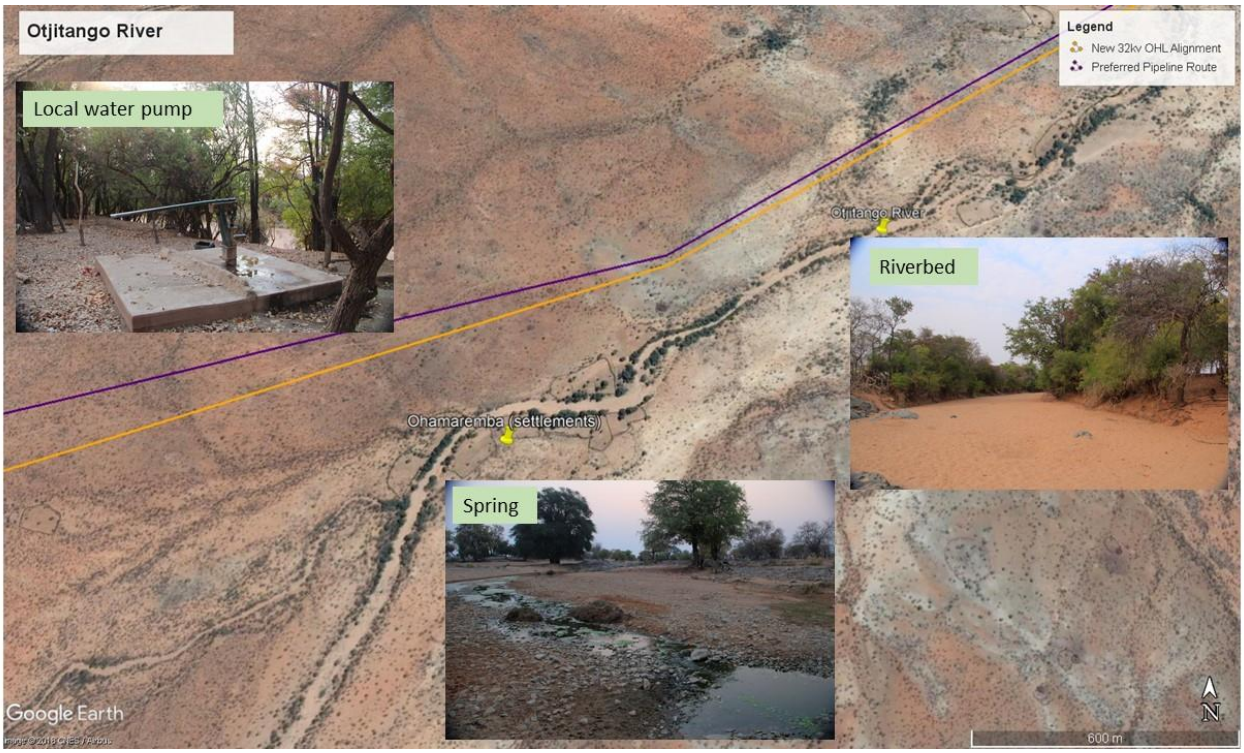

Figure 13 – Otjitango River

4.3.6. Site Preparation and Construction

Whilst the construction methodology has not been finalised, the following activities are likely to take place:

Water pipeline and pumping stations:

- Vegetation Removal: as and when required, avoiding established and/or protected/important trees and shrubs, remaining in the boundary of the pipeline alignment, pumping station and access road;
- Establishment of the laydown areas utilising clear areas where possible;
- Installation of access road: minor ground preparation, use existing ones where possible;

- Ground excavation: specific to the pipeline alignment (approximately 1,100mm deep (1,700mm at river crossings), 700mm wide with a 900mm cover) and pumping stations;
- Ground excavation: in some areas where rock is at a shallow depth (1m below the natural ground level), blasting may be required to excavate the trench to the required depth. These areas are isolated places and it will be kept to a minimum. Where blasting is not appropriate, the trench has been backfilled and compacted, and additional cover of larger rocks will be layered to protect the pipeline against erosion and potential elephant damage;
- Installation of pipeline (below ground to be the preferred choice);
- Installation of pumping station infrastructure and fencing (production boreholes have already been drilled and the five monitoring boreholes will be capped);
- Connection to the pumping stations;
- Backfill alignment with excavated material (no waste ground material to be produced); and
- Compaction of ground.

