

Environmental Impact Assessment and compilation of an Environmental Management Plan for the construction, operation, maintenance, and decommissioning of the proposed Aroab scheme extension and upgrade, //Karas region.

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ENVIRONMENTAL SCOPING REPORT



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LIST OF ACRONYMS

BID:	Background Information Document
DEA:	Directorate of Environmental Affairs
DWA:	Department of Water Affairs
EAP:	Environmental Assessment Practitioner
ECC:	Environmental Clearance Certificate
EIA:	Environmental Impact Assessments
EMA:	Environmental Management Act
EMP:	Environmental Management Plan
FC:	Ferrule Connector
GMS:	Galvanised Mild Steel
GN:	Government Notice
HDPE:	High-Density Polyethylene
HIV/AIDS:	Human Immunodeficiency Virus / Acquired immunodeficiency syndrome
I&APs:	Interested and Affected Parties
KRC:	//Karas Regional Council
MAWLR:	Ministry of Agriculture, Water, and Land Reform
MEFT:	Ministry of Environment, Forestry, and Tourism
MoHSS:	Ministry of Health and Social Services
NamPower:	Namibia Power Corporation
NamWater:	Namibia Water Corporation
NHC:	National heritage Council
NSA:	Namibia Statistic Agency
OD:	Occupational Diseases
PPE:	Personal Protective Equipment
RA:	Roads Authority
WRMA:	Water Resource Management Act

EXECUTIVE SUMMARY

The Namibia Water Corporation (NamWater) Ltd, hereinafter referred to as the Proponent, supplies water to the Aroab village through the Aroab bulk water supply scheme. According to the assessment of water supply to the Aroab bulk water supply scheme in 2020, the current water supply to Aroab Village Council does not meet the demand. Moreover, the existing collector reservoir and most of the existing pipelines are in a deteriorated state and need replacement. Hence, NamWater has proposed for the extension and upgrading of the Aroab scheme to meet the future water demand and ensure water supply security for the area.

The proposed activities will trigger certain activities listed under No. 8 (8.5 and No. 10 (10.1) of Schedule 1 of the EIA Regulations (GN No. 30 of February 2012), therefore cannot be carried out without an EIA being undertaken. Green Gain Consultants cc has been appointed as an independent Environmental Assessment Practitioner (EAP) by NamWater, to conduct an Environmental Impact Assessment (EIA) for the construction, operation, maintenance, and decommissioning of the proposed Aroab Scheme extension and upgrading.

The main objective of this EIA is to determine the potential environmental impacts emanating from the construction, operation, maintenance, and decommissioning of the proposed infrastructure. The EIA was conducted in a multidisciplinary approach and followed Namibia's Environmental Assessment process. Relevant environmental data have been sourced from personal observations during site visits as well as from input from NamWater officials, stakeholders, and Interested and Affected Parties (I&APs) as well as a review of relevant literature and legal instruments.

This report constitutes an Environmental Scoping Report which provides information that enables the Department of Water Affairs (DWA) and the Directorate of Environmental Affairs (DEA) to make informed decisions about the project. Moreover, an Environmental Management Plan (EMP) has been prepared and it should be read in conjunction with this Scoping Report. The EMP will be used as a mitigation tool and an onsite reference document during all phases of the proposed project (planning, construction, operation, and decommissioning).

1. INTRODUCTION AND BACKGROUND

1.1 Introduction

The Namibia Water Corporation (NamWater) Ltd, hereinafter referred to as the Proponent, supplies water to the Aroab village through the Aroab bulk water supply scheme. The scheme consists of five electrically driven boreholes, two collector pipes, a 500m³ steel collector reservoir, and a 180 m³ elevated reservoir.

Due to its proximity to the South African borders, Aroab is the economic centre for the surrounding farmers and is a primary growth point in the area. According to the assessment conducted of water supply to the Aroab bulk water supply scheme in 2020, the water supply from the five boreholes currently in operation cannot meet the demand any longer while the existing 500m³ steel collector reservoir and much of the existing pipelines are in a deteriorated state and need replacement. Hence, NamWater proposed for the extension and upgrading of the Aroab scheme to meet the future water demand and ensure water supply security for the area.

The proposed works entails the installation and commissioning of existing boreholes BH29114 and BH29115, construction of a connector pipeline from these two boreholes, replacement of the pipeline from boreholes BH7444, via BH7437 to the ground level reservoir and construction of a new ground level reservoir in Aroab.

The proposed activities cannot be undertaken without an approved EIA and EMP and an Environmental Clearance Certificate (ECC) being obtained. The EIA study identified potential environmental, safety, health, and socio-economic impacts associated with the construction, operation, maintenance, and decommissioning of the proposed pipeline and the new ground level reservoir. Various mitigation measures were also proposed to avoid, mitigate, or lessen the identified negative impacts and enhance the positive impacts.

1.2 Purpose of the Report

This report provides details of the assessment process that was followed to address the key environmental issues and impacts associated with the development and to document issues and concerns of stakeholders and I&APs. Furthermore, it provides the background, motivation, details of the proposed project, description of the public participation process undertaken and provides a list of the applicable legislation.

The objective of this report is therefore, to provide the competent authority (DWA) and the regulatory authority (MEFT) with a comprehensive account of the process, findings, and input from I&APs, stakeholders, and commenting authorities who have participated in this EIA. Another objective is to provide details of the applicable legislative framework to ensure that the proposed work is undertaken in an environmentally responsible manner.

2. TERMS OF REFERENCE

The Terms of Reference provided by the Proponent requires the Environmental Assessment Practitioner (EAP) to carry out an EIA, prepare an EMP, and apply for an ECC for the construction, operation, maintenance, and decommissioning of the proposed Aroab Scheme extension and upgrade, //Karas region.

2.1 Scope of the Study

The scope of the EIA is to determine the potential environmental impacts emanating from the construction, operation, and decommissioning of the proposed project. This EIA will ensure that the proposed Aroab scheme extension and upgrade is environmentally sound and sustainable; that decision-making is improved through the appropriate analysis of actions and their likely environmental impacts; and that stakeholders/potentially affected people are properly consulted. The study was undertaken in two linked phases:

- ❖ Phase 1: Scoping study
- ❖ Phase 2: Environmental Management Plan

The Proponent and the EAP have agreed that the information provided at the Scoping level is sufficient and no specialist studies are required after completion of the Scoping process. The EAP will then submit the Scoping report and the EMP to the DWA as the competent authority and to DEA as the regulatory authority. The EAP will provide sufficient information to allow the DEA/MEFT to issue an ECC for the project.

2.2 EIA Objectives

The aim of the study was to produce a Scoping report and EMP report, which will provide sufficient information to enable the MEFT: DEA to make an informed decision about the project. The information submitted should be sufficient to enable the DEA to issue ECC if no fatal flaw is identified. Thus, the specific objectives of this EIA are to:

- Identify potential impacts associated with the proposed activities.
- Consult potential I&APs and relevant stakeholders to solicit input.
- Produce a Scoping report and EMP report, which will provide sufficient information to enable DWA and DEA to make an informed decision about the project.

The report should enable decision-makers to decide whether to proceed with the project as anticipated and if so, what the implications of mitigation are likely to be. The EMP should indicate how mitigation measures will be implemented to avoid or minimize negative impacts and enhance positive impacts. Monitoring and rehabilitation measures should be properly addressed.

3. APPROACH AND METHODOLOGY

3.1 The EIA Processes

This EIA study was conducted in line with the EIA Regulations (No. 30, February 2012). This draft Scoping report will be shared with the registered I&APs and relevant stakeholders, and will be submitted to the competent authority, and the regulatory authority, for record of decision thereafter.

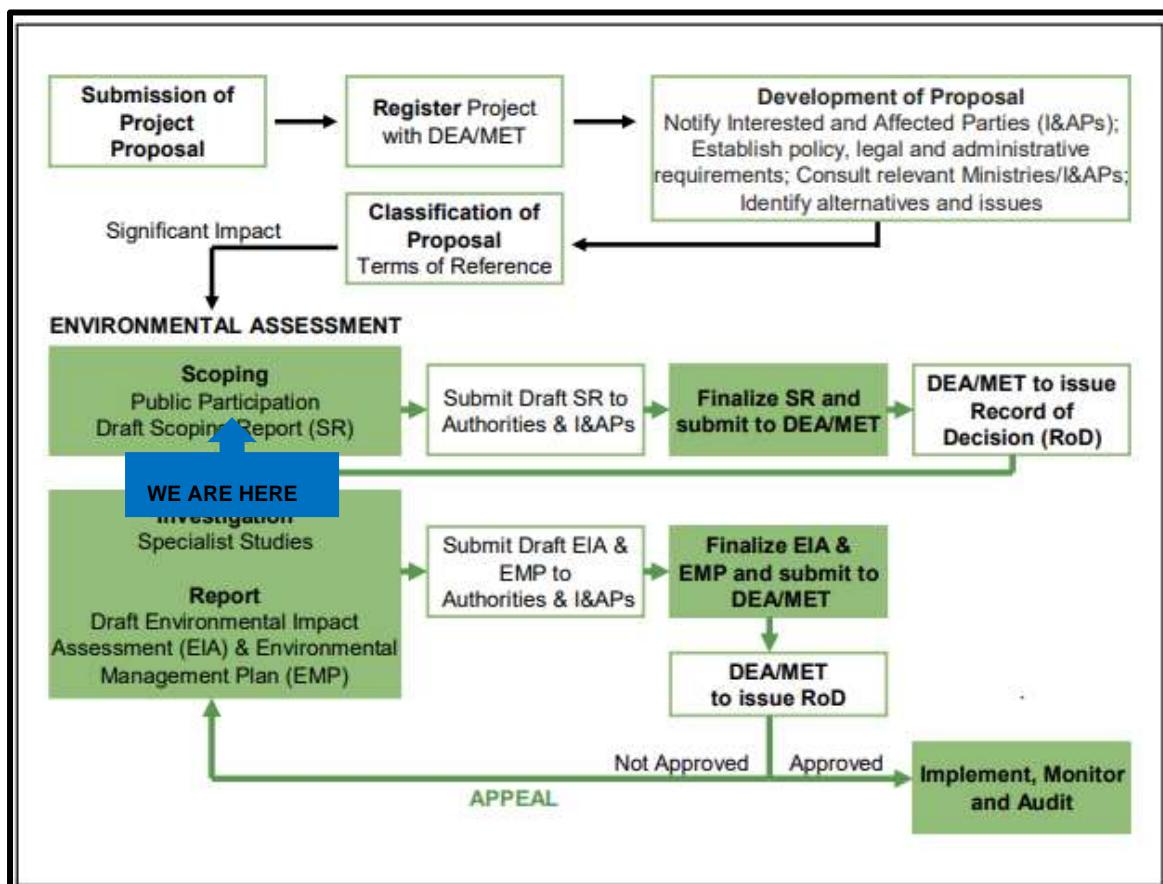


Figure 1: Namibia's EIA process

3.2 Collection of Baseline Information

Baseline information about the proposed development site, the receiving environment, and the proposed activities was obtained from personal observation, reviewing of existing secondary information, and contributions from the NamWater staff, stakeholders, and I&APs. The process that was followed is explained in detail below.

3.2.1 Site visits and assessment

The EAP conducted a site visit on 15 August 2022 and was taken through the scheme infrastructure which included the bulk water storage and treatment facilities, pump rooms, the elevated tower, existing pipelines, and boreholes. During the site visit, the EAP also conducted a line survey on a corridor of 30m wide (15m on both sides) along the pipeline replacement route from boreholes BH7444, via BH7437, as well as along the two alternative routes (Route 1 and Route 2) for the proposed new pipeline from boreholes BH29114 and BH29115 to the ground lever reservoir (Figure 2).



Figure 2: View of the site visit and line survey

The EAP was provided with information on how the current scheme is functioning. The information collected during the assessment includes, the terrain and landscape formations, local occurring flora & fauna as well as adjacent land uses. Details of information collected are outlined in Sections 5, 6 and 7 of this report.

3.2.2 Review of existing information

The Scoping process also benefited a great deal from existing relevant information sourced from the Preliminary Design report for Aroab Scheme extension and upgrade, as well as information from stakeholders such as the Aroab Village Council, Namibia Statistic Agency (NSA) and Ministry of Agriculture, Water and Land Reform (MAWLR).

3.3 Public Participation Process

The study was subjected to a public participation process as defined in the Environmental Management Act No. 7 of 2007 and EIA Regulations of February 2012, this is summarized below:

3.3.1 Stakeholder's consultation

The project was formally introduced by means of letters and emails sent to key stakeholders such as the Aroab Village Council, MAWLR, //Karas Regional Council (KRC), and government parastatals such as Namibia Power Cooperation (NamPower) and Roads Authority (RA). These consultations aimed to ensure that all relevant stakeholders are aware of the development and to solicit their input.

3.3.2 I&APs invitation and consultation

The public advertisements (**Figure 3**) providing brief information about the proposed project and an invitation to the public meeting was advertised in two local newspapers namely, Namibian Sun and Republikein newspapers, on 11 and 15 August 2022. Additionally, several public notices were also displayed at several public places in Aroab and the NamWater premises.



Figure 3: Copy of the Newspaper Advert and Site Notice

3.3.3 Consultative meetings

The Consultant's Team and the Proponent's Team had an inception meeting at the commencement of the EIA study. The purpose of the meeting was for the Consultant's Team to gain an understanding of the Proponent's requirements and expectations for this study.

Furthermore, a public meeting was held on 16 August 2022 at the Aroab Community Hall at 10:30. The meeting was attended by representatives of various stakeholders as well as by the Aroab residents as seen in the picture below. During the meeting, the EAP introduced the project to the attendees and allowed them to ask questions and give their comments regarding the proposed project.



Figure 4: View of the public meeting

The proof of the above consultations is contained in Appendix D, of this report. These include:

- Copies of newspaper advertisements x 4,
- Stakeholder database,
- Attendance registers for the public meeting,
- List of registered I&APs and stakeholders consulted, and
- Issue response report.

All stakeholders and I&APs were provided with the Background Information Document (BID) which provided a brief introduction of the proposed project, the assessment process, and the public consultation process. In line with Section 3.4 (11) of the EIA Regulations of February 2012, I&APs were given 21 days to submit comments.

3.3.4 Review of draft scoping report

This draft Scoping report will be submitted to registered I&APs as well as to relevant stakeholders for comments. Upon review by I&APs and stakeholders, the final Scoping report will be submitted to the competent authority and to the regulatory authority for record of decision.

3.3.5 Summary of issues from I&APs and stakeholders

Issues that were raised during the initial public participation process are listed in **Table 1** below and were incorporated in the assessment.

