



Submitted to: Cleanergy Solutions Namibia (Pty) Ltd
Attention: Ms Gloudi De Beer
P O Box 16, Windhoek
7th floor, South Block
23-33 Fidel Castro Street
Windhoek,
Namibia

REPORT:

DRAFT SCOPING REPORT FOR THE CONSTRUCTION OF A GREEN HYDROGEN PIPELINE FROM ARANDIS TO FARM 58, ERONGO REGION, NAMIBIA

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Client Name:	Ms Gloudi De Beer
Ministry Reference:	APP-002568
Authors:	Kelly Ochs, Samuel Shinyemba and Stephan Bezuidenhout
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ENVIRONMENTAL COMPLIANCE CONSULTANCY CONTACT DETAILS:

We welcome any enquiries regarding this document and its content. Please contact:



Environmental Compliance Consultancy (Pty) Ltd

PO Box 91193, Klein Windhoek, Namibia

Tel: +264 81 669 7608

Email: info@eccenvironmental.com

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EXECUTIVE SUMMARY

Environmental Compliance Consultancy (Pty) Ltd (ECC) has been appointed by Cleanergy Solutions (Pty) Ltd (the Proponent) as the environmental assessment practitioner (EAP) to conduct an environmental and social impact assessment (ESIA) for the proposed construction of a green hydrogen pipeline (80 km) from Arandis to Farm 58, in the Erongo Region, Namibia. Cleanergy Solutions Namibia (Pty) Ltd is a joint venture between Ohlthaver & List (O&L) Group and CMB.Tech. The Ohlthaver & List (O&L) Group is the largest privately owned consortium in Namibia, with an operational track record spanning over a century and covering a diverse number of industries. CMB.TECH, is a Belgium based company specialising in the design, construction and operations of large marine and industrial modes of transportation that utilise hydrogen and ammonia.

The proposed green hydrogen pipeline project is intended to store and transport up to 15 000 m³ of hydrogen daily from Arandis to the ammonia production plant on Farm 58. Ammonia produced at the production plant will then be transported to the ammonia terminal at the Walvis Bay port area via the ammonia pipeline.

In terms of the Namibian Environmental Management Act, 2007 and its 2012 regulations, the Ministry of Mines and Energy (MME) is the competent authority for the proposed Project. The proposed project trigger listed activities in terms of the EMA, and as such, requires an environmental clearance certificate.

SCREENING PHASE

The first step in the ESIA process is to register the Project with the Department of Environmental Affairs (DEA)/Ministry of Environment, Forestry and Tourism (MEFT) (completed) followed by a screening exercise to determine which listed activities under the Environmental Management Act, No. 7 of 2007 and associated regulations are triggered, and if significant impacts may arise from the Project. The location, scale, and duration of Project activities will be considered against the receiving environment.

The screening phase determined that the most likely potential environmental and social impacts could include:

- Noise impacts
- Air quality, including dust emissions
- Visual impacts affecting the sense of place
- Impacts on heritage and culture
- Traffic impacts off-site
- Impacts on biodiversity
- Archaeological/heritage impacts
- Impacts on surface and groundwater resources

- Economic and socio-economic impacts, e.g., employment opportunities, contribute to green fuel economy and reduction of greenhouse gas emissions

SCOPING PHASE

The objective of the scoping phase was to obtain a thorough understanding of the biophysical and socioeconomic environment in which the Project is located, using baseline and specialist studies. It also provided an opportunity for the public to have input into the scope of the assessment. The technical inputs combined with the inputs from the I&APs led to the development of the Terms of Reference (ToR) for the assessment phase. A desktop and literature research and specialists' input were considered during the preparation of the scoping report.

TERMS OF REFERENCE

The ToR within the scoping report was proposed for the assessment phase and covered the following:

Socio-economic assessment

A socio-economic study will be conducted to assess the impact of the project on the current socio-economic state of the locals and impacts on a regional and national scale.

Visual assessment

The assessment to be conducted will include a study of the visual impacts considered, such as pipeline visibility, infrastructure, and construction activities and its effects on the local tourist businesses and residential areas. The assessment will also take into consideration the landscape impacts.

Health and Safety assessment

The objective is to assess potential health and safety impacts associated with the construction and operation of the hydrogen pipeline project. The assessment will identify hazards, evaluate risks associated with hydrogen handling and pipeline operations (e.g., flammability, leaks), and recommend measures to mitigate and manage health and safety concerns.

Climate change assessment

A climate change assessment will assess the emission baseline of the biophysical environment and formulate recommendations for the management or mitigation of any potential impacts that the Project may contribute to climate change. Additionally, contribute to the potential benefits of the project to the set climate change objectives/goals.