Overhead line:

- Vegetation Removal: as and when required, along the alignment including a suitable swathe area;
- Minor ground preparation (trenches) for the installation of wooden poles;
- Assembly of wooden poles and installation of power cable; and
- Connection to the pumps and existing 32kv powerline.

The construction of the proposed project is expected to take approximately ten months and will commence quarter two of 2018.

Approximately 50 workers will be required for the duration of the construction works. Various roles will be required which will include a foreman and site manager, and general construction workers. Local people will be utilised including 10% (5 people) from the younger generation in Ohamaremba (as per request from the Headman on behalf of the community – see Appendix J). Worker accommodation will not be required as the work force is expected to be accommodated within the Ohamaremba and Okanguati settlements and transported to and from the work site daily.

Delivery of construction material and equipment will require heavy transport vehicles, but no abnormal or hazardous loads are expected. The typical material to be transported to the working areas would include wooden poles, conductors, insulators, machinery and precast concrete pipes. Plant and equipment will include HGVs, excavator, hydraulic and pneumatic tools for small tasks, trucks/Hilux Bakkies for transporting material and workers, grader and potentially a roller.

Limited amounts of waste will be generated: any ground excavated will be used as back fill or landscaping. Where waste is generated, it will be reused and recycled where possible, or disposed of to a local waste management site.

4.3.7. Operations and Maintenance

The pipeline is expected to have a lifetime of 30 - 50 years, the pump station 30 years, electrical and mechanical equipment 16 years; concrete reservoir 30 – 50 years; and sectional steel tanks 15 – 20 years. All infrastructure will require annual checks and some maintenance.

PowerConsult will maintain the pipelines and powerlines to ensure the longevity of the pipelines is extended as far as possible.

The ESMP in Appendix A provides expected activities, impacts, mitigation and responsible roles for the maintenance of the infrastructure.

4.3.8. DECOMMISSIONING AND REINSTATEMENT

It is expected that after approximately 50 years, the project will enter the decommissioning and reinstatement phase. The pipeline will remain in situ, the pumping station and the overhead line will be removed, and material disposed of to suitable and formal disposal sites.

5. CONSULTATION

5.1. CONSULTATION UNDERTAKEN

Throughout the development of the proposed project, various stakeholder engagement has been undertaken and is summarised in Table 7. Appendix K provides all consultation evidence in line with the requirements of the Environmental Management Act, 2007.

Table 7 – Summary of Consultation

DATE	CONSULTATION	OUTPUT / NOTES
September 2017	Background Information Document circulated to interested and affected parties (I&APs)	Found in Appendix N
17th September 2017	Ohamaremba Community held a meeting to inform each other about the proposed project.	63 community members from Ohamaremba and surround villages attended. See Appendix J for more information.
21st September 2017	ECC held a public meeting for the local community and other I&APs.	47 individuals attended the meeting, made up of members of the Regional Council, various Traditional Authorities, National Defence Force Okanguati, Ministry of Agriculture, Water and Fisheries, Ministry of Education, Epupa Constituency and the community. See Appendix K for full details and a summary of comments and responses provided in Section 5.2
25th October 2017	Following on from the meeting on the 21st September, ECC wrote a letter to the community and Headman of Okanguati seeking advice on a monument sited next to the C43.	Approval from the Headman was obtained which allowed the pipeline to be sited between 5 – 10m from the monument, and confirmed all burial sites would have a 100m exclusion zone. See Appendix L
1st March 2018	ECC held a follow up public meeting with the community to present the findings of the ESIA and water studies.	53 individuals attended the meeting, made up of members of the Regional Council, various Traditional Authorities, National Defence Force Okanguati, Ministry of Agriculture, Water and Fisheries, Nampol and Power Consultant. It was widely accepted by all that the findings of the ESIA and specialist studies were supported by the community and that the Water pipeline must be installed without further delay. No further comments or questions were provided during or after the meeting.

5.2. Summary of Consultation Responses September 2017

A summary of the consultation comments received during the meeting held on the 21st September 2017 and ECC's responses are summarised in Table 8.