Table 1 Summary of identified issues

Issue Raised by	Issues and concerns raised	Responses/Remarks
Honourable. Witbooi (Councillor. Keetmanshoop Rural Constituency)	<ul style="list-style-type: none"> • Will the proposed scheme affect the local water prices? • Local companies and local people should be given preference during the construction of the proposed works. Moreover, there is a local company named Aroab Quality Builder Contractors owned by the local people who are experts in different fields such as builders, electricians, plumber etc. This company has the capacity to carry out the construction works. • The Operator seems to know his work, however we understand that he is still working on contract for many years now, why can't NamWater recruit him on a permanent basis? • How long will it take until this project is implemented? 	<ul style="list-style-type: none"> -Yes, the increases of the cost of water treatment, which will eventually increase the cost of water supply so as the consumer price. -The National Procurement Act will be followed in appointing the Contractor. -Concern noted and to be forwarded to the relevant NamWater Department. -The project will commence as soon as it is approved by the competent authority and the ECC is issued by MEFT.
Aroab residents	<ul style="list-style-type: none"> • There is a big tree next to one of the boreholes, the roots might penetrate the boreholes and cause damages. • Sometimes the water turns brownish, what causes that? • We want to thank NamWater because we always receive water on time. 	<ul style="list-style-type: none"> The tree being referred to was already removed by NamWater. -Brownish color is attributed to rust from metal pipes. It is not dangerous to human health.
Aroab Village Council	<ul style="list-style-type: none"> • Council would like to thank NamWater for considering upgrading the Aroab Scheme as this is long overdue. • The water supplied by NamWater over the years is very hard and strong. It has caused serious damage to toilet pots, 	<ul style="list-style-type: none"> • -Noted -The new project will make provision for SeaQuest dosing in order to manage the water hardness. Once the system is up

	<p>water meters and taps. This has forced the Village Council to procure a SeaQuest machine in order to smoothen the water. However, operating this machine is quite challenging and costly. NamWater should consider putting up a treatment plant for Aroab, like the ones in Grunau and Bethanie.</p> <ul style="list-style-type: none"> • What is the estimated lifespan of the current boreholes? • The section of the pipeline within the townland should be below ground. • The town always experience water shortages during summer due to high demand and this has set a huge burden on the Council in meeting the demand for residents and businesses. Hence, the proposed scheme capacity should be sufficient to cater for these shortages. • Council has observed that NamWater is always unable to supply water when there is power outage. This means the capacity of the elevated tower is not sufficient or the tower is not operated to its full capacity. Hence, NamWater should also ensure consider extending the capacity of the elevated reservoir and that it is operated to its full capacity. • NamWater should ensure that the proposed pipeline replacement from the southern east does not pass through the erven of the proposed Oorsterheim Extension 4. 	<p>and running NamWater will monitor the water quality and make changes to the system as required.</p> <p>-The proposed scheme is estimated to meet the demand until 2036.</p> <p>-NamWater herewith confirms that all pipelines within the town lands will be underground. The Village Council should also take cognizance of the fact that no structures are allowed within the servitude of these pipelines.</p> <p>-NamWater takes note of the Council's concerns and confirms that the purpose of the current project is to extend the scheme to augment supply. NamWater's Infrastructure Planning Section did take into account future demand as well.</p> <p>-NamWater further confirms that a new and bigger ground level reservoir is also to be constructed as part of the project. It is noted that power supply falls within the mandate of NamPower. NamWater has engaged NamPower in this regard and further requests the Council's support in engaging the bulk power supplier to ensure that power supply disruptions are kept to a minimum. Notwithstanding this, NamWater will make provision for on the new system to enable the connection of generators in case of an emergency so as to minimize water supply disruptions during short power supply interruptions.</p> <p>-The pipeline will be routed along the C16 road, far from the proposed township development.</p>
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4. LEGAL FRAMEWORK AND REQUIREMENTS

4.1 Environmental Management Requirements

The proposed activities (construction, operation, maintenance, and decommissioning of the proposed Aroab Scheme extension and upgrade) will trigger activities listed under the Environmental Management Act No. 7 of 2007 and the EIA Regulations (No. 03 of February 2012) as follows:

Table 2: The listed project activities

Proposed project activities	Activities triggered	
	Category	Specific activity
<ul style="list-style-type: none">• Construction of new water pipeline and pipeline replacement	No. 10 Infrastructure	10.1 The Construction of (a) oil, water, gas and petrochemical, and other bulk supply pipelines
<ul style="list-style-type: none">• Replacement of ground level reservoir	No. 8 Water Resource Developments	8.5 Construction of dams, reservoirs, levees, and weirs.

4.2 Applicable Legislations

To protect the environment and ensure that the development is undertaken in an environmentally responsible manner, several environmental legislations need to be considered as tabulated below:

Table 3: Applicable legislations

LEGISLATION	PROVISION	PROJECT IMPLICATIONS
Constitution of the Republic of Namibia (1990)	<p>Articles 91 (c) commands the state to actively promote and sustain the environmental welfare of the nation by formulating and institutionalizing policies to accomplish the sustainable objectives which include:</p> <ul style="list-style-type: none"> • Guarding against overutilization of biological natural resources, • Limiting over-exploitation of non-renewable resources, • Ensuring ecosystem functionality, • Protecting Namibia’s sense of place and character. • Maintain biological diversity. • Pursuing sustainable natural resource use. <p>Article 95 (l) recites: “The State shall actively promote... maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on</p>	Through the implementation of the EMP, the proponent shall be advocating for sound environmental management as set out in the Constitution.

	<p>a sustainable basis for the benefit of all Namibians, both present and future”.</p> <p>Furthermore, Artic 95 (l) ensures that workers are paid a living wage adequate for the maintenance of a decent standard of living and the enjoyment of social and cultural opportunities.</p>	
<p>Environmental Management Act No. 7 of 2007</p>	<p>The purpose of this Act is to promote the sustainable management of the environment and the use of natural resources by establishing principles for decision-making on matters affecting the environment; to provide for a process of assessment and control of projects which may have significant effects on the environment, and to provide for incidental matters. The Act gives legislative effect to the Environmental Impact Assessment Policy. Moreover, the act also provides procedures for adequate public participation during the environmental assessment process for the interested and affected parties to voice and register their opinions and concern about the proposed project.</p> <p>The Environmental Impact Assessment Regulations Government Notice No. 30, promulgated on 6 February 2012. The regulations listed certain activities that require an ECC from MEFT: DEA before commencing.</p>	<p>Application for the ECC for the activities will be submitted to the competent and regulatory authority for consideration and issuance of the ECC.</p>

<p>Water Act 54 of 1956 (SA)</p>	<p>The Water Act 54 of 1956 and its requirements in terms of water supply for drinking water and wastewater treatment and discharge.</p> <p>The Guidelines for the evaluation of drinking-water quality for human consumption with regards to chemical, physical, and bacteriological quality requires that; water supplied for human consumption must comply with the officially approved guidelines for drinking-water quality. For practical reasons, the approved guidelines have been divided into three basic groups of determinants, namely:</p> <ul style="list-style-type: none"> • Determinants with aesthetic implications. • Inorganic determinants. • Bacteriological determinants. <p>The water quality for human consumption is classified into four groups. The concentration of and limits for the aesthetic, physical and inorganic determinants define the group into which water will be classified.</p> <ul style="list-style-type: none"> • Group A: Water with an excellent quality • Group B: Water with acceptable quality • Group C: Water with low health risk • Group D: Water with a high health risk, or water unsuitable for human consumption 	<p>The Department of Applied Scientific Services is responsible for conducting microbiological analysis while the physical/ aesthetic and chlorine analyses are done by the Aroab Scheme Operator.</p> <p>The Water Act 54 of 1956 has been replaced with a new Water Resource Management Act (WRMA) 11 of 2013 along with new water quality standards. The WRMA is not enforced yet. However, the DWA has started enforcing the water quality standards of 2013 and NamWater in endeavour to meet these standards.</p>
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Water should ideally be of excellent quality (Group A) or acceptable quality (Group B), however, in practice, many of the determinants may fall outside the limits for these groups. If water is classified as having a low health risk (Group C), attention should be given to this problem, although the situation is not critical yet.

If water is classified as having a higher health risk (Group D), urgent and immediate attention should be given to this matter. Since the limits are defined based on average lifelong consumption, short-term exposure to determinants exceeding their limits is not necessarily critical, but in the case of extremely toxic substances, such as cyanide, remedial measures should immediately be taken.

The overall quality group into which water is classified is determined by the determinant that complies the least with the guidelines for the quality of drinking water.

All applications in terms of Section 21(5) and 22(2), for compliance with the requirements of Section 21(1) and 21(2) of the Water Act (Act 54 of 1956) that purified water shall comply with General Standard as laid out in Government Gazette Regulation R553 of 5 April 1962.

Water Resources Management Act 11 of 2013.

To provide for the management, protection, development, use, and conservation of water resources; to provide for the regulation and monitoring of water services and to provide for incidental matters. This Act has been passed by Parliament, but it is not enforced yet. It will be enforced once a date is set by the Minister in the Government Gazette. The Regulations of the WRMA also outlined the water quality guidelines and standards for potable water specified in Table 1 to Table 3 of the WRMA.

The Regulations also specified the frequency of microbiological monitoring for bulk water supply: as outlined in the table below (Table 4 of the WRMA)

SIZE OF POPULATION SERVED	Turbidity 95%	MINIMUM FREQUENCY OF SAMPLING
>250 000	< 0.5 NTU	Thrice weekly ***
100 001 – 250 000	< 1.0 NTU	Twice weekly
50 001 – 100 000	< 1.0 NTU	Once weekly
10 001 – 50 000	< 1.0 NTU	Three times every month
< 10 000 reticulated	< 1.0 NTU	Once very month*
< 10 000 non-reticulated	1 - 2 NTU	Once every month*

Although the WRMA has not yet been Gazetted, NamWater: Department of Applied Scientific Services which is responsible for water quality testing has started applying the new water quality guidelines and standards in 2019.

In terms of the water quality guidelines and standards, the microbiological testing for the Aroab scheme should be carried out once monthly.

<p>Namibia Water Corporation Act 12 of 1997</p>	<p>To establish the Namibia Water Corporation Limited; to regulate its powers, duties, and functions; to provide for more efficient use and control of water resources, and to provide for incidental matters.</p> <p>Without prejudice to the generality of section 5, the Corporation shall perform the following functions in pursuit of its objects under this Act, namely –</p> <ul style="list-style-type: none"> (a) Explore, develop, and manage water resources for water supply. (b) Acquire, plan, design, construct, extend, alter, maintain, repair, operate, control, and dispose of waterworks. (c) Subject to section 7 and notwithstanding any provisions of the Water Act to the contrary, supply water to customers within and outside the borders of the Republic of Namibia. (d) Investigate, research, and study matters relating to water resources, waterworks, and the environment. (e) Take such action as the Corporation may consider necessary or as the Minister may direct to conserve or augment water resources in Namibia. (f) Render services, provide facilities, and lease rights, subject to the payment of relevant charges. 	<p>In providing for the planning & designing, construction, operation, maintenance, and decommissioning of the proposed Aroab Scheme extension and upgrade, NamWater is carrying out its functions as mandated by the Act.</p>
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	<p>(g) Establish training facilities and train personnel; and</p> <p>(h) Perform any other function as may be necessary or expedient for the achievement of the Corporation's objects.</p>	
Soil conservation Act 76 of 1969	<p>The objectives of the Soil Conservation Act 76, 1969 are to make provision for the combating and prevention of soil erosion, and the conservation, protection, and improvement of the soil, the vegetation, and the sources and resources of the water supplies.</p> <p>Part II deals with soil conservation works and it further states that in section 4(1). The Minister may by means of a direct order the owner of land to construct the soil conservation works referred to in such direction either on land belonging to such owner or on land belonging to another person, in such manner and within such period as may be mentioned in such direction, if the Minister is of the opinion that the construction of such soil conservation works is necessary to achieve any object of this Act in respect of the land belonging to such owner.</p>	<p>Prior to the construction of the below ground pipeline and ground level reservoir, geotechnical investigations should be carried out to determine the engineering properties of the soil(s) and/or rock(s) underlying the sites, including the identification of potential problem soils and the presence of an underground water table.</p>

<p>National Labour Act 11 of 2007</p>	<p>The objectives of the National Labour Act are:</p> <ul style="list-style-type: none"> • To establish a comprehensive labour law for all employers and employees; to entrench fundamental labour rights and protections. • Regulate basic terms and conditions of employment. • Ensure the health, safety, and welfare of employees and protect employees from unfair labour practices. • To regulate the registration of trade unions and employers' organization and regulate collective labour relations. • To provide systematic prevention and resolution of labour disputes. <p>Some of the notable Sections under this Act are:</p> <p>Health and Safety Procedures Section 17 (1) The employer shall prepare any health and safety procedure referred to in sub-regulation (1) in consultation with the workplace safety committee concerned.</p> <p>Section 22. (1) In the event of an accident or dangerous occurrence in or in connection with a workplace or if an employee dies or suffers a serious injury because of such an accident or dangerous occurrence, the employer shall notify and report</p>	<p>The Proponent, Contractor, Sub-contractor shall all be guided by this Act when recruiting or handling employment-related issues.</p> <p>The Contractor must adhere to the minimum workplace safety standards such as all employees must be provided with appropriate Personal Protective Equipment (PPE).</p>
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	<p>such accident to the Chief Inspector of Labour of the area.</p> <p>Notification of Occupational Diseases (OD), Section 23. If a medical practitioner finds that any person is suffering from an occupational disease listed in Annexure A. 2(1), or of any other disease that he or she believes was caused by that person's current or past employment, he or she shall immediately and in the form of Form OD. 1, report this fact to the chief medical officer of occupational health and safety.</p> <p>It shall be an unfair dismissal, or unfair disciplinary action, in terms of section 45 by an employer if such employer terminates the services of, or takes disciplinary action against, such employee if such employee has contracted an occupational disease listed in Annexure A. 2 (1), or any other disease, because of his or her past or present employment with such employer. Section 210, states that an employer shall ensure that an employee wears or uses, to the satisfaction of an inspector, suitable and adequate personal protective equipment.</p>	
<p>Public Health and Environmental Act of 2015</p>	<p>Section 119 of this Act prohibits the existence of a nuisance on any land owned or occupied by the proponent. The term nuisance is important for this EIA, as it is specified, where relevant in Section 122 as follows:</p> <p>a) any dwelling or premises which is or are of such construction as to be injurious or dangerous to</p>	<p>Nuisance such as dust, noise, bad odours, etc. should be controlled during all project phases.</p>

	<p>health or which is or are liable to favour the spread of any infectious disease.</p> <p>b) any dung pit, slop tank, ash pit, or manure heap so foul or in such a state or so constructed as to be offensive or to be injurious or dangerous to health.</p> <p>c) any area of land kept or permitted to remain in such a state as to be offensive, or liable to cause any infectious, communicable, or preventable disease or injury or danger to health; or</p> <p>d) Any other condition that is offensive, injurious, or dangerous to health.</p> <p>Furthermore, in terms of Section 8 of the Public Health Proclamation 16 of 1936, where a local authority is of the opinion that a nuisance is seriously offensive or a serious menace to the health, it may serve a notice on the owner or occupant of the nuisance to immediately remove the nuisance. Failure to abide by this provision is an offense.</p>	
<p>Atmospheric Pollution Prevention Ordinance No. 11 of 1976</p>	<p>This Ordinance generally provides for the prevention of the pollution of the atmosphere and matters incidental thereto. The Ordinance deals with administrative appointments and their functions; the control of noxious or offensive gases; atmospheric pollution by smoke, dust control, motor vehicle emissions; and general provisions.</p> <p>Part IV of this ordinance deals with dust control. The Ordinance is clear in requiring that any person</p>	<p>Air pollution could occur during the construction phase. It is the responsibility of NamWater to control excessive air pollution and comply with the ordinance.</p>

	<p>carrying out an industrial process which is liable to cause a nuisance to persons residing in the vicinity or to cause dust pollution to the atmosphere, shall take the prescribed steps or, where no steps have been prescribed, to adopt the best practicable means for preventing such dust from becoming dispersed and causing a nuisance.</p> <p>Of applicability to the envisaged project, is dust generated by vehicles or equipment as well as dust generated during construction. The risk of dust generation is high at the envisaged site. This deals with air pollution as it affects occupational health and safety, and no consideration is given to the natural environment.</p>	
Pollution Control and Waste Management Policy, 2003	The bill provides a framework for a multitude of administrations on pollution control and waste management in the country. Each authority identified by the bill shall play its respective role.	All waste management activities generated by the Aroab scheme activities are the responsibility of NamWater.
Nature Conservation Ordinance 14 of 1975 and its amendments	The Nature Conservation Ordinance Section 14 protects and preserves wild animal life, fisheries, wild plant life and objects of geological, archaeological, historical, and other scientific interest and for the benefit and enjoyment of the inhabitants of Namibia.	Ensure protection and preservation of natural resources in line with the Ordinance.
MEFT Policy on HIV/AIDS	MEFT has recently developed a policy on HIV/AIDS. In addition, it has also initiated a programme aimed at mainstreaming HIV/AIDS and gender issues into environmental impact assessments.	The proponent and its contractor must adhere to the guidelines provided to manage the aspects of HIV/AIDS. Experience with construction projects has shown that a

		significant risk is created when migrant construction workers interact with local communities.
National Heritage Act No. 27 of 2004	The Act is aimed at protecting, conserving, and registering places and objects of heritage significance.	All protected heritage resources (e.g., human remains, etc.) discovered, need to be reported immediately to the National Heritage Council (NHC) and require a permit from the NHC before they may be relocated.
Local Authorities Act No. 23 of 1992	The Local Authorities Act prescribes how a town or municipality should be managed by the Municipal Council.	All project activities should be carried out in line with the relevant provisions of the Local Authorities Act. All decision to be taken by the Aroab Village Council should be in line with the delegation of powers prescribed under Section of the Local Authorities Act.