Air quality

The assessment will include a study of the legal requirements pertaining to air quality applicable to international legal guidelines, limits and dust control regulations.

Noise quality

The objective is to assess the potential noise impacts of the proposed project on surrounding sensitive receptors, including residents, businesses, and the tourism sector.

Traffic assessment

A traffic assessment will assess the implications relevant to the project regarding additional vehicles on the current D1984, C28 and B2 road.

Biodiversity assessment

The objective of the biodiversity assessment will be to assess the bio-physical (vertebrate fauna & flora) issues relevant to the project and assess the significance of development and environmental impact that the project may have on the vertebrate fauna and flora at the proposed site including general comment. A visit to the proposed project pipeline routes (applicable portions only) will be conducted to assess the development site, identify sensitive areas and recommend the best pipeline route for the project that is unlikely to trigger significant impacts.

Heritage assessment

A heritage assessment will be required to comply with the Namibian national legislature, including the National Heritage Act, 2004 (Act No 27 of 2004) and the National Heritage Regulations (if applicable), Government Notice (GN) 3490 of 2005. The study will identify any archaeological artifacts/objects which likely warrant protection under the Heritage Act.

Groundwater and surface water assessment

To assess the potential hydrology and hydrogeological issues relevant to the Project and assess the significance of the operational and environmental impacts that the Project may have on the hydrological and hydrogeological systems along the proposed pipeline. This study will give recommendations so that the final pipeline design does not disrupt the natural surface and groundwater flow regimes.

Additionally, the scoping report defines the impact methodology for the impact assessment phase of the ESIA, the method to be used for the impact assessment is detailed in Chapter 6 of this report. The evaluation and identification of the environmental and social impacts require the assessment of the Project characteristics against the baseline characteristics, ensuring that all potentially significant and cumulative impacts are identified and assessed.

The next stage of this assessment is to conduct the impact assessment, incorporating the specialist impact assessments as well as updating the preliminary ESMP. All I&APs comments

will be responded to, by providing an explanation or further information in the response table, which will be attached as an addendum report to this final scoping report. Public participation throughout the ESIA process and stakeholder feedback is a critically importance part of an ESIA process and as such will be incorporated throughout the ESIA process.

Once finalised, prior to formal submission, the final ESIA report and appendices, including relevant specialist reports, will be made available to all registered I&APs and stakeholders for review and commentary.

The ESIA report and appendices will be formally submitted to the competent authorities, first the MME and then to the MEFT as part of the application for an environmental clearance certificate for the Green Hydrogen Pipeline Project. The phases of the ESIA are provided in Figure 1.

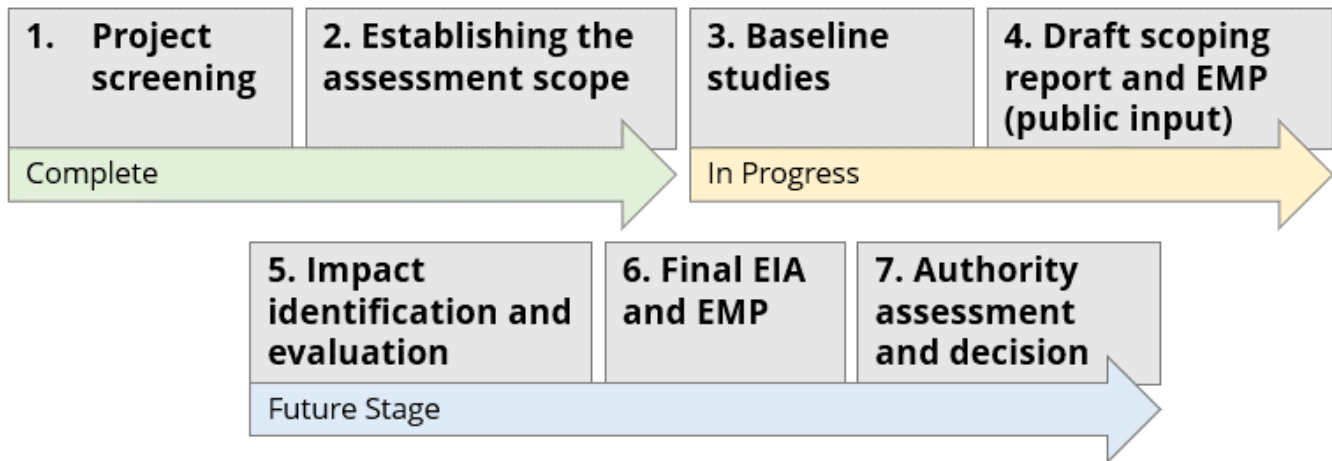


Figure 1 – Simplified phases of the Green Hydrogen Pipeline Project ESIA process.