Table 8 - Summary of Consultation Comments (2017)

CONSULTATION COMMENT	ECC RESPONSE
Potential impacts from pumping of the aquifer on natural springs	The Hydrological Report (Appendix G) concludes that the springs are located in the alluvial, it is believed that the springs are perched and that the groundwater abstraction will not impact the springs. During droughts, water from the monitoring boreholes can be pumped as contingency for the local communities should spring be impact.
Water from the boreholes – will the water be filtered	The water will not be filtered. Samples taken illustrate it is of good quality and therefore no need for filtering – see Appendix D. The water supply will be fitted with standard quality control measures to meet the Namwater specifications.
Queries if there will be off-takes from the main line.	As discussed in Section 4.2.4, this option was considered, however due to the mandate of the project being to provide a bulk water supply and not a rural water supply, it was not considered feasible.
Requests for water to be made available for cattle	The sustainable long-term supply of water to the community is based solely on human consumption and not for cattle watering. Water will be metered and billed accordingly. No provisions will be made for cattle watering as cattle watering would compromise the long-term sustainability of water supply to the settlement and community.
The community requested that the two community bores be fitted with pumps for their use.	This request was made based on the thinking that the groundwater abstraction might impact the springs for which the community rely. The study has shown that the springs are perched and not connected to the groundwater aquifer for which abstraction will occur. In the event that impacts to the springs are detected (through monitoring) contingency plans will be implemented that include fitting a bore / monitoring bore with pumps for community access should water in the springs be depleted.
The communities along the route requested access to power from the new overhead line	The local community will be allowed to access power from the new overhead line, this will be metered and billed in accordance with NORED policies.
Queried any vegetation removed and what would happen with any wood.	The use of any wood from vegetation clearning must be subjected to the terms and considerations of the permit to clear land to be obtained from the MAWF.
The community requested to have another meeting prior to submitting the EIA to Government. They	ECC held a second community meeting and was attended by the Headman and community members. All

CONSULTATION COMMENT	ECC RESPONSE
requested ECC return to Okanguati and Ohamaremba to present the EIA and the findings.	agreed with the findings of the ESIA and wished to proceed to Government for approval as soon as possible.

6. IMPACT ASSESSMENT FINDINGS

6.1. SCOPING

The scoping exercise considered best practice measures (detailed in Appendix A), the design of the proposed project, and subsequently identified where impacts may potentially occur and where further mitigation or investigation may be required.

Due to the nature of the proposed project (activities), the potential pathways of causing an impact and the surrounding environment (the receiver), the following environmental and social topics were scoped out of the assessment, as it was deemed unlikely that the proposed project would likely adversely affect receptors categorised in the following topics:

- Soils and Geology
- Topography
- Land use
- Built environment
- Infrastructure and waste management
- Socio-economics (employment, local businesses, community, demographics & tourism)
- Sense of place (landscape and visual amenity, residential and recreational views, lighting)
- Air Quality
- Noise and vibration
- Climate and meteorology

The following topics were thus scoped into the assessment, as there was potential for the proposed project to adversely affect receptors within these topics:

- Ecology
- Groundwater and surface water
- Cultural heritage

These three topics have been the focus of this assessment, which has considered the construction, operation and decommissioning of the proposed project. The study area included in the assessment has considered an area of approximately 200m from the centre line of the pipeline and overhead line for the cultural heritage assessment; 1km for groundwater and surface water assessment; and 500m for the ecological assessment.

A cumulative impact assessment was also scoped out as there were no realistically committed projects identified that could interact with the proposed project and cause combined effects. There would also be limited combined environmental and social impacts within the project due to the short duration of the construction works.

6.2. ECOLOGY

6.2.1. RECEIVING ENVIRONMENT

The area around Okanguati is broadly referred to as the Mopane Savanna (tree and shrub savannah) or Western Highland. The vegetation structure is classified as grasslands and scattered trees. The Mopane Savannah, as the name implies, is characterised by *Colophospermum* mopane in tree and shrub form while the grasses are varied and dependant on soil types. Trees are mainly associated with the various drainage lines whilst shrubs dominate the plains (for further information, see Appendix C).

The general Okanguati area is regarded as “moderate to high” in overall (all terrestrial species) diversity and endemism (Mendelsohn et al., 2003). There are low numbers of herbivorous mammals, with medium densities of large predators.