5. DESCRIPTION OF AROAB WATER SUPPLY SCHEME

5.1 Water Source

The Aroab town rely on groundwater extracted from the fractured aquifer of the Nama sediments. There are two groups of production boreholes that supply water to Aroab. One group, consisting of two boreholes, situated to the southeast of Aroab on a prominent fault and the second group of four boreholes situated to the west of Aroab on the farm Streitdamm.

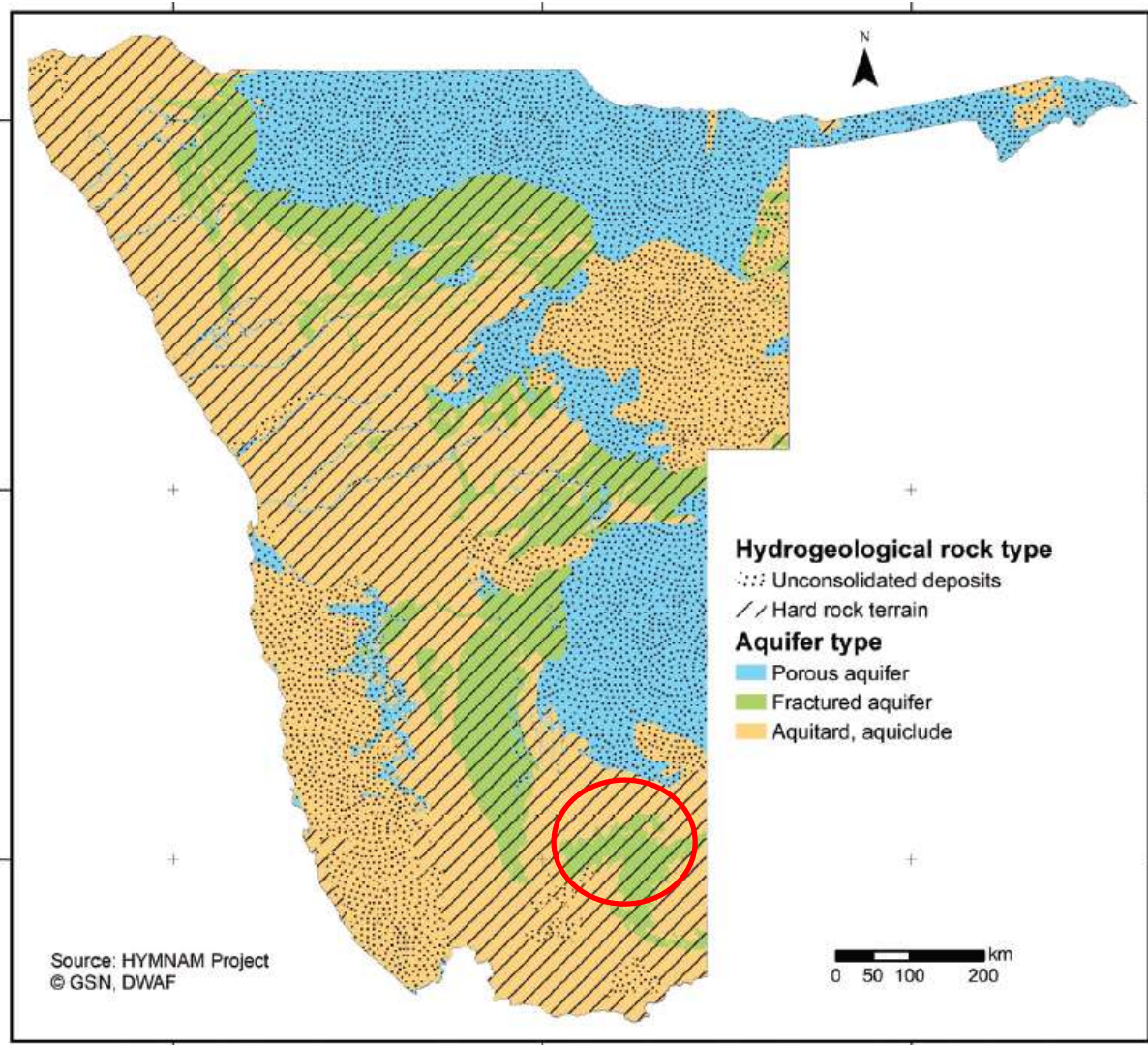


Figure 5: Groundwater potential map

5.2 Existing Infrastructure and Functions

The existing infrastructure of the current Aroab Scheme and their functions is explained below.

5.2.1 Boreholes

There are six production boreholes (WW7437, WW7444, WW25601, WW25602, WW25628 and WW25601). All boreholes are electrically powered with power supply from a 25 kVA NamPower transformer. Power is transmitted through a 33 kV primary- and 400 V secondary power lines which supplies electricity to the pumpstation switchboard and splits into single phase which supply to the boreholes. The flow levels of all boreholes are controlled through the telemetry system.

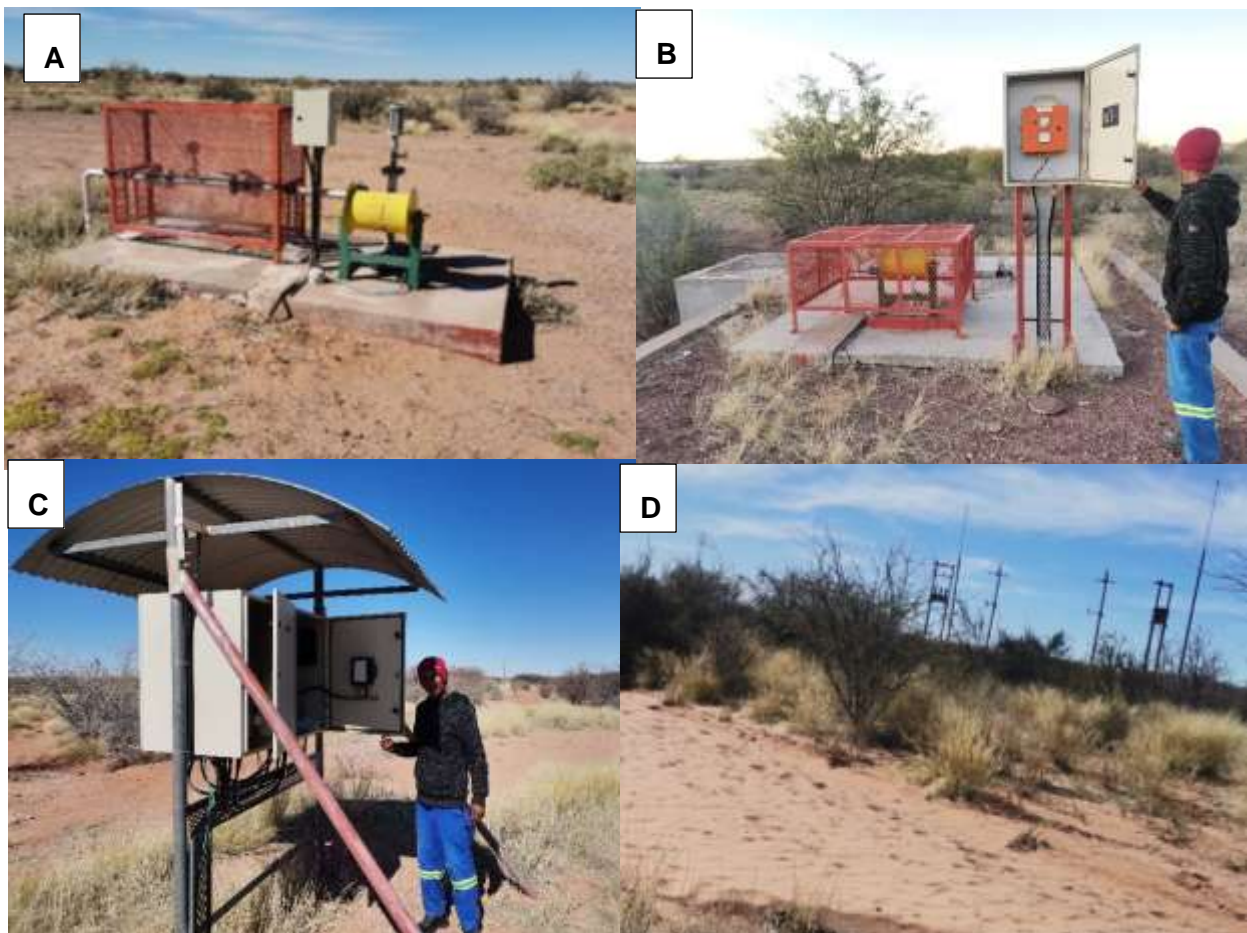


Figure 6: Boreholes

A and B – Boreholes, C – Telemetry system at boreholes and D – Power supply line

5.2.2 Pipelines

The bulk water pipeline supplying water to Aroab town is divided into three sections. The first section consists of an underground 100 mm diameter, 4.535 km long Ferrule Connector (FC) pipeline with a capacity of 679 m³/day connecting the south-eastern boreholes to the ground reservoir.

The second pipeline section consist of an above ground pipe with a diameter of 80 mm and length of 1.24 km, medium duty Galvanized Mild Steel (GMS) with a capacity of 434 m³/day which connects three of the second group of boreholes (those located west of Aroab) and from there the diameter increases to 100 mm covering 0.83 km up to the fourth borehole of the second group. The GMS pipeline, connecting the third borehole of the second group to the reservoir, has a diameter 150 mm which runs over 1.17 km.



Figure 7: Existing above ground GMS pipeline

The final section of the pipeline is below ground which consists of a 100 mm diameter, 0.56 km long, FC pipeline that connects the ground reservoir through a booster pump station to the elevated reservoir.

5.2.3 Bulk water storage and treatment

Water from the boreholes is supplied through the pipelines to the storage facilities at the NamWater premises in town. These facilities consist of a round ground galvanised-steel-plate reservoir with a capacity of 500 m³, booster pumpstation, office, storeroom, and valves. There is also an elevated concrete cone reservoir with a capacity of 180 m³, located in the Aroab Secondary School yard, about 600 m from the NamWater premises.

a) Reservoir, treatment, and pump station

The telemetry system is used to control the level of the ground level reservoir. Chlorination of water is done by a single injector system. The treated water is supplied from the ground level reservoir to the elevated reservoir by the two booster pumps.



Figure 8: Bulk storage infrastructure

A – Ground reservoir, B – Single inject system, C – Telemetry system, D – Booster pumps

b) *Elevated tower*

The flow and level of water in the elevated tower is controlled through a telemetry system located at the base of the tower. There is a bulk water meter located at the base of the tower which provides readings for water supplied to the Aroab Village Council.



Figure 9: Elevated Tower and control system

A – Telemetry system at the base of elevated tower B – Bulk water meter

The full Schematic layout of the current Aroab water supply scheme is described in **Figure 8** below.

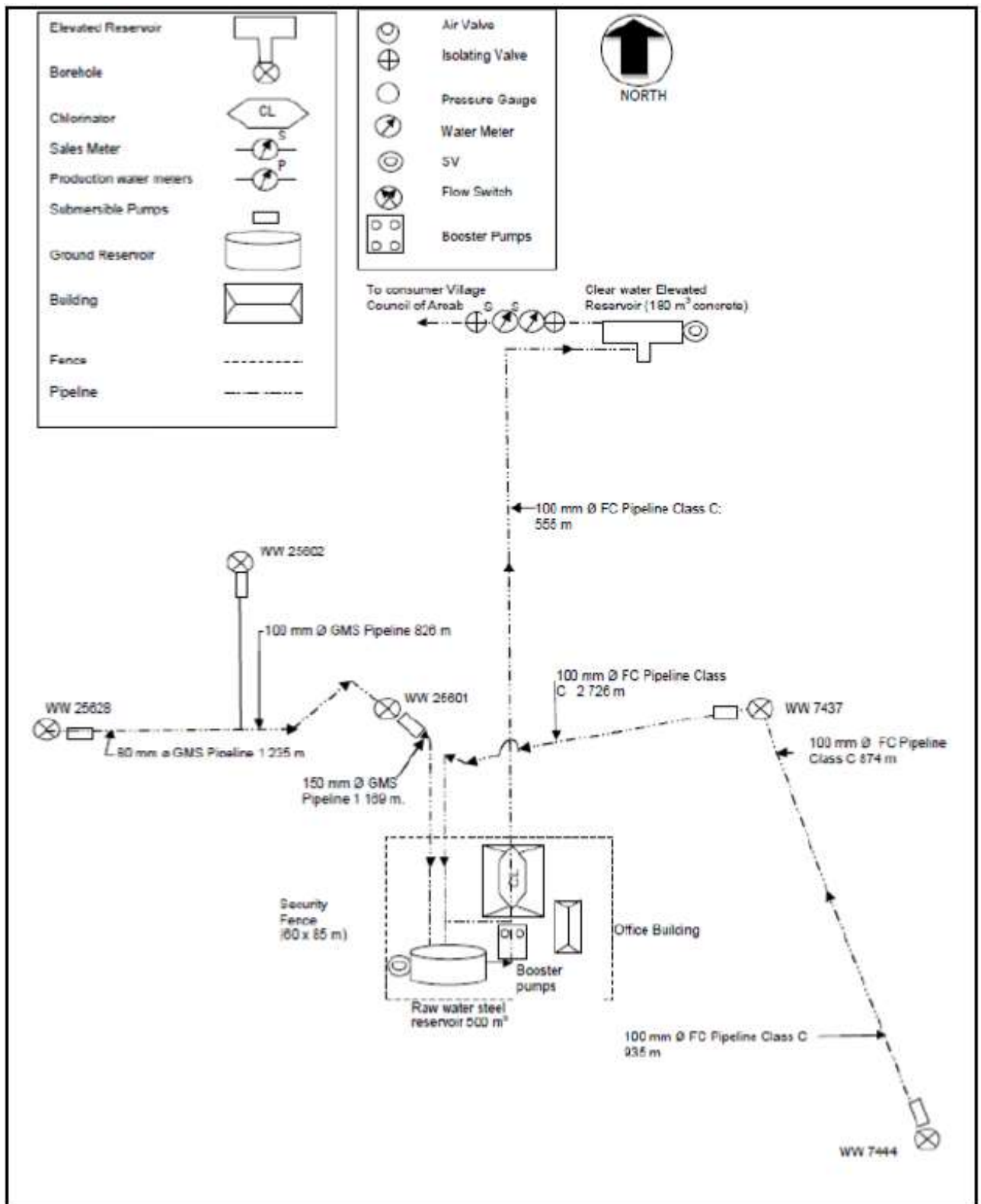


Figure 10: Overview of the current Aroab Scheme (Source: NamWater)

5.3 Water Balance Analysis

Table 4 and Table 5 below provide an assessment of the production and distribution losses respectively for the period July 2021 to June 2022.