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ABBREVIATIONS

Abbreviation	Description
%	percentage
~	approximately
°C	degree celcius
AS	Australian Standard
ASME	American Society of Mechanical Engineers
BID	background information document
Cleanergy Solutions	Cleanergy Solutions Namibia (Pty) Ltd
CMB.TECH	Compagnie Maritime Belge
CBNRM	Community-based natural resources management
DEA	Directorate of Environmental Affairs
EAP	environmental assessment practitioner
ECC	Environmental Compliance Consultancy (Pty) Ltd
EEZ	Exclusive Economic Zone
e.g.	for example
EMA	Environmental Management Act, No. 7 of 2007
ENE	east northeast
EPC	engineering, procurement and construction
ErongoRED	Erongo Regional Electricity Distributor Company (Pty) Ltd
ESMP	Environmental and social management plan
ESIA	environmental and social impact assessment
FSA	Functional Safety Assessment
GDP	gross domestic product
GHGs	greenhouse gases
GIS	geographic information system
GN	government notice
ha	hectares
HDD	horizontal directional drilling
HIV	human immunodeficiency virus
I&APs	interested and affected parties
i.e.	that is
IEC	International Electrotechnical Commission
IFC	International Finance Corporation
JV	joint venture
Km ²	square kilometre
km	kilometre
km/h	kilometre per hour

Abbreviation	Description
kg/h	kilogram per hour
Ltd	limited
m ³	cubic metres
m	metre
mm	millimetre
MAOP	maximum average operating pressure
MEFT	Ministry of Environment, Forestry and Tourism
MIT	Ministry of Industrialisation and Trade
MME	Ministry of Mines and Energy
MPa	megapascal
MoHSS	Ministry of Health and Social Services
MURD	Ministry of Urban and Rural Development
NACSO	Namibian Association of CBNRM Support Organisation
NamPower	Namibia Power Corporation
NAMCOR	National Petroleum Corporation of Namibia
NamPort	National Port Authority
NCCSAP	National Policy Climate Change Strategy and Action Plan
NDC	Nationally Determined Contribution
NDP5	fifth National Development Plan
NPC	National Planning Commission
O&L	Ohlthaver & List Group
PHC	primary healthcare
PS	performance standard
Pty	proprietary
QGIS	Quantum Geographic Information System
RH	relative humidity
RoD	Record of Decision
ROW	right-of-way
SANS	South Africa National Standard
SDGs	sustainable development goals
SOP	standard operating procedures
SW	southwest
ToR	Terms of Reference
UNCLOS	United Nations Law of the Sea Convention
UNFCCC	United Nations Framework Convention on Climate Change
WWF	World Wide Fund

1 INTRODUCTION

1.1 COMPANY BACKGROUND

Environmental Compliance Consultancy (Pty) Ltd (ECC) has been appointed by Cleanergy Solutions Namibia (Pty) Ltd (hereinafter referred to as the Proponent or Cleanergy Solutions) as the environmental assessment practitioner (EAP) to conduct an environmental and social impact assessment (ESIA) and an environmental and social management plan (ESMP) for the proposed construction of a green hydrogen¹ pipeline from Arandis to Farm 58, Erongo Region, Namibia.

Cleanergy Solutions Namibia (Pty) Ltd is a joint venture between Ohlthaver & List (O&L) Group and CMB.Tech. The Ohlthaver & List (O&L) Group is the largest privately owned consortium in Namibia, with an operational track record spanning over a century and covering a diverse number of industries. CMB.TECH is a Belgium company specialising in the design, construction and operations of large marine and industrial modes of transportation that utilise hydrogen and ammonia. It forms an integral part of Compagnie Maritime Belge which is a family-owned shipping group, founded in 1895.

Cleanergy Solutions Namibia is intending on becoming a driving force in the growth of the Namibia's hydrogen economy, while contributing to the global shift for industrial decarbonisation. The organisation is in the process of finalising the construction of the first hydrogen demonstration plant in Namibia, with first production intended for the latter part of 2024.

The proposed 80 km green hydrogen pipeline forms a key part of the broader hydrogen and ammonia² infrastructure development. It will be constructed between Arandis and Farm 58 in the Erongo Region, Namibia (Figure 2) running parallel the B2 national road. The B2 connects Arandis with Swakopmund and Walvis Bay. From Swakopmund, the pipeline will turn onto the D1984 corridor road to Farm 58.