It is estimated that at least 62 reptile, 18 amphibian, 94 mammal, 225 bird species (breeding residents), at least 157 larger trees and shrubs and up to 58 grasses are known to or expected to occur in the general Okanguati area of which a high proportion (e.g. 38.7% endemic reptiles) are endemics (Appendix C).

Bush thickening or encroachment is viewed as an economic problem in the general area with an estimated 2,000 to 3,000 plants/hectare, mainly *Colophospermum* mopane, being the dominant problematic species. Appendix C provides further information on the flora and fauna of the area.

6.2.2. Assessment of Impacts

An ecological desk-based study and assessment was commissioned by ECC, the results of which are documented in Appendix C. This section of the report summarises the findings and identifies the overall significance of the potential effects.

6.2.2.1. Construction: Vegetation strip

During construction, some vegetation will be removed to clear the working areas where the pipeline, pumping stations and overhead line will be sited/routed. Fifty-three species of larger trees and shrubs that may be found in the area have some kind of protected status. The most important species known and/or expected to occur in the general Okanguati area and are considered to be of high value, are viewed as:

- *Adenia pechuelii* (Endemic, near threatened, Protected under the Forest Act No. 12 of 2001);
- *Commiphora steynii* (Endemic);
- *Cyphostemma currorii* (Protected under the Forest Act No. 12 of 2001 and Nature Conservation Ordinance No. 4 of 1975);
- *Cyphostemma uter* (near endemic, Protected under the Forest Act No. 12 of 2001 and Nature Conservation Ordinance No. 4 of 1975),
- *Erythrina decora* (Endemic, Protected under the Forest Act No. 12 of 2001); and
- *Sesmaothamnus leistneri* (Endemic, Protected under the Forest Act No. 12 of 2001).

These trees and shrubs should be identified prior to construction works. A site walk over has already been undertaken by ECC, however the alignments have been refined since this time. It is unlikely that protected trees will be found along the alignment, however the contractor shall ensure any protected trees within 10m of the alignment are identified (using photos found in the ESMP and associated Annexes, and through communications with ECC) and appropriately marked with clear visible tape (e.g. red/white tape) so that workers and machinery avoid the area and minimise damage. Additional best practice mitigation measures are detailed in the ESMP (Appendix A).

It is assumed protected trees will not be impacted and can be avoided, therefore the significance of effect is considered to be minor.

6.2.2.2. Construction: Blasting Activities

Blasting may be required to achieve the required depths for the buried pipeline. Where required, some loud, short term intermittent noise will be generated. The exact locations of blasting areas are to be finalised, however, known rocky outcrops that will require blasting are sited closed to community areas. Blasting activities will be localised and undertaken by a qualified blaster. Increased noise levels are unlikely to affect bird population due to the localised short-term nature of impact.

6.2.2.3. Operations: Presence of Overhead Line & Birds

The is potential that the proposed development may have an impact on certain birds that are sensitive to powerlines: birds flying at powerline height; birds with nocturnal transients; birds following certain geological and/or landscape features; and birds attracted to the area during rainfall events. Birds known or expected in the general area that may be impacted include:

- Bateleur;
- Black stork;
- Booted eagle;
- Cape eagle owl;
- Kori bustard;
- Lappet-faced vulture;
- Lűdwig's bustard;
- Marabou stork;
- Martial eagle;
- Peregrine falcon;
- Southern ground hornbill;
- Tawny eagle;
- Verreaux's eagle; and
- White-backed vulture.

The ecological assessment concludes that although there is risk to certain birds, none of the unique/important species are exclusively associated with the proposed development area. The overhead line is also a rural electrification line, which is considered as a low impact line. It is however recommended that bird avoidance mechanisms are installed as best practice, for example light green rectangles on the line and anti-perching devices. This has been included in the ESMP.

It is unlikely that the proposed project will cause significant impacts on avian life; the effects of which are considered to be low adverse.

6.2.2.4. Operations: Height of Overhead Line & Mammals

The height of the power line could potentially affect large mammals (elephant and giraffe) as the infrastructure could impeded their movement and/or could result in mortalities or injury if the line is placed too low. In order to avoid this potential effect, the powerline must be greater than 5.9m. If the line is placed at this height, it is unlikely that a significant effect would occur, however if set at a lower height, there is potential to cause a minor significant effect. This recommendation has been included in the ESMP.