5.3.1 Production losses

The production losses are the amount of water lost between the borehole meters and distribution meter.

Table 4: Production losses

Date	Amount produced (M ³)	Amount distributed to Aroab Village Council (M ³)	Loss/Gain (M ³)	Loss/Gain (Percentages %)
21-Jul	5583	5505	78	1%
21-Aug	4738	4316	422	9%
21-Sep	6839	5576	1263	18%
21-Oct	5822	5160	662	11%
21-Nov	6533	5272	1261	19%
21-Dec	6689	7094	-405	-6%
22-Jan	7315	6886	429	6%
22-Feb	7083	6363	720	10%
22-Mar	6609	6070	539	8%
22-Apr	7714	7384	330	4%
22-May	6674	6205	469	7%
22-Jun	6120	6549	-429	-7%

As depicted in Table 4 above, the production losses for the period July 2021 to June 2022, ranged between 1% to 19% of the water produced. These losses can be attributed mainly to supply pipeline leakages and/or spillages from the ground level reservoir.

The negative results indicate that the amount of water supplied by NamWater to Aroab Village Council during December 2021 and June 2022 exceeded the amount of water produced from the boreholes, hence realizing savings during those months. These savings normally remained in the reservoir and get used up in the following month.

5.3.2 Distribution losses

The distribution loss is the amount of water lost during the distribution or supply process. These losses were calculated between the distribution meter and the sales meter.

Table 5: Distribution losses

Date	Amount supplied by NamWater (M ³)	Amount sold to consumers (M ³)	Loss/Gain (M ³)	Loss/Gain (Percentages %)
21-Jul	5505	5238	267	5%
21-Aug	4316	5562	-1246	-29%
21-Sep	5576	5565	11	0%
21-Oct	5160	5557	-397	-8%
21-Nov	5272	5122	150	3%
21-Dec	7094	6700	394	6%
22-Jan	6886	6785	101	1%
22-Feb	6363	6250	113	2%
22-Mar	6070	5702	368	6%
22-Apr	7384	5760	1624	22%
22-May	6205	5405	800	13%
22-Jun	6549	5285	1264	19%

The distribution losses for the period July 2021 to June 2022, ranged between 1% to 22%. The losses are attributed to leakages in the distribution pipeline, illegal water connections/tapping or unaccounted water usages.

The negative results show that in August 2021 and October 2021, the amount sold by the Aroab Village Council exceeded the amount supplied by NamWater. There is no explanation as to what caused the water sales to exceed the amount received. Hence, the situation could be attributed either to late payments by the residents or erroneously record keeping by the Aroab Village Council.

5.4 Water Quality

According to NamWater, 2020, the production boreholes in the Aroab Scheme provide raw water that contains parameters within Group C of the guidelines. The water from boreholes south-east of Aroab experience Nitrate-Nitrogen (NO₃-N) as the most serious exceedance parameter of the blended product water, which is in Group C. The chlorination at present takes place by means of an advance gas chlorinator with a disinfection capacity of 3 500 m³/day at 4 mg/l, situated in a building at the ground reservoir.

According to the Aroab Village Council, the water supplied to the Council over the years is very hard and strong which also caused damages to the toilet pots, water meters. Hence, the Aroab Village Council procured a SeQuester machine as depicted in **Figure 11** below to soften the water.



Figure 11: Water treatment cage

5.5 The Need and Desirability for Scheme Extension and Upgrade

In 2020, NamWater commissioned a study to assess the water supply situation for the Aroab bulk water supply scheme and which concluded the following:

- The existing 500 m³ ground level collector reservoir is in a deteriorated state and only fills up to 60% of its capacity due to leaks on its upper level, thus requires urgent replacement (**Figure 12**).
- The current source capacity was only adequate until 2021, thus it is below the current and future demand.
- Boreholes BH29114 and BH29115 were drilled but not installed and commissioned. Once they are installed and commissioned, their added capacity will be enough to cater for future demand until 2036.
- The existing Fibre Cement (FC) pipeline from boreholes BH7444, via BH7437 to the collector reservoir is old and deteriorated, hence it must be replaced.
- The Peak Daily Water Demand analysis was calculated until the year 2036 as follows; 314 m³/day for 2031 and 334 m³/day for 2036.



Figure 12: Existing ground level reservoir

6. PROPOSED DEVELOPMENT AND ALTERNATIVES

6.1 Scope of Work

The proposal works is aimed at addressing the need and desirability of the project as described in Section 5.5 of this report. The proposed works entail the following:

- Installation and commissioning of the existing boreholes BH29114 and BH29115.
- Construction of new collector pipelines from boreholes BH29114 and BH29115 to the new collector reservoir through the suitable route (Red or Blue line).
- Upgrading of the existing FC pipeline from boreholes BH7444, via BH7437 to the new collector reservoir (Green line). and
- Construction of a new 500 m³ ground level collector reservoir in Aroab.

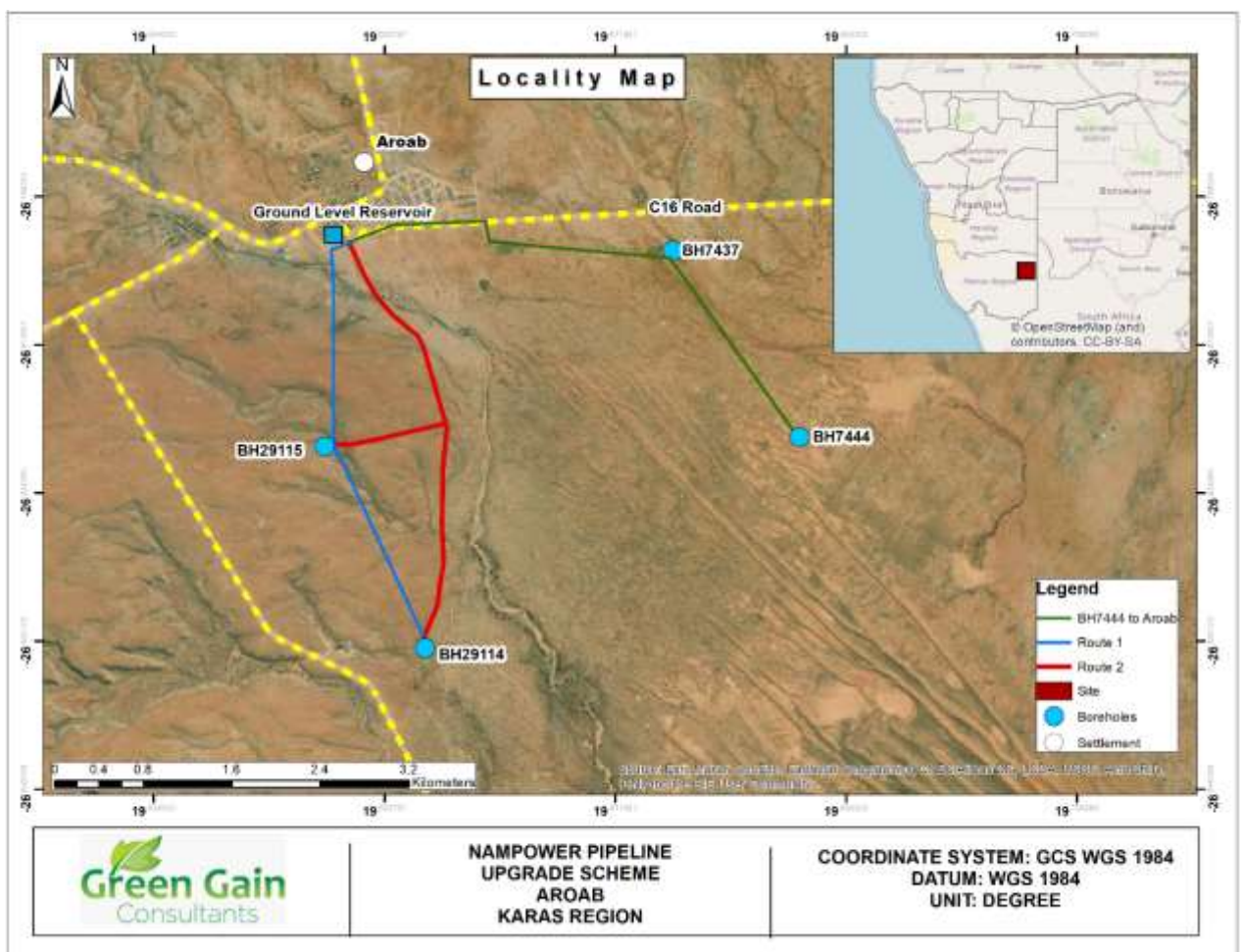


Figure 13: Layout for the proposed pipeline routes

6.1.1 Installation and commissioning of existing boreholes

The two existing boreholes BH29114 and BH29115 were drilled but not installed. It is believed that once these two boreholes are installed and commissioned, their added capacities will be enough to cater for future demand until 2036.



Figure 14: Drilled boreholes BH29114 and BH29115

6.1.2 Construction of the new pipeline

A new pipeline will be constructed to connect the new boreholes BH9114 and BH29115 to the collector reservoir in town. As such, different alternatives were identified during the project planning stage and assessed during the EIA study and recommendations were made for the most suitable alternatives as described below.

a) Alternative pipeline routes

As depicted in **Figure 13** above, two pipeline routes (red and blue) are being considered.

Route 1

Route 1 is about 4.01 km and is crossing through the camps of Farm Streitdamm. The terrain along this route is very hilly and bushy. The local occurring vegetation consists mainly of thorn bushes, shrubs, and herbaceous grass species as listed in Section 7.2.6. Although there is an existing farm track road in the vicinity of this route, the larger section of the route is inaccessible by vehicle. Hence, clearing, cutting, and filling works are required to make the route accessible and usable. The route also crosses through two valleys, including the main Aroab River.



Figure 15: Scenic view along Route 1

Route 2

Route 2 consists of the main pipeline route from BH29114 to the collector reservoir which is about 3.97 km and a feeder pipeline route from BH29115 to the main pipeline route, about 0.98 km. This makes the total length of Route 2 to be 4.95 km. The route passes through the camps of Farm Streitdamm and is along a farm track. The terrain along this route gradually slopes up from BH29114 to the collector reservoir.

The main route crosses through a small shallow valley, about 25 m wide and through the main Aroab River which is about 70 m wide. The feeder pipeline route to BH29115 also crosses through a deep valley. The soil can be excavated in some areas but becomes rocky at most areas. The local occurring vegetation consists mainly of thorn bushes, shrubs, and herbaceous grass species which are sparsely distributed and, in some way, disturbed along the route due to its proximity to the existing farm track.



Figure 16: Scenic view along Route 2

Due to the nature of the surrounding terrain and its accessibility as described above, it is recommended that the new pipeline should follow Route 2.

6.1.3 Pipeline replacement

The existing FC pipeline from borehole WW7444, via WW7437, to the ground collector reservoir in town, as depicted in the green line in Figure 13 above, is in a poor state and it is frequented with leaks, thus, needs replacement urgently.

The existing pipeline route passes through the farm camps which belongs to the Aroab Village Council and crosses under the C16 road and passes through the street until it reaches the ground level reservoir. The terrain along the pipeline route is flat and covered mainly with Kalahari sands. The vegetation along the pipeline route is mainly shrubs, herbaceous species, and bushes as well as a mixture of climax and sub-climax grass species as listed in Table 7. The route is also easily accessible through the existing track road.



Figure 17: Scenic view along the existing pipeline route

6.1.4 Pipeline development options

i. Above ground vs below ground pipeline

The two alternative options were assessed whether to construct the proposed pipelines above or below ground. The pipeline replacement from boreholes WW7444, via WW7437, to the collector reservoir will be buried at the depth of approximately 0.6 m, next to the existing pipeline. The existing pipeline, which is also below ground, will not be exhumed but will instead be left intact to avoid interruption to the current water supply and any disturbances to the environment.

Due to the rocky nature of the local occurring soil, the main section of the new pipeline from borehole BH29114 to BH29115 will be laid on concrete pedestals above ground at a minimum height of 0.2 m as shown in Figure 7 above. The section of the pipeline at the crossing of the Aroab River as well as within the townlands will be buried at depth of approximately 0.6 m.

ii. Pipeline material

The preferred pipe material for the below ground pipeline is High Density Polyethylene (HDPE) whereas the preferred pipe material for the above ground pipeline is GMS. The GMS material is preferred for the above ground because it is strong, and it will not be damaged by external forces such as the weather and animals.

6.1.5 New reservoir

A new 500 m³ Abeco pressed steel collector reservoir will be erected next to the existing reservoir. The proposed tank will be 10.98 m wide, 9.76 m long and 4.88 m high like the tank in **Figure 18** below. The proposed steel collector reservoir can easily be designed, manufactured, transported, and installed by local suppliers. The design and construction of the foundations for the steel collector reservoir will be done by NamWater.



Figure 18: Example of Abeco pressed tank (Source: Namibia Engineering Corporation)

The existing reservoir will be decommissioned and taken out of operation upon the completion of the new reservoir. NamWater will ensure that a switch over between the old and new reservoir is properly done to avoid any disruption of the water supply to the area.

6.2 Resource Requirements

6.2.1 Source of construction materials

The required pipeline materials such as GMS and HDPE will be imported from neighbouring countries, whereas most of the construction materials i.e., sand, cement, gravel, stone, etc. will be sourced locally.

6.2.2 Electricity consumption and requirements

A 25kVA, 400V AC 3 phase power supply points will be applied for via NamPower to power the pumps at the new boreholes. Details of the power line route is not available at this stage.

6.2.3 Workforce requirement during construction

The exact number of temporary jobs to be created during the construction phase is not yet known, however, a project of this nature is expected to create between 40-50 temporary job opportunities. Secondary job opportunities will also be created in the town through supply and delivery of construction materials.

6.2.4 Workforce requirements during operation

The Aroab Scheme is currently operated by an Operator based in Aroab, who oversees metering, pumps, and water treatment. The Operator reports to the scheme superintendent based in Karasburg, while the NamWater officials based in Keetmanshoop provide the technical assistance. There is no provision made to create additional staff for the proposed scheme extension and upgrade.

7. DESCRIPTION OF THE RECEIVING ENVIRONMENT

This chapter presents the environmental baseline of the receiving environment. It entails a description of various environmental receptors that are likely to be affected by the proposed project. This includes both the socio-economic and biophysical aspects.