6.2.2.5. Operations: Water Pipeline Above Ground & Mammals

It has been assumed that the water pipeline will be buried throughout the whole alignment. If the design alters from this assumption, the development would likely result in causing impacts on various mammals as it would become an unnatural barrier to wild life (See Appendix M). It is strongly recommended that the pipeline is buried underground for the majority of the alignment to avoid this potentially significant impact. This measure is included in the ESMP.

6.3. Heritage

6.3.1. Receiving Environment

Appendix D provides a study into the Cultural Heritage of the area and presents the baseline and outcome of an assessment of effects from the proposed project. A summary is provided in this section.

The north-west of Namibia is known to have an extended archaeological record of human occupation, and several sites have been uncovered, however the majority of this area has not been thoroughly investigated and surveyed. Various artefacts have been uncovered through surveys, which provides evidence that illustrates the presence of human occupation from 10,000 years ago. Pastoral OvaHimba sites are a common feature of the area, which are influenced by rainfall. Burial sites, particularly those of important individuals, form permanent fixed and highly visible

points in a changeable settlement system. The burial sites of important male figures also serve in OvaHimba tradition as places where it is possible to consult the ancestors about issues affecting the community.

Although no archaeological survey of the Okanguati area has been carried out, several burial sites were documented during the site visit undertaken by ECC. The actual number of burials is not clear, however the burials include both isolated single graves of the traditional circular pattern, as well as elongate graves of the conventional Christian pattern.

The groups of burials include some traditional examples among Christian graves. Two graves with Christian headstones are for members of the Tjiposa and Kavari patrilineages, both prominent families in north-west Namibia. Spatial data for the pipeline and the project show that all but one of the burials are in close proximity to the Ohamaremba boreholes (see Figure 14). The exact location of the pumping station by the borehole used for pumping is not defined at this stage, and these heritage sites should be avoided by at least 100m to avoid disturbance. A 100m exclusion zone for burial sites and heritage remains has been applied to those found in close proximity to the monitoring boreholes Figure 14). These zones have been applied through the routing of the alignments of the pipeline and overhead line.

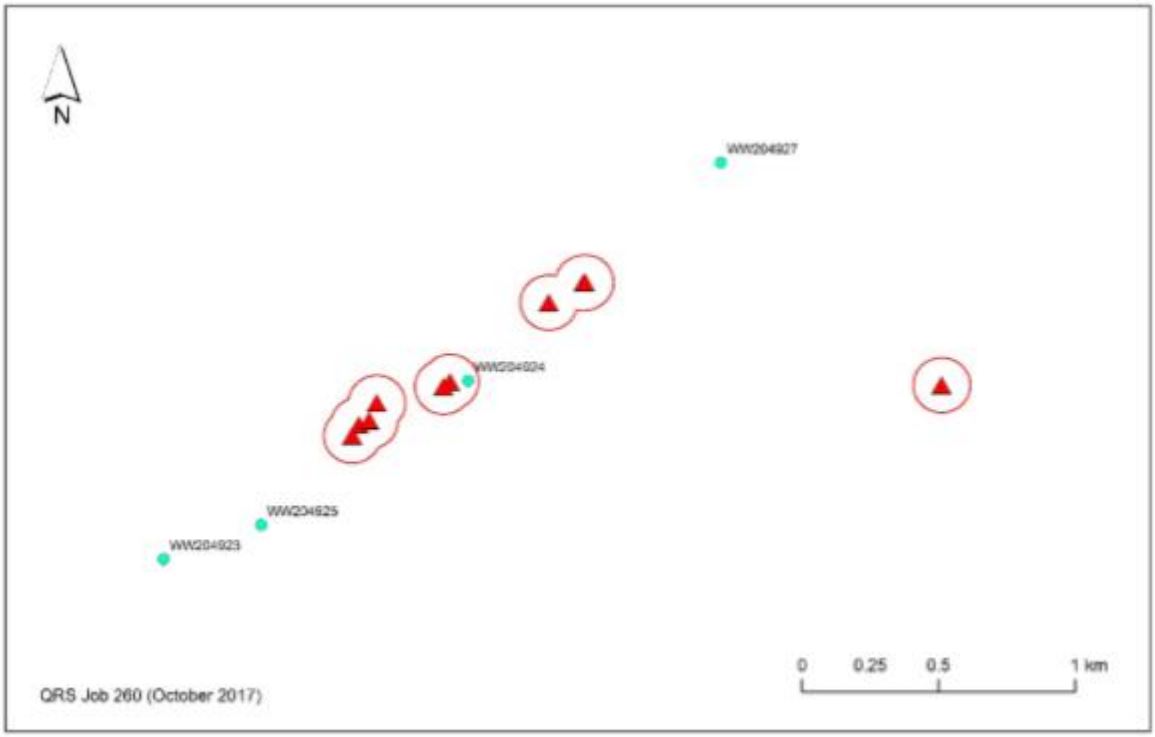

Figure 14 - Cultural Heritage remains (Source: Appendix E)