The impacts on socio-economic aspects will affect a greater geographical area e.g., national, regional and constituency. Hence, the description of the socio-cultural-economic baseline provided for the study area corresponds to the extent of the community in which the project is taking place.

On the other hand, the baseline study area chosen for physical and ecological data collection is mainly the area that is in the direct zone of influence of the proposed pipeline and new reservoir, its process facilities, and supporting infrastructures.

7.1 Social Settings

7.1.1 About the town

Aroab is a village town in the //Karas Region of southern Namibia situated 35 km west of the South African borders at Rietfontein and 160 km east of Keetmanshoop on the C11 road.

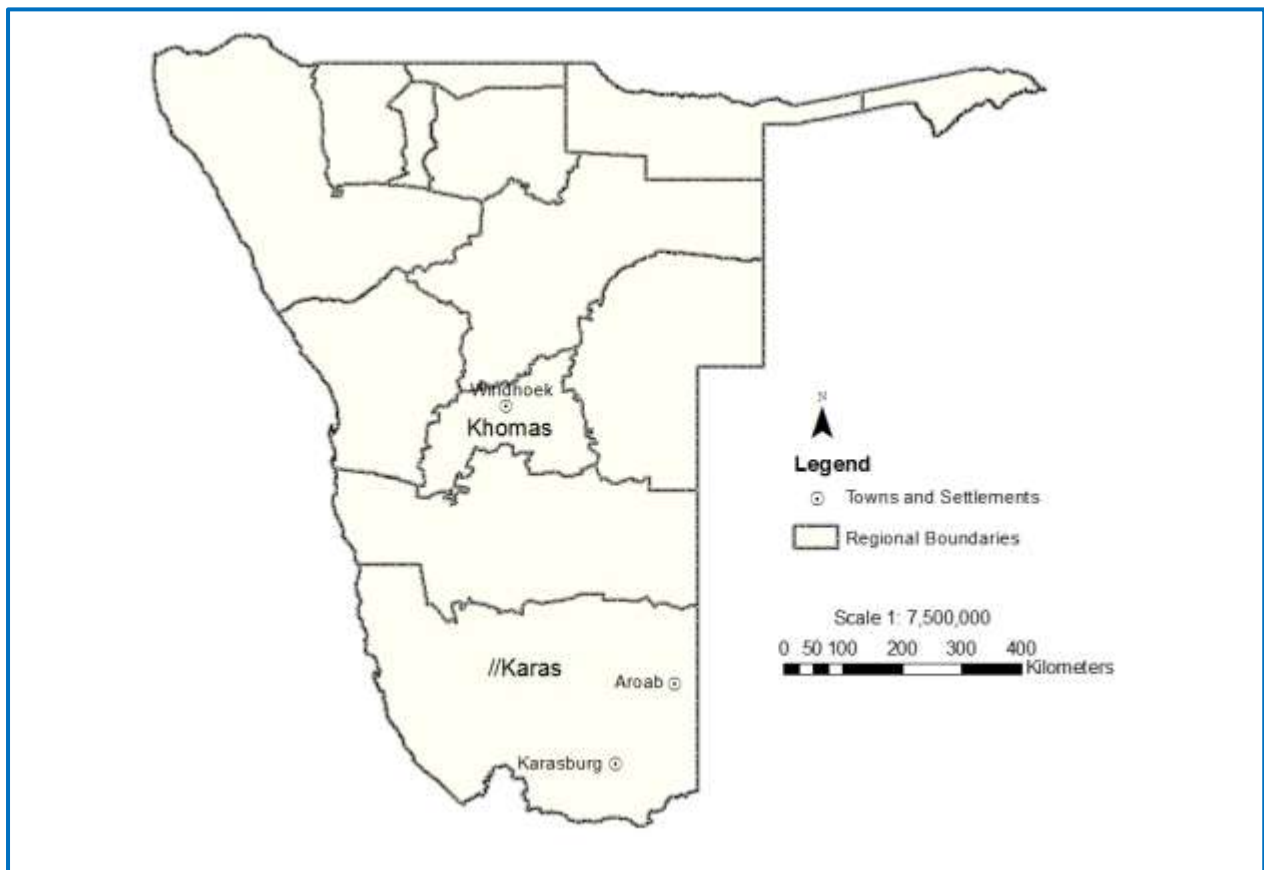


Figure 19: Aroab Location Map (Source: NamWater, 2016)

7.1.2 Demographic settings

The Keetmanshoop rural constituency is made up of the Krönlein suburb of Keetmanshoop and the villages of Koës, the settlements of Seeheim, Klein //Karas, Aroab as well as several farming communities in the area. According to the National Population Census of 2011 by the Namibia Statistic Agency (NSA), the population of Aroab was estimated at 7,219.

Table 6: Population dynamics of the Keetmanshoop rural Constituency (NSA, 2011)

	2011	2001		2011	2001
Population Size			Labour force, 15+ years, %		
Total	7 219	6 399	In labour force	72	67
Females	3 363	3 122	Employed	70	77
Males	3 856	3 276	Unemployed	30	24
Sex ratio: Males per 100 females	115	105	Outside labour force	24	32
Age composition, %			Student	32	16
Under 5 years	12	13	Homemaker	32	47
5 – 14 years	23	24	Retired, too old, etc.	37	25
15 – 59 years	58	54	Housing conditions, %		
60+ years	8	8	Households with		
Marital status: 15+ years, %			Safe water	91	97
Never married	53	67	No toilet facility	33	35
Married with certificate	29	22	Electricity for lighting	50	40
Married traditionally	1	0	Wood/charcoal for cooking	58	84
Married consensually	12	7	Main source of income, %		
Divorced/Separated	1	1	Household main income		
Widowed	4	2	Farming	14	19
Private households			Wages & Salaries	65	64
Number	1 735	1 480	Cash remittance	4	3
Average size	4.1	4.3	Business, non-farming	2	3
Head of household, %			Pension	12	9
Females	26	24	Fertility		
Males	74	76	Average number of children per woman	3.5	4.1
Literacy rate, 15+ years, %	94	88	Disability, %		
Education, 15+ years, %			With disability	3	4
Never attended school	8	12			
Currently at school	9	5			
Left school	82	81			

According to the Aroab Village Council, the current population of the town is estimated at around 5,000 people.

7.1.3 Land use pattern

According to the Aroab Village Council (2022), the town is made up of six townships of which four are fully established. There are currently about 500 households in Aroab while about 150 erven have been serviced and were scheduled for handing over to the recipients as of 1st of October 2022. The town is still surrounded by its vast vacant townland which is earmarked for future developments.

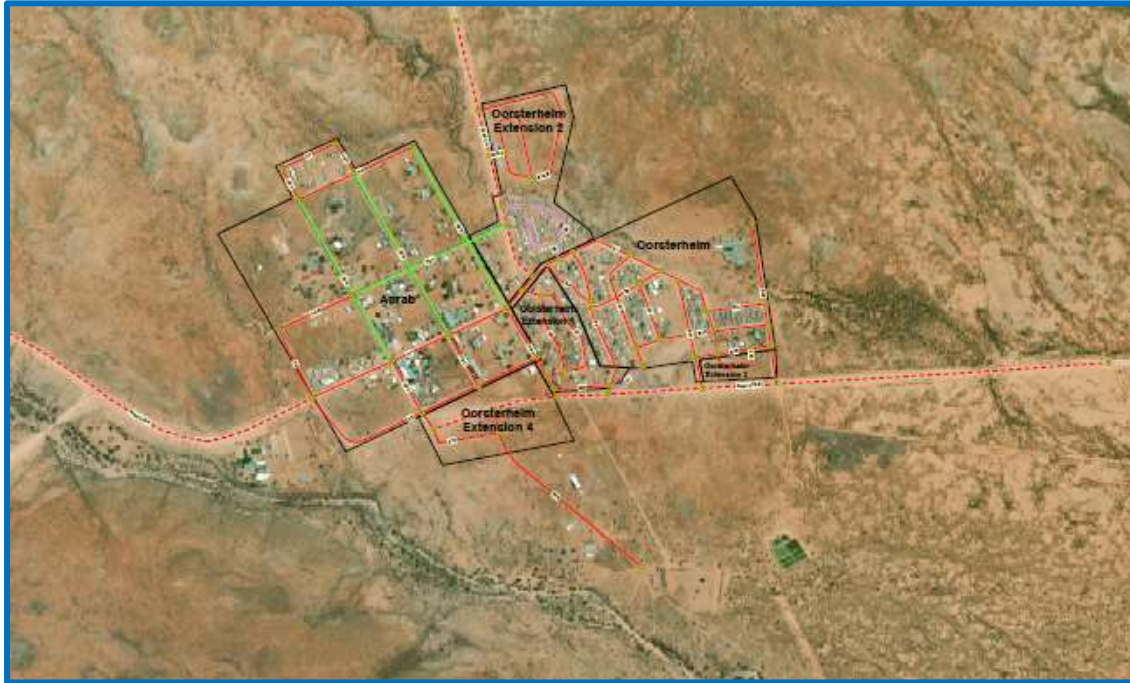


Figure 20: Aroab Townlands (Source: Aroab Village Council, 2022)

There is an informal settlement situated northeast of the town and is consisting of about 400 people. Most of the informal houses are constructed out of corrugated iron sheets and wooden poles. The informal settlement is provided with communal prepaid water taps installed by the local authority (Aroab Village Council, 2022).

7.1.4 Economic and social development

Aroab is reachable via gravel road network; about 160 km from Keetmanshoop and 35 km from the Klein Menasse /Rietfontein borders via the C16 road, about 182 km from Karasburg, and 142 km from Koës via the C11 road.

Aroab is the economic centre for the surrounding farmers with the main sources of income generated from ranches which stems from sheep, goat, and cattle ranching for meat production purposes. Hunting of wild animals also takes place during winter times mainly for meat and to a lesser extent for trophy hunting. Businesses that are operating in the town are, a farmer's cooperative, general dealer, windpump repairs & engineering, and a small abattoir and butchery.

There are four (4) public schools, one private school, a clinic, a post office, a police station, and various churches. Like many other towns in Namibia, Aroab is plagued by a high unemployment rate, especially amongst the youth.

7.1.5 Water and sanitation

All 500 households, businesses, and institutions in Aroab are connected to the water and sewerage systems. The village is completely electrified through the national grid provided by NamPower.

7.1.6 Archaeological and heritage context

The subject sites are not known to be of any historical significance. There are also no significant archaeological and heritage sites that are known to be located within the proposed pipeline routes.

7.2 Biophysical Environment

7.2.1 Climate

- **Temperature, humidity, and evaporation rate**

The climate of //Karas region is classified as Subtropical desert climate. The temperatures can vary by 45°C in one day. On winter nights temperatures can plummet to -14°C, while soaring to 30°C during the day. On a cold summer night temperatures may drop to 5°C, whereas daytime temperatures may exceed 45°C. The average evaporation rate of the Aroab area is more than 2 660 mm/year (Mendelsohn, *et al* 2002).

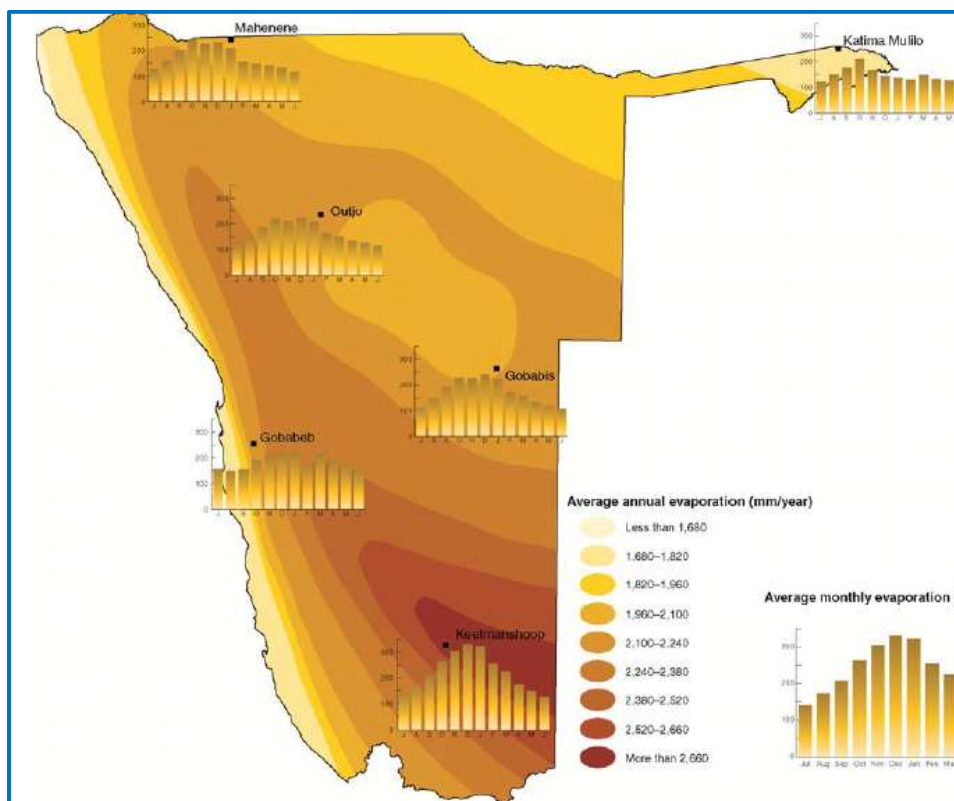


Figure 21: Average Evaporation rate (Mendelsohn, *et al* 2002)

- **Precipitation**

The rainfall in //Karas region is remarkably patchy and receives average annual rainfall has 34.64 rainy days (9.49% of the time) annually (Mendelsohn, *et al* 2002). The average annual rainfall of the Aroab area is estimated between 150 and 200 mm (Figure 22).

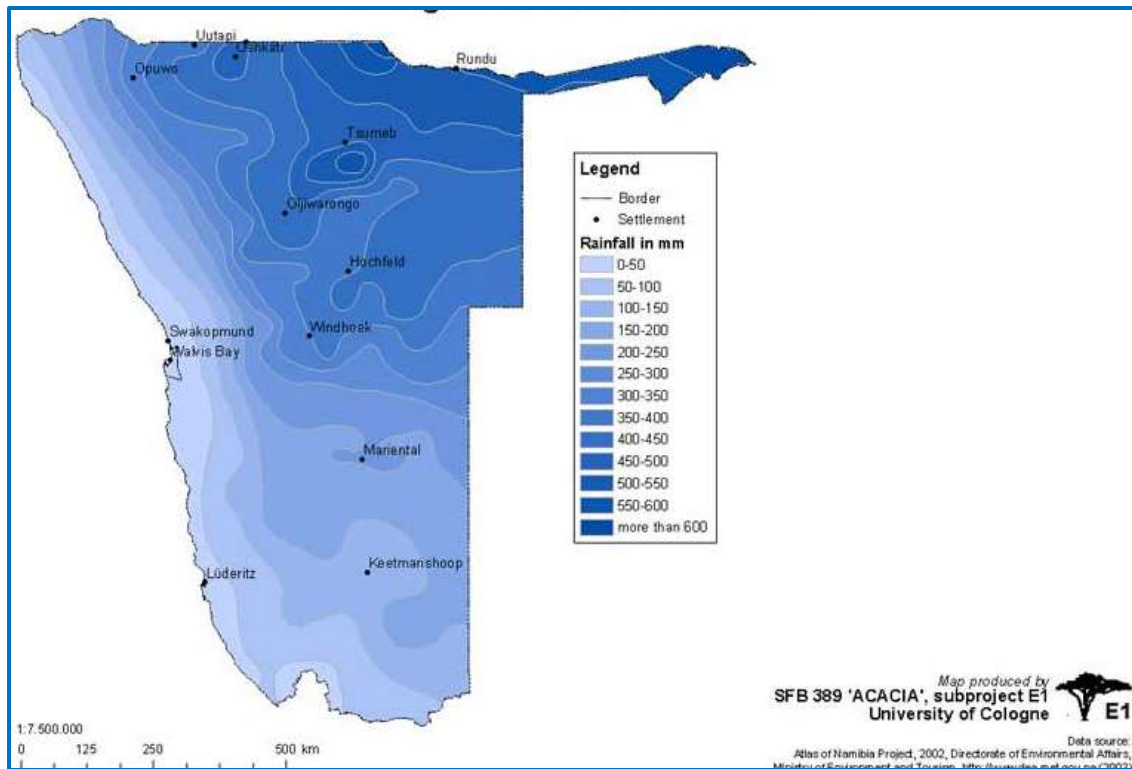


Figure 22: Average annual in Namibia

7.2.2 Topography

The surrounding terrain varies from flat to very hilly and is interspersed by valleys including the major Aroab River running from west to the south of the town. The elevation of the area is also influential, and the area occurs at elevations between 600 m and 1 600 m.

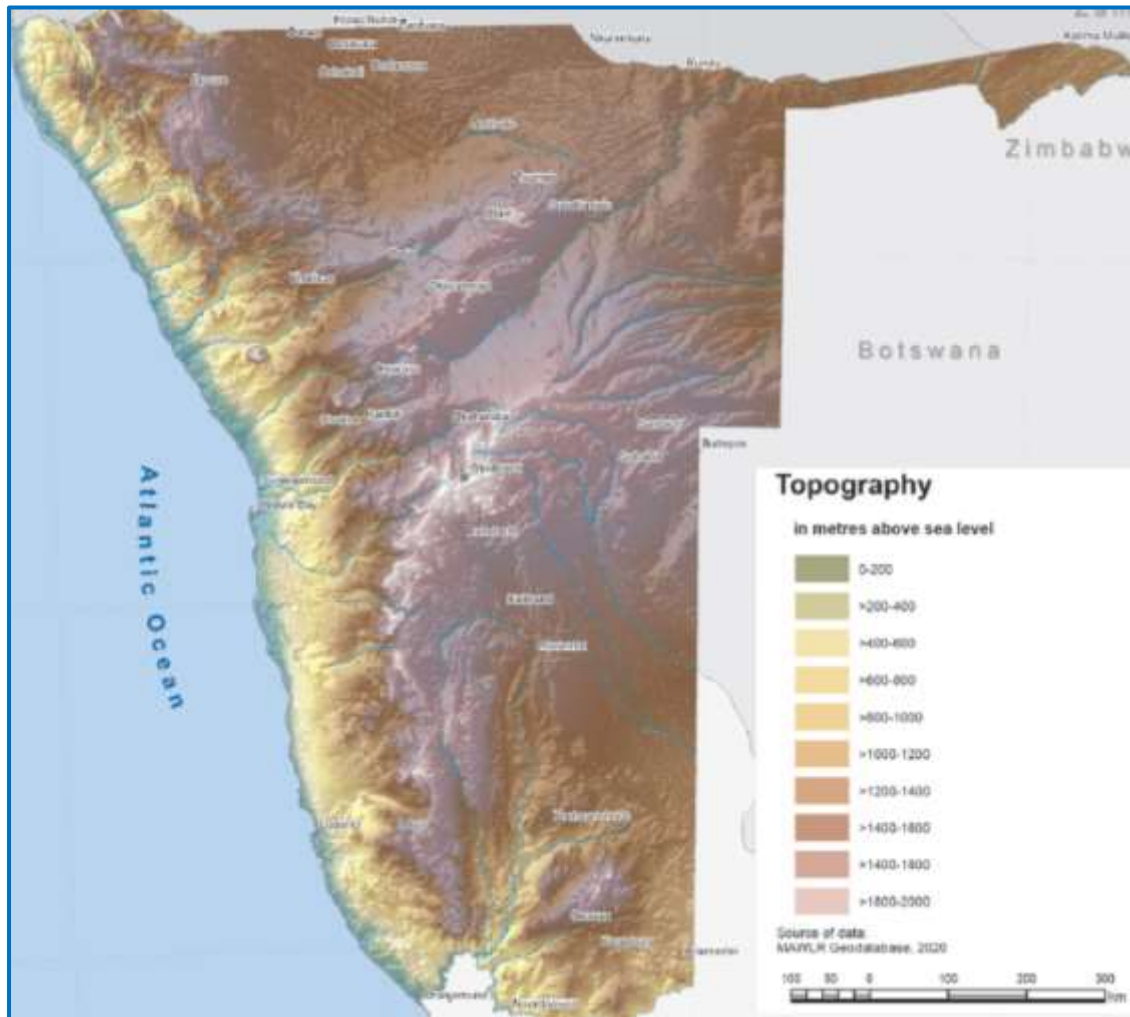


Figure 23: The landscape map of Namibia (Source: Christoph L, *etal*, 2021)

7.2.3 Soils

The dominant soil in the area is Kalahari sands which are of the *calcisols* and *leptosols* groups, which is nutrient poor and reddish-brown in colour, except were leached by water (Makhabu SW, et al, 2002). The soil texture ranges from sandy loam to weathered rocky soil.

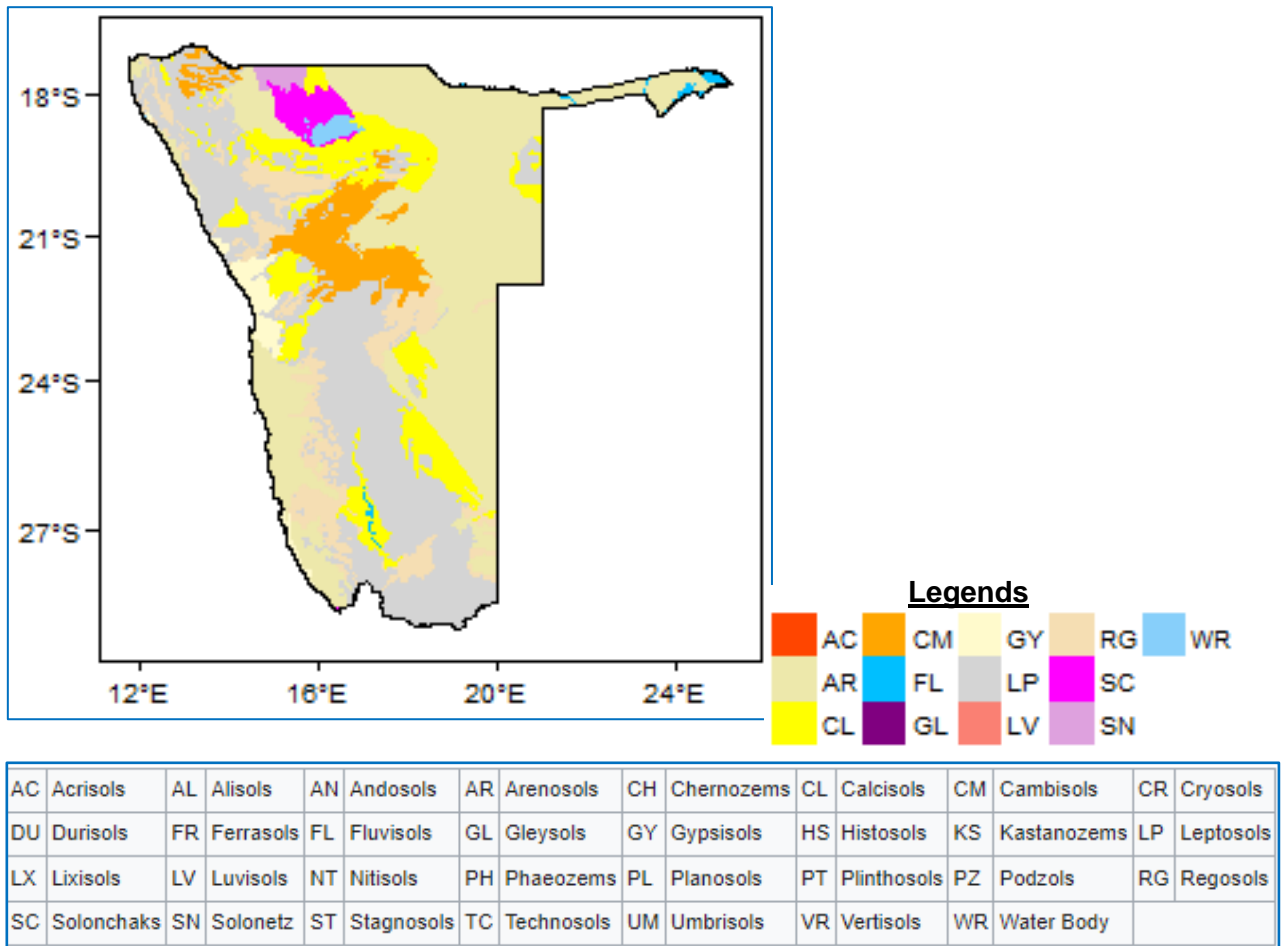


Figure 25: Soil map of Namibia (Source; Christelis & Struckmeier 2001)



Figure 24: Main soil types of the area

7.2.5 Local occurring flora

The Aroab area is part of the Kalahari xeric savanna which stretches across north-western South Africa, southern Botswana, and central-south-eastern Namibia.

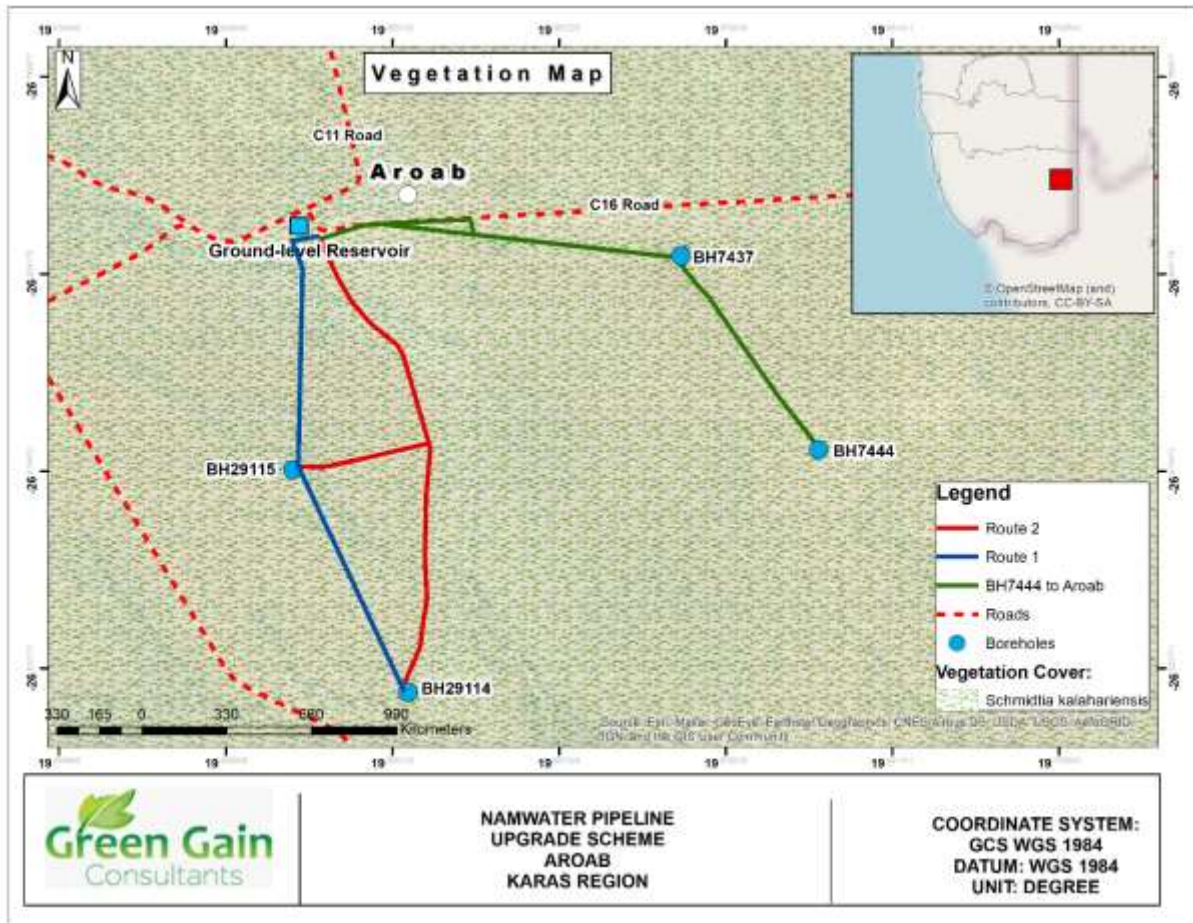


Figure 27: Local occurring flora

The vegetation of the area is characterized by a mixture of acacia shrubs, herbaceous species, climax and sub-climax grass species, broom bushes, and is mostly interspersed by large trees such as *Acacia haematoxylon* (grey camelthorn), *Acacia reficiens* (false umbrella thorn), *Prunus spinosa* (blackthorn), *Boscia albitrunca* (shepherd's tree), and *Terminalia sericea* (silver cluster-leaf) which occur mainly in riverbeds. The local occurring sub-climax and climax grass species are of high grazing value while the shrubs, broom bushes and trees, including the protected species i.e. *B. albitrunca* are important source of browsing for the farm animals.

According to Emma M and Neil B (2022), the plant species richness per unit area in the Kalahari xeric savanna is among the lowest of all the southern African ecoregions, as only 3% of species are considered endemic to the Kalahari ecoregion.

Table 7: Local occurring vegetation species

Grass species	Bush/shrubs	Trees
<ul style="list-style-type: none"> • <i>Stipagrostis ciliata</i>, • <i>Panicum maximum</i>, • <i>Schmidtia kalahariensis</i> • <i>Aristida spp</i> • <i>Eragrotis spp</i> 	<ul style="list-style-type: none"> • <i>Boscia foetida</i> locally known as !hoe boss • <i>Grewia flava</i> • <i>Ziziphus mucronata</i>, • <i>Tarchonanthus camphoratus</i>, • <i>Rhigozum trichotomum</i>, • <i>Acacia hebeclada</i> • <i>Lycium spp.</i> 	<ul style="list-style-type: none"> • <i>Senegalia mellifera</i> • <i>Acacia haematoxylon</i> • <i>Vachellia reficiens</i> • <i>Prunus spinosa</i> • <i>B. albitrunca</i> • <i>Terminalia sericea</i>



Figure 28: Pictures of the local vegetation

7.2.6 Local fauna

The local occurring fauna consists of both domestic animals and abundance of wildlife. Domestic animals are mainly cattle, sheep, goats, and horses. There are several large and small mammals such as *Oryx gazella* (gemsbok), *Antidorcas marsupialis* (springbok), *Acinonyx jubatus* (cheetah), *Tragelaphus strepsiceros* (kudu) to mention a few., which are highly adapted to arid area. There is also a high diversity of smaller predators, such as *Felis nigripes* (black-footed cat), *Suricata suricatta* (meerkat), *Cynictis penicillate* (yellow mongoose), *Caracal caracal* (caracal), *Canis mesomelas* (black-backed jackal), and *Mellivora capensis* (honey badger).