6.3.2. Assessment of Impacts

6.3.2.1. Construction: Site Preparation and Excavation

The area surrounding the Okanguati project site includes some terrain that is known to be archaeologically significant on the basis of field surveys in the surrounding area, it is therefore likely that during construction works in particular trenching and any ground excavation, archaeological remains from the mid-Pleistocene to recent Holocene period may be found. The available data from the area suggests that these sites would be primarily surface scatters of stone artefacts.

Prior to commencing works, the contractor will be made aware that under the National Heritage Act any items that have heritage meaning found during the construction of the project should be reported to the National Heritage

Council. The Chance Finds procedure as detailed in the ESMP shall be adhered to. The Headman of the local community has elected community members to support the construction activities, which shall also provide an element of mitigation as they will be more aware of heritage finds in the area.

Whilst measures will be in place (awareness and the chance find procedure), heritage remains may not be identified and therefore there is a risk that they could be lost or damaged. Due to the potential sensitivity and value of undiscovered remains (medium value – rarity on regional scale with limited potential for substitution), there is potential to cause a moderate significant effect.

6.4. HYDROLOGY

Appendix D and G document the hydrological studies undertake for the proposed project. This section summarises the baseline, monitoring and sampling results specific for the Ohamaremba River area, and presents the findings of the assessment undertaken using this information.

6.4.1. RECEIVING ENVIRONMENT

6.4.1.1. OHAMAREMBA RIVER & SPRINGS

The Ohamaremba River is an ephemeral river that has springs and shallow wells (less than 1m deep) in the alluvium as a result of the surrounding topography and geology. The river is a tributary of the Kunene River, a perennial river that flows west along the border of Namibia and Angola to the Atlantic Ocean. The majority of the catchment area is in Angola (Appendix D).

The ephemeral riverbed alluvium remains wet through most of the year and is a losing stream that contributes surface flow or water in the alluvial sediments to the aquifer. The point where the spring emanates, alluvial groundwater head is higher than the ground elevation. Bedrock is present at shallow levels below the alluvium fill in the river channel and is impervious, unless affected by faulting (see Figure 8) (Appendix G).

6.4.1.2. HYDROGEOLOGY

The geology at Okanguati and Ohamaremba is predominantly granites and gneisses of the Epupa Complex. These are rocks known for general poor aquifer properties. Water bearing properties in the local geology are however enhanced through faulting and fracturing resulting in secondary aquifers, and in areas where younger lava (part of the Kunene Complex) have intruded. Towards the north-east, the geology changes and in places aquifer and properties improve in the lavas of the Kunene Complex. The Zebra Mountains, to the north have a major porous hinterland that can act as reservoir-aquifer (Appendix D).

The Ohamaremba area has abundant groundwater as seen from perennial fountain-flow in the Ohamaremba River and from boreholes drilled in the area. Groundwater levels are elevated along the River, and it is expected that recharge to the aquifer occurs during times of river flow, however an unsaturated zone is maintained below the saturated alluvium during dry periods (Appendix D).

6.4.2. ASSESSMENT OF IMPACTS

6.4.2.1. OPERATIONS: SUSTAINABILITY

The need for the proposed project is driven by the decline in water quality and gaining infrastructure of the existing water supply for the town of Okanguati. Various areas have been investigated for an alternative water supply, and the best available option is at the Otjitango river, approximately 20km south-east of Okanguati. The proposed project will cost a substantial amount of money, and therefore the water source must be sustainable: economically feasible and support the increasing population of the town and surrounding area over a long-term duration.

The sustainability of the aquifer is not fully appreciated due to the lack of historical data on water level reactions, fluctuations in the entire area, which includes the aquifer along the Omuhonga river. There is a risk that the water source may not support the Okanguati community for the long term and this risk could result in both economical and

social impacts on a moderate scale. To understand this risk and to determine the duration of which the borehole will sustainably provide portable water, a monitoring system needs to be implemented for approximately 1.5 years prior to abstraction commencing. It is therefore recommended that three diver pressure probes connected to telemetric data transmitters are installed in three boreholes that are on each flank of the fault nest to the Otjitango river, and one of the production boreholes.

Through undertaking this monitoring, the pumping rates can be determined to ensure the sustainability of the Aquifer or additional resources could be investigated if additional capacity is required. Either way, a suitable plan can be made to ensure the community has access to portable drinking water. Therefore the magnitude of impact would come down to minor adverse.

During operations monitoring of water levels, abstraction rate, rainfall and periods flow in the river should be initiated together with pumping. The replenishment of the groundwater occurs during flow in the river and monitoring data over several years will provide the understanding on the frequency of replenishment and sustainable yield from this source. The abstraction rate should be assessed after a year of monitoring and adjusted if necessary. Monitoring data should be evaluated subsequently on a yearly basis. In addition, water quality monitoring is recommended. Sampling and analysis for inorganic constituents should be carried out yearly while microbiological analyses should be done on a quarterly basis. The ESMP (Appendix A) includes a monitoring plan, which includes this information.

6.4.2.2. OPERATIONS: PUMPING & SPRINGS

The local community along the Ohamaremba River use the springs and shallow groundwater as their main water source. It is unlikely that the proposed project will affect the springs, as it is understood that the alluvium feeds the springs and not the surrounding groundwater. However, during droughts, this water source may dry up and the local communities may place blame on the pumping operations therefore it is imperative that ongoing monitoring is in place.

Appendix G presents the findings of the potential risk to the springs when pumping the boreholes. Two scenarios were envisaged:

- Firstly, with pumping capture of groundwater from the alluvium is likely to occur. Groundwater in the alluvium will flow into the underlying hardrock fractured aquifer at an increased rate. Flow in the alluvium downstream of the borehole will consequently be reduced. Depending on the pumping rate and frequency of recharge events the springs may dry up altogether.
- Secondly, the alluvial aquifer may be completely perched, i.e. there is an unsaturated zone below the alluvial aquifer and flow to the underlying aquifer does not occur unless large surface flows occur in the stream.

With the available information it is not possible to quantify the extent and time period of the effect of pumping. As stated above, water level, groundwater abstraction, river flow and rainfall monitoring shall be undertaken to understand the parameters of the aquifer. The abstraction rate should be assessed after a year of monitoring and adjusted if necessary. Monitoring data should be evaluated subsequently on a yearly basis. Boreholes have been drilled as alternate supply sources in the vicinity of the springs and can be used to supply the affected people in the area.

The local community will also be consulted with and findings of monitoring shared to demonstrate the extraction of groundwater and impacts on the springs. The existing boreholes (used to undertaken the initial survey) will be capped, and during drought periods could be used as relief.

6.4.2.3. OPERATIONS: ACTIVITIES OF LOCAL COMMUNITIES

Due to the shallow groundwater and the fracturing nature of the local geology, there is a high risk of contamination spreading through the ground and entering the groundwater. This could be from animal waste (urine and faeces), human waste, and potential spills from vehicles or use of pesticides. The accumulation of contamination entering the groundwater could lead to reducing the groundwater quality and making it unsuitable for human consumption,

thereby affecting local communities who rely on this water source. There is potential to cause a moderate significant impact due to the sensitivity of the local community and the scarce resource, and potential long-term impacts.

As part of this project, the proponent has and will continue to communicate these risks to the local communities located around the aquifer and an aquifer protection zone along the fault zone of 150 m width will be demarcated to protect the groundwater from pollution. Within this area, certain activities will not be allowed, including activities using oil, fuel or chemicals, storage of live-stock (animal kraals) and ablution facilities (including septic tanks and long-drop toilets). As a result, certain activities such as animal kraals may need to be relocated. An outline of the protection zone is shown in Figure 8. In addition, the Ohamaremba River course should be maintained free of any possible contaminants as this is the main source of recharge to the aquifer (Appendix G). With the implementation of this protection zone, the significance of impact would be brought down to minor.