There are also few species of avifauna which includes many species of raptiles, including the *Sagittarius serpentarius* (secretary bird), *polemaetus bellicosus* (martial eagle), *Terathopius ecaudatus* (bateleur), and *Bubo lacteus* (eagle owl). As in many arid areas, the amphibian fauna is not particularly species rich (Emma M and Neil B, 2022).



Figure 29: Fauna species known to occur in the area

There are no sensitive habitats within the proposed pipeline routes and no fauna with territorial needs is known to occur within the area.

8. ANTICIPATED ENVIRONMENTAL IMPACTS

According to the EIA Regulations, the term “environment” is referred to the complex of natural and anthropogenic factors and elements which include both the natural environment and the human environment. Hence, this section provides anticipated environmental impacts (short-term and long-term) associated with the planning & design, construction, operation, and decommissioning of the proposed Aroab scheme extension and upgrade. The assessment considered the potential impacts on the existing socio-economic and biophysical settings of the receiving environment as well as on the future land uses in the development area.

8.1 Impacts rating scales

In assessing the impact of the proposed development, four rating scales were considered. Each issue identified was evaluated in terms of the most important parameter applicable to environmental management. These include the **extent, intensity, probability, and significance** of the possible impact on the environment and whether such effects are positive (beneficial) or negative (detrimental). The rating scales used are as follows.

Table 8: Impact rating scales

CRITERIA	DESCRIPTION			
EXTENT	National (4) The whole country	Regional (3) //Karas Region and neighbouring regions	Local (2) Within a radius of 2 km of the development site.	Site (1) Within the development site
DURATION	Permanent (4) Mitigation either by man or natural process will not occur in such a way or such a period that the impact can be considered transient	Long-term (3) The impact will continue/last for the entire operational life of the development but will be mitigated by direct human action or by natural processes thereafter.	Medium-term (2) The impact will last for the period of the project phase, whereafter it will be entirely negated	Short-term (1) The impact will either disappear with mitigation or will be mitigated through a natural process in a span shorter than the construction phase
INTENSITY	Very High (4) Natural, cultural, and social functions and processes are altered to extent that they permanently cease	High (3) Natural, cultural, and social functions and processes are altered to extent that they temporarily cease	Moderate (2) The affected environment is altered, but natural, cultural, and social functions and processes continue albeit in a modified way	Low (1) The impact affects the environment in such a way that natural, cultural, and social functions and processes are not affected
PROBABILITY	Definite (4) The impact will certainly occur	Highly Probable (3) Most likely that the impact will occur	Possible (2) The impact may occur	Improbable (1) The likelihood of the impact materializing is very low
SIGNIFICANCE	Is determined through a synthesis of impact characteristics. Significance is also an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.			

Table 9: Description of the significance of impacts

Low impact	A low impact has no permanent impact of significance. Mitigation measures are feasible and are readily instituted as part of a standing design, construction, or operating procedure.
Medium impact	Mitigation is possible with additional design and construction inputs.
High impact	The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/or operational phases. The effects of the impact may affect the broader environment.
Very high impact	Permanent and important impacts. The design of the site may be affected. Intensive remediation is needed during construction and/or operational phases. Any activity which results in a "very high impact" is likely to be a fatal flaw.
Status	Denotes the perceived effect of the impact on the affected area.
Positive (+)	Beneficial impact
Negative (-)	Deleterious or adverse impact.
Neutral (I)	The impact is neither beneficial nor adverse
It is important to note that the status of an impact is assigned based on the status quo. Therefore, not all negative impacts are equally significant.	
Significance Rating Scale	
Points 1-4	Insignificant/low
Points 5-8	Significant /Moderate
Points 9-12	Very significant/High.
Points 13-16	Highly significant /Very high

The significance of each impact has been rated before and after mitigations measures. The implementation of mitigations is expected to reduce the significance of impacts using at least two (2) scales.

8.2 Anticipated Impacts: Planning and Design Phase.

The first step in avoiding and preventing any possible negative impacts during the construction, operation, maintenance, and decommissioning phase, should start with the planning and designing phase. Below are issues that should be considered during the planning and design phase.

- Suitable pipeline routes
- Pipeline crossings at watercourses and within the townlands
- New reservoir capacity
- **Suitable pipeline routes**

The proposed pipeline replacement will follow the existing route, hence no consideration for additional routes. However, the pipeline will be routed along the existing C16 road as it enters the town. The whole section of the pipeline replacement will be below ground.

As for the new pipeline from boreholes WW29114 and WW29115, two alternative routes were considered of which Route 2 was recommended.

Measures

- ✓ Servitudes should be registered for the two pipelines with the Deeds Registry Office. This should also be incorporated in the Aroab Town Planning Scheme to safeguard the pipeline from future developments.
- ✓ NamWater to seek for approval from Roads Authority (RA) to route the pipeline within the road reserve.
- ✓ NamWater to obtain consent from the owner of Farm Streidemmm for the proposed pipeline route and to access the farm during pipeline maintenance.

- **Pipeline crossings at watercourses and within the townlands**

Proper consideration should be made at the planning stage for the pipeline at river crossings and within the townlands to avoid issues during the construction and operation phases.

Measures

- ✓ The new pipeline should be buried at the river crossings to prevent pipe damage during rainy seasons.
- ✓ The pipeline section within the townlands should be also buried to avoid any limitation to the land use as well as to safeguard the pipeline from damages.

8.3 Anticipated Negative Impacts: Pipeline Construction Phase

The anticipated negative impacts during the construction phase of the proposed above and below ground pipelines will affect both the biophysical and socio-economic settings of the receiving environments as explained below.

a) Negative impacts to the natural environment

- Disturbance to local flora
- Disturbance to local fauna
- Soil disturbance from bulk earthworks and civil works
- Risk of fuel and lubricants spill or leaks at construction, refuelling, and storage sites
- Dust and air pollution
- Waste generation
- Risks of groundwater contamination

b) Negative impacts on the socio-economic environment.

- Land use effects
- Impact of migrant construction workers and danger of HIV/AIDS
- Occupational health and safety hazards
- Impacts of laydown areas, workshops, and temporary camps
- Visual and aesthetic intrusion

These impacts have been explained in detail below.

- *Disturbance to local flora*

The vegetation of the affected area comprises of a mixture of shrubs, grasses of climax and sub-climax species which are of high grazing value as well as large trees which include protected species i.e., *B. foetida*. Disturbance to the local flora within the working corridor, (30m wide) will occur due to the vegetation clearance and vehicle traffic movement during the construction phase. Although large trees could easily be avoided, other plants such as broom bushes, shrubs and grasses can easily be disturbed because of clearing and trampling. Moreover, deposition of fugitive dust onto the plant leaves can also affects the plant transpiration and respiration and may lead to decreased productivity.

The impacts are likely to be more severe during the construction of the below ground pipeline due to activities such as sand padding, grading, stockpiling of materials or waste and movement of trenching equipment such as the tractor-backhoe-loader. If not properly managed, the impacts to the local fauna could remain visible for an extended period.

Impact Type	Ratings (before mitigation/measures)				Significance	
	Extent	Duration	Intensity	Probability	Without measures	With measures
Negative	2	3	2	3	10	8

Measures:

- ✓ All disturbances should be limited to the working corridor.
- ✓ Only use existing access routes as far as possible.
- ✓ Vehicles must be driven by authorized drivers.
- ✓ All employees must be sensitised to minimise disturbances.
- ✓ Only prepare trenches in short sections sufficient to be worked for a short period i.e., a week, and avoid leaving empty trenches for too long.
- ✓ Construction activities must be limited to daytime hours.
- ✓ Employ some dust suppression and control measures i.e., sprinkling of dusty areas, mixing of cement in a closed area.
- ✓ Avoid the use of open fire in the wild.
- ✓ Avoid spilling of waste, including wastewater in the environment.
- ✓ The EMP should be made part of the Contract to which Contractor should abide to.

- *Disturbance to local fauna*

The affected fauna is made of domestic animals i.e., sheep, goat, cattle, and a variety of wildlife species which include burrowing animals, avifauna, as well as small and large mammals. Impacts to fauna may occur due to the loss of grazing/browsing materials and habitat, and fragmentation during the pipeline placement. Other impacts such as noise, vibration, dust emission, improper handling of waste and littering during the construction works will also have serious bearings on the local fauna.

Impact Type	Ratings (before mitigation/measures)				Significance	
	Extent	Duration	Intensity	Probability	Without measures	With measures
Negative	2	2	3	2	9	7

Measures:

- ✓ All disturbances should be limited to the working corridor.
- ✓ Avoid the use of open fire in the wild.
- ✓ Only use existing access routes as far as possible.
- ✓ All employees must be sensitised to minimise disturbances.
- ✓ Avoid killing or trapping, chasing, or injuring any animal crossing or found along the pipeline route.
- ✓ Only prepare trenches in short sections sufficient to be worked for a short period i.e., a week, and avoid leaving empty trenches for too long.
- ✓ Open trenches should be demarcated with danger tapes to ensure the safety of animals and people.
- ✓ No camping is allowed within the wild.

- *Soil disturbances and contamination from bulk earthworks and civil works*

Soil is one of the most important natural resources which support a community of diverse organisms. The excavation of trenches and movement of construction vehicles will disturb the organisms it contains and expose the soil to wind erosion. Soil may also be contaminated from leaks and spills from construction vehicles. Moreover, excavations may also expose the soil to wind and water erosions.

Impact Type	Ratings (before mitigation/measures)				Significance	
	Extent	Duration	Intensity	Probability	Without measures	With measures
Negative	1	2	2	1	6	4

Measures:

- ✓ The topsoil from the construction site must be carefully extracted and kept separate from construction waste for use as backfill materials.
- ✓ Limit the movement of vehicles within the construction working corridor and make use of existing access routes.
- ✓ The construction site for the new ground level reservoir should be fenced off during the construction phase and allow only one access route and entrance to the site to minimise disturbance from vehicle movement
- ✓ Reduce soil contamination by providing proper maintenance to the construction vehicles and machinery.
- ✓ Contaminated sand must be collected and disposed of at the Keetmanshoop landfill site.

- *Risk of fuel and lubricants spill or leaks at construction, refuelling, and storage sites*

The poor handling and spillage of fuel, lubricants, and chemicals i.e., oil, grease from construction vehicles could contaminate the soil, surface water, and groundwater, especially within the watercourses.

Impact Type	Ratings (before mitigation/measures)				Significance	
	Extent	Duration	Intensity	Probability	Without measures	With measures
Negative	1	1	1	1	4	2

Measures

- ✓ All vehicles and machines with leakages should be fitted with drip trays.
- ✓ All construction vehicles must be serviced at the maintenance workshop and no offsite maintenance should be allowed.
- ✓ Refuelling of vehicles and machinery should be done at a designed transfer site supported with a bunding wall, big enough to contain 120% of the volume of the fuel tank.
- ✓ All leakages and spillages of oil and grease should be contained, cleaned up, and disposed of at the Keetmanshoop landfill site. Follow the spillage procedures as outlined in the EMP.

- *Dust and air pollution*

Excavation and construction-related activities i.e., cement mixing and backfilling will generate fugitive dust that can pose serious health risks and irritation to humans, especially those working on the construction site. However, the worst case of dust pollution would be during windy conditions. Other atmospheric pollution is in the form of fumes and noxious gases i.e., hydrocarbon vapours, carbon monoxide, and sulphur oxides released from vehicles and construction equipment. However, the emissions of dust and vibration from construction activities will occur for a short time and will likely be insignificant since the pipeline route is far from residential areas.

Impact Type	Ratings (before mitigation/measures)				Significance	
	Extent	Duration	Intensity	Probability	Without measures	With measures
Negative	2	1	1	2	6	4

Mitigation:

- ✓ When the wind speed exceeds 40 km/h, the construction work must cease.
- ✓ Ensure dust control measures such as sprinkling all haulage roads and construction areas with water. All cement mixing should be done in an enclosed area.

- ✓ All construction vehicles and machinery must be roadworthy and driven within the maximum driving speed limits.
- ✓ Cover dump trucks loaded with sand or other building materials with tarpaulin to contain dust emissions.

- *Waste generation*

Construction activities will generate several types of solid wastes such as waste rocks, food refuse, trash, scrap materials, oily rags, and empty products containers. Additionally, liquid waste from construction camps will be generated. All these types of waste will have a negative impact on surrounding areas if not disposed of properly and regularly.

Impact Type	Ratings (before mitigation/measures)				Significance	
	Extent	Duration	Intensity	Probability	Without measures	With measures
Negative	2	1	1	2	6	4

Mitigation

- ✓ Biodegradable waste such as tree branches, shrubs etc., resulting from site clearance should be kept separate from other waste and should be left to naturally decompose into the soil.
- ✓ All general household waste generated at the site must be gathered and disposed to the Aroab waste disposal site.
- ✓ Recyclable waste i.e., empty product containers, paper, plastic, etc., should be collected, sorted, and supplied to the local recycling companies in Keetmanshoop or transported to Windhoek.
- ✓ Vehicles transporting waste should be sealed with a tarpaulin to avoid waste from being blown away by wind and prevent dust emissions.
- ✓ Provision must be made for sufficient portable ablution facilities during the construction period. In terms of the general health Regulations (GN 121. 1969), it is recommended to have at least 1 toilet within 500 m along the pipeline route and 2 toilets for every 25 people (separate water closet for males and females) at the construction site. Sewage from ablution facilities should be contained in a septic tank and disposed of at the Keetmanshoop wastewater treatment plant.

- *Risks of groundwater contamination*

Groundwater is an important source of water in the Aroab area. Given the nature of the aquifer, (Kalahari Sequence), the groundwater table is very susceptible to pollution from the surface activities. Hence measures must be in place to prevent any form of contamination. The main source of groundwater pollution during the pipeline construction could result from poor handling of liquid waste and chemicals, fuel spills, or leaks.

Impact Type	Ratings (before mitigation/measures)				Significance	
	Extent	Duration	Intensity	Probability	Without measures	With measures
Negative	2	3	2	1	8	6

Measures

- ✓ No refuelling or fuel storage will be permitted within the watercourses.
- ✓ Drip trays should be provided for vehicles and machines with leakages.
- ✓ All construction vehicles must be serviced at the maintenance workshop and no offsite maintenance should be allowed.
- ✓ Refuelling of vehicles and machinery should be done at a designed transfer site supported with a bunding wall, big enough to contain 120% of the volume of the fuel tank.
- ✓ All leakages and spillages of oil and grease should be contained, cleaned up, and disposed of at the Keetmanshoop landfill site. Follow the spillage procedures as outlined in the EMP.

- *Land use effects*

The proposed pipelines are passing through farm camps and within the townlands. Land use competitions could occur due to vehicle movement and other construction-related activities. Other noticeable impacts could be noise, dust, and vibration generated from the construction site which could be a nuisance to the landowner, avifauna as well as wildlife and farm animals.

Impact Type	Ratings (before mitigation/measures)				Significance	
	Extent	Duration	Intensity	Probability	Without measures	With measures
Negative	2	1	2	2	7	5

Measures

- ✓ Permission should be obtained from the farm owner to access the farm camps.
- ✓ Construction works should be limited to daylight and no work should be allowed during odd hours.
- ✓ Construction materials i.e., pipes must be kept at the construction camps and only delivered when needed, rather than stacked onsite.
- ✓ Only use designated access roads.
- ✓ The construction site for the new ground level reservoir must be enclosed/barricaded.

- ✓ Erect warning signs at the construction site.
- ✓ The contractor must erect construction signage at the construction site.
- ✓ Construction vehicles must be driven by authorized drivers only.

- *Migrant construction workers and danger of HIV/AIDS and COVID-19*

Temporary construction activities may cause an influx of people from different parts of the country in search of employment opportunities. Migrant construction workers are likely to engage in casual relationships with locals. This will result in unplanned pregnancies and may contribute to the spread of HIV/AIDS, especially among youth and school children. Moreover, the movement of people from other parts of the country will contribute to the spread of the latest pandemic of COVID-19.

Impact Type	Ratings (before mitigation/measures)				Significance	
	Extent	Duration	Intensity	Probability	Without measures	With measures
Negative	2	2	1	2	7	5

Mitigation:

- ✓ Provide health education and awareness.
- ✓ Qualified locals should be given priority.
- ✓ Enforce Public Health COVID-19 General Regulations: Public and Environmental Health Act 2015 as amended.
- ✓ Conduct regular health check-ups.
- ✓ Non-local employees should be encouraged to return to their original residential areas after completion of the contract.

- *Occupational health and safety hazards*

Occupational health hazards are expected particularly for the construction workers who will be present at the site. Workers will be exposed to dust, vibrations, high noise levels, sun exposure (sunstroke), and dehydration during the summer months. The safety of the public may also be compromised by certain construction activities i.e., uncovered trenches, increase in traffic volume generation of dust, noise, and vibration.

Impact Type	Ratings (before mitigation/measures)				Significance	
	Extent	Duration	Intensity	Probability	Without measures	With measures
Negative	1	1	1	2	5	3

Mitigation:

- ✓ Employees must be provided with appropriate PPE.
- ✓ Employees must also be trained on the nature of their jobs and made aware of potential hazards at their workplace.
- ✓ Ensure that, there is a safety representative who is equipped with a first aid kit at the construction site.

- ✓ The construction site must be barricaded and out of bounds for the public and visitors.
- ✓ Only prepare trenches in short sections sufficient to be worked for a short period i.e., a week, and avoid leaving empty trenches for too long.
- *Impacts of laydown areas, workshops, and temporary camps*

Improper positioning of construction camps and workshops could result in several environmental impacts such as pollution and contamination of the soil from spills and leaks of oil and lubricants. Placing construction camps and workshops next to residential areas could result in a nuisance to the residents.

Impact Type	Ratings (before mitigation/measures)				Significance	
	Extent	Duration	Intensity	Probability	Without measures	With measures
Negative	1	1	1	2	5	3

Mitigation:

- ✓ The existing NamWater yard should be used as a storage yard, and for construction camps, and workshops.
- ✓ If for some reason other sites are considered, such sites must have impervious surfaces in line with Section 183 of the General Health Regulations (GN. 121 1969).
- ✓ Additional ablution facilities, including showers and a water closet with running water maybe required during the construction phase. The recommended ratio for toilets is 2 toilets for every 25 adults for separate for male and female as per the General Health Regulations (GN. 121 1969).
- ✓ The floor of the maintenance workshop should be covered with industrial mats to contain oil and grease from vehicles and equipment servicing.
- ✓ All operations should be limited to daylight and music played should not be at the discomfort of the neighbours.
- ✓ No alcohol may be permitted in the construction camps and workshops.
- ✓ Fireplaces should be properly secured and controlled.

- *Visual intrusion*

Visual impacts associated with the construction of the pipeline will occur because of the uncollected waste stockpile, unpacked construction materials, open trenches, and other facilities which makes the view of the site unappealing.

Impact Type	Ratings (before mitigation/measures)				Significance	
	Extent	Duration	Intensity	Probability	Without measures	With measures
Negative	2	1	1	2	6	4

Mitigation:

- ✓ Only excavate trenches in small sections, enough to be worked for a short period i.e., a week.
- ✓ Uncovered trenches should be barricaded with danger tapes to ensure public safety.
- ✓ The stripped topsoil must be backfilled carefully in position after the completion of the pipe laying.
- ✓ Waste generated should be collected and disposed of weekly. Excess sand from trenches should be regarded as waste.
- ✓ Construction materials should be properly stacked in one place.
- ✓ The construction area and construction camps and workshops should be kept neat as far as possible.

8.4 Anticipated negative impacts: operation and maintenance phase.

The operation and maintenance of the Aroab scheme will equally result in several negative impacts to the biophysical and socio-economic environment. These impacts are not expected to be of high significance provided that the proposed mitigation measures are implemented during the planning & design and construction phase.

Table 10: Negative Impacts during operation and maintenance

ASPECT	POTENTIAL IMPACTS	SIGNIFICANCE RATING (BEFORE MITIGATION)				SIGNIFICANCE (WITH MEASURES)	MEASURES
		Extent	Duration	Intensity	Probability		
1. BIOPHYSICAL	Disturbance to local flora and fauna may occur as a result of vehicle movement, especially in cases off-road driving.	1	1	1	1	4	<ul style="list-style-type: none"> ✓ Existing maintenance roads should be used as far as possible during maintenance. ✓ All vehicles should be driven at a minimum speed limit of 60km/hr. in town.
	Unattended pipe leaks in the wild could feed the germination of annuals and opportunistic plants which may include poisonous plants i.e., <i>Drimia Sanguinea (slagkop)</i> Such species could sprout faster than the perennial species and be the only green ones in the area, therefore tempting for farm animals.						

	Soil disturbances and contamination from spills and leaks.	1	1	1	1	4	<ul style="list-style-type: none"> ✓ Soil disturbance from this activity is expected to be minimal. ✓ Contaminated soil must be cleaned up and disposed of appropriately at the nearest dumpsite.
	Dust and noise pollution	2	1	1	1	4	<ul style="list-style-type: none"> ✓ Maintenance and repair will be concessionary, hence the limited impacts. ✓ All silencing mechanisms on all equipment must be in a good state of repair. ✓ All routine maintenance shall be restricted to daylight hours.
	Waste generation from operation and maintenance activities. This includes empty containers of disinfectants i.e. hth chlorine that is used in water treatment in the absence of chlorine gas.	2	1	1	1	5	<ul style="list-style-type: none"> ✓ General household waste should be disposed of in the refuse bins. ✓ Worn-out parts should be collected and sent to the local scrap yards if any or in the nearest town.

	Hazardous waste such as used oil, paints, unused chemicals, etc., will also be generated, although on a relatively small quantity.						<ul style="list-style-type: none"> ✓ All empty disinfectants containers should be sent to the local recycling companies or properly cleaned before re-use. ✓ All hazardous waste should be collected separately and disposed of appropriately at the nearest dumpsite.
	Disturbance to the natural flows within watercourses, including the main Aroab River, especially during rainy the season.	1	1	1	1	4	<ul style="list-style-type: none"> ✓ The pipeline section crossings within the watercourse should be buried. ✓ All trenches excavated during pipeline maintenance must be filled properly, and the area must be levelled.
	Groundwater contamination from spillages	1	1	1	1	4	<ul style="list-style-type: none"> ✓ Contaminated soil must be removed and disposed of appropriately at the nearest dumpsite. ✓ No refuelling or fuel storage should be permitted within the Aroab Riverbank.

2. SOCIO-ECONOMIC	Land-use effects i.e., disturbances from traffic movement.	1	1	1	1	4	<ul style="list-style-type: none"> ✓ NamWater should reach an agreement with the concerned farm owner to get permission to access the farm camps during maintenance. ✓ Use existing maintenance roads as far as possible ✓ No off-road driving should be allowed. ✓ All vehicles should be driven on a minimum speed limit 80km/hr., on gravel road and 60km/hr in town.
	Safety, security, and health hazards.	1	1	1	1	4	<ul style="list-style-type: none"> ✓ Employees should be equipped with appropriate PPE. ✓ All trenches should be covered after completion of maintenance work. ✓ Uncovered trenches must be barricaded with a danger tape. Restricted access encouraged.

8.5 Anticipated positive impacts

The proposed development will also result in several positive impacts during the construction and operation phases. However, certain enhancement measures must be implemented to fully realize such positive impacts.

Table 11: Anticipated positive impacts

ASPECT	POTENTIAL IMPACTS	SIGNIFICANCE RATING (BEFORE MITIGATION)				SIGNIFICANCE (WITH MEASURES)	MEASURES
		Extent	Duration	Intensity	Probability		
1.	<p>Job opportunities</p> <p>The proposed project will create job opportunities both direct and indirect for local people in technical and non-technical fields such as civil, electrical, mechanical, security, etc., especially during the construction phase.</p>	2	1	2	2	7	✓ As part of the tender requirements, Contractors must be encouraged to give priority to qualified locals if any.
	<p>Gender roles</p> <p>Equal opportunities for men and women.</p>	2	1	1	1	5	✓ Women must be afforded the same opportunities as men.
	<p>Business opportunities</p> <p>The construction works will create business opportunities for consultants, building contractors, and local suppliers of building materials. Other local businesses such as guest houses, and street vendors will also benefit indirectly from the construction works.</p>	2	1	2	2	7	✓ Building materials must be sourced from local businesses as far as possible. Qualified Namibian construction companies should be given a fair chance to compete in the bidding process.

<p>Economic prosperity</p> <p>During the construction phase, it is expected that the local economy will be beneficially impacted by increased temporary employment opportunities and business opportunities.</p> <p>Furthermore, the improved water supply will contribute to the growth of the local economy by attracting investments and development in the area.</p>	1	1	1	1	4	<ul style="list-style-type: none"> ✓ Local people and businesses must be given a fair chance to benefit from the project. ✓ There must be a water demand management plan for the area and all major economic activities proposed in the area should be subjected to the water demand management plan.
<p>Provision of water supply</p> <p>One of the significant positive impacts that will result from the proposed project is the improved water supply to the area. Hence, the increased supply capacity will ensure a reliable supply of safe drinking water to the Aroab village until 2036.</p> <p>However, on the other hand, the increased water supply due to the demand will put the source under pressure if not properly managed.</p>	2	1	1	1	4	<ul style="list-style-type: none"> ✓ Ensure timely fixing of leaks and breaks on the pipeline to minimise water supply interruptions. ✓ Residents must be sensitised to use water sparingly. ✓ NamWater should incorporate a system to smoothen the final product water as requested by the Aroab Village Council.

8.5.1 Decommissioning the existing ground level reservoir

Once the new ground level reservoir has been installed and commissioned, the existing collector ground level reservoir will be decommissioned and taken out of operation. The decommissioning and demolition of the existing reservoir will give rise to certain environmental impacts which should be managed by implementing mitigation measures as listed below.

Table 12: Potential impacts of demolishing the existing reservoir

Potential Impacts	Ratings (before mitigation/measures)				Significance		Mitigation measures
	Extent	Duration	Intensity	Probability	Without measures	With measures	
<p>Land-use effects</p> <p>Once the new reservoir is operational, demolishing the existing reservoir might cause disturbances to the neighbouring community.</p>	2	1	2	2	7	5	<ul style="list-style-type: none"> ✓ Erect warning signs at the worksite.
<p>Dust and Noise</p> <p>To be generated from demolishing works might constitute to a nuisance. This will be limited to project site.</p>	1	1	1	1	4	4	<ul style="list-style-type: none"> ✓ Work should be limited to daytime hours. ✓ Provide measures to control dust, noise.
<p>Waste generation</p> <p>The structural demolishing of the existing reservoir will generate waste.</p>	2	1	1	1	5	3	<ul style="list-style-type: none"> ✓ Building rubble and other general waste should be disposed of appropriately at Aroab disposal site. ✓ Steel and metals should be taken to local Scrapyards in the nearest town if any.

<p>Soil contamination from spills and leaks of lubricants and oil from vehicles, machinery, and equipment.</p>	1	1	1	2	5	3	<ul style="list-style-type: none"> ✓ All vehicles and machinery with leakage should be provided with drip trays. ✓ Contaminated sand must be cleaned up and disposed of appropriately at the nearest dumpsite.
<p>Safety and health hazards</p> <p>The safety of the community living in proximity of the site and the employees could be compromised by workplace hazards.</p>	2	1	1	1	6	4	<ul style="list-style-type: none"> ✓ Erect warning signs at the construction work site. ✓ The site should be fenced off and out of bound. ✓ All employees should be equipped with appropriate PPE. ✓ Prohibition and access restricted signs should be displaced at the site.

9. CONCLUSION AND RECOMMENDATIONS

9.1 Conclusion

The objective of the Scoping phase of the EIA study was to define the range of the environmental impact assessment and to determine the need to conduct any specialist study. It is believed that this objective has been achieved and the study can be concluded at the Scoping level. The following conclusions have become apparent from this study:

- The existing supply pipeline from boreholes WW7444 via WW7437, as well as the existing ground level collector reservoir in town are in deteriorated state and need an urgent replacement. The source capacity of the current Aroab scheme was only adequate until 2021, thus it is below the current and future demand of the area.
- The proposed works entails the installation and commissioning of two existing boreholes BH29114 and BH29115, construction of a supply pipeline from these boreholes and construction of a new 500 m³ ground level collector reservoir in town.
- Once extended and upgraded, the capacity of the Aroab scheme will be sufficient to supply water until 2036.
- The existing ground level reservoir will be decommissioned once the new reservoir is commissioned, and a switchover will be done without causing any interruption of the water supply.
- The water supplied to the Aroab town was found to be too strong for human consumption and caused serious damages to the infrastructure. The Aroab Village Council is already in possession of a SeQuester machine which could be used to sequester the water. The SeQuester machine could be incorporated in the NamWater's water treatment system.

Moreover, all possible environmental aspects associated with the proposed activities have been adequately assessed and documented in the Scoping Report. Hence, there is no need for a specialist study. Since there were no objections received from the I&APs or stakeholders, it is assumed that the proposed project is well received by all. All necessary control, mitigation and monitoring measures have been formulated to meet statutory requirements and are contained in this Scoping Report and the EMP (Annexure D).

9.2 EAP recommendations

a) Recommendations to the Proponent (NamWater)

- The proposed above ground pipeline from boreholes BH29114 via BH29115 should be buried at the section within the townlands to safeguard the pipe from damages, vandalism, and for easy access for the future township developments.
- NamWater should register servitude for the new pipelines and should obtain approval from RA to register the servitude for the section of the pipeline within the C16 road reserve.
- As per the official request from the Aroab Village Council, NamWater should consider incorporating a sequestration system to smoothen the product water. The existing sequestration machine which belongs to the Aroab Village Council can be adopted for this purpose.

b) Recommendation to DWA and DEA

- Approve the findings of the Scoping process and mitigation measures contained in the Scoping.
- When deemed necessary, attach any condition/s to ensure environmental compliance and for the proposed project to meet statutory requirements.
- Authorize the issuance of the ECC to NamWater Ltd., for the construction, operation, maintenance, and decommissioning of the Aroab scheme extension and upgrade, //Karas Region.

10. REFERENCES

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11. APPENDICES

11.1 Appendix A: Preliminary Design Report

11.2 Appendix B: Proof of Consultations

11.3 Appendix C: Aroab Village Council Consent Letter

11.4 Appendix D: EMP