6.4.3. Other Impacts

The proposed project shall provide communities in Ohamaremba with power as a result of the new overhead line (metered and billed by NORED). This will result in a long-term benefit to the local community resulting in a minor beneficial impact.

6.5. Summary of Effects

A summary of the predicted effects is provided in Table 9. The effect of most concern is around the long-term sustainability of the aquifer, the potential disturbance to burial sites and the removal of vegetation. The ESMP provides a range of mitigation measures that will ensure these effects are minimised and avoided where possible.

Additional mitigation to further reduce the impacts has not been identified.

Table 9 – Summary of effects

Activity	Receptor	Impact	Nature of impact	Value & Sensitivity	Magnitude of change	Significance of impact
Construction: Vegetation Strip	– Flora	Loss of vegetation / protected species	Medium term Local / on-site Direct Adverse Unlikely	High	Negligible	Minor Adverse
Operations: Presence of overhead lines	– Avian	Injury or mortality	Medium term Local / on-site Direct Adverse Unlikely	Low	Negligible	Low Adverse
Operations: Presence of overhead lines	– Mammals	Injury or mortality	Medium-term Local / on-site Direct Adverse Unlikely	Low	Negligible	Low Adverse
Construction: Site preparation and excavation	– Heritage remains	Disturbance, loss or destruction of heritage remains	Medium-term Permanent On-site Direct Adverse Likely	High	Minor	Moderate Adverse
Operations: Sustainability	– Local communities	Insufficient supply for a sustainable future	Long-term Permanent Local Direct Adverse Likely	Medium	Minor	Moderate Adverse

Activity	Receptor	Impact	Nature of impact	Value & Sensitivity	Magnitude of change	Significance of impact
Operations: pumping	– Local communities	Community perception during droughts	Short-term Temporary On-site / local area Indirect Adverse Likely	Low	Minor	Low Adverse
Operations: Activities of local communities	– Groundwater Quality	Contamination entering the groundwater and reducing quality to a standard that is not consumable	Medium to long-term Permanent On-site / local Direct and indirect Adverse Likely	Medium	Minor	Minor Adverse
Operations: Activities of local communities	– Local community – available electricity	Improved services to local communities, enhancing their lives	Long-term Permanent On-site / local Direct and indirect Adverse Likely	Low	Minor	Minor Beneficial

7. CONCLUSIONS AND RECOMMENDATIONS

This environmental assessment has focussed on the environmental and social receptors that would likely be affected by the proposed project: ecology, hydrology and cultural heritage. All other topics were scoped out of the assessment due to the nature of the activities and the receiving environment. The assessment concludes that significant environmental and social impacts are unlikely to occur as a result of the proposed project. Various mitigation measures have been identified to avoid and reduce impacts as far as reasonable practicable:

- Identify and protect and avoid protected species of flora;
- Minimise blasting activities;
- Overhead line to have avoidance mechanisms installed, for example light green rectangles on the line and anti-perching devices;
- Set the overhead line at least 5.9m high;
- Set the water pipeline underground, at least 1m deep;
- Apply the Chance Finds procedure to heritage remains;
- Implement a monitoring system prior to abstraction;
- Monitor water levels, abstraction rate, rainfall and periods of flow I the river should be undertaken during operations;
- Regularly sample and test extracted water;
- Engage with the local community on a regular basis; and
- Apply an aquifer protection zone along the fault zone of 150, width.

The assessment is considered to be comprehensive and sufficient to identify impacts, and it is concluded that no further assessment is required.

A summary of recommendations made throughout the report are as follows:

- The bulk water supply pipeline must not be permitted for any cattle watering
- Water level monitoring system to be installed in the production bores prior to construction commencing
- Permits to remove vegetation and clear land must be obtained from the MAWF prior to construction
- Cultural heritage exclusions zone must be compiled with
- An aquifer protection zone (fenced or demarcated) must be in place to prevent potential contamination of the aquifer (no kraals, housing or sewerage waste to be developed within the exclusion zone and grazing within the protection zone should be prohibited)
- The construction contractor must wherever possible hire local labour. Performance of local employees can be guided and enforced by Headman who are requesting local input.

On this basis, it is of the opinion of ECC that an environmental clearance certificate could be issued, on conditions that the management and mitigation measures specified in the ESMP are implemented and adhered to.

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