¹ Green hydrogen refers to hydrogen produced using renewable energy sources, specifically through a process called electrolysis. In electrolysis, an electric current powered by renewable sources like solar or wind energy splits water (H₂O) into its constituent elements, hydrogen (H₂) and oxygen (O₂). This method results in hydrogen production with a near-zero carbon footprint, as opposed to traditional methods that rely on fossil fuels and release greenhouse gases.

² Green ammonia production replaces the fossil fuel-based hydrogen source with green hydrogen (hydrogen produced from renewable energy sources through electrolysis). This significantly reduces the carbon footprint of ammonia production. Green ammonia is considered a potential carbon-neutral energy carrier and an essential ingredient in green fertilizers.

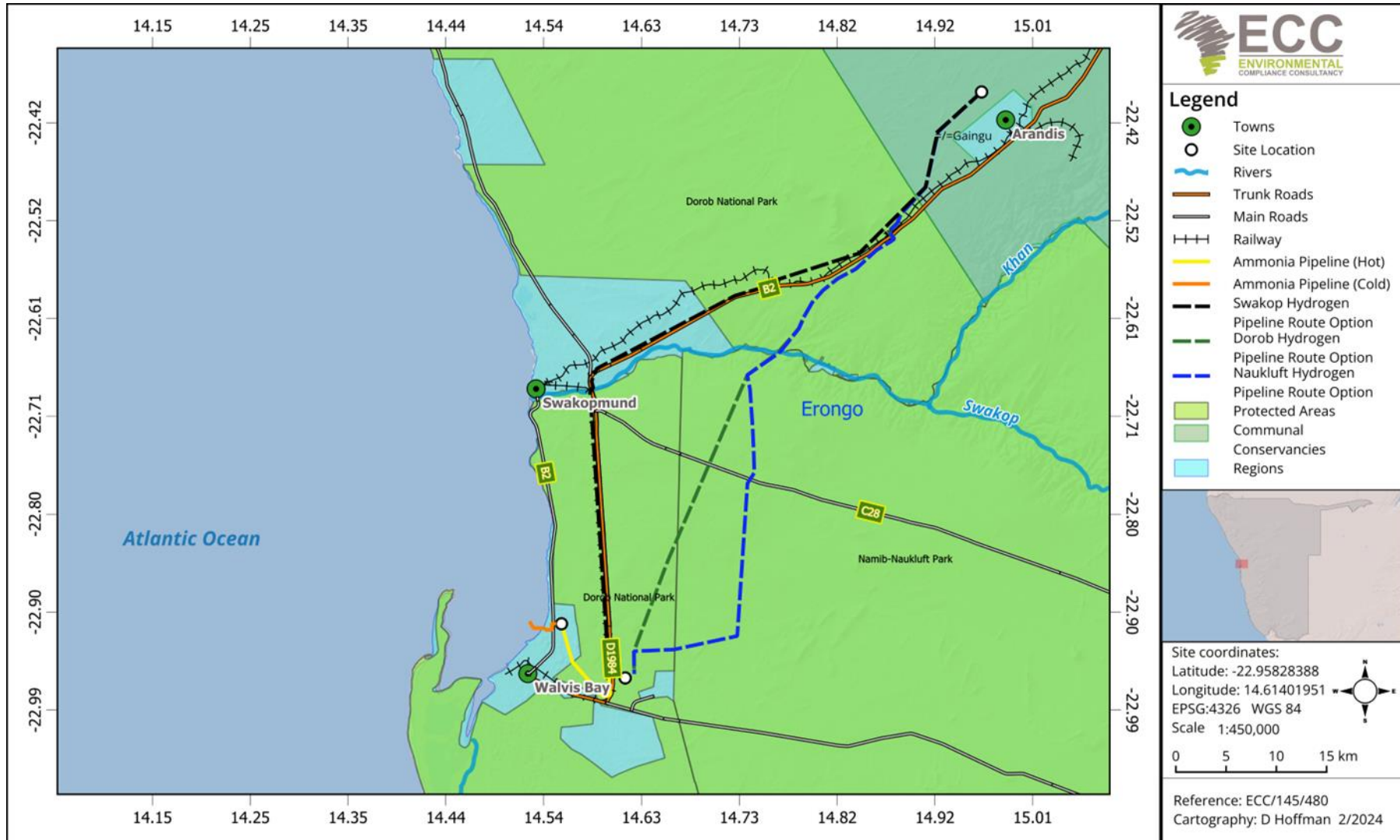


Figure 2 - Locality map of the project.

1.2 PURPOSE OF THE SCOPING REPORT

An environmental and social impact assessment (ESIA) has commenced in compliance with the requirements of the Environmental Management Act, No. 7 of 2007 (EMA), and its 2012 regulations. This report aims to present the findings of the scoping study phase that forms part of the larger ESIA process.

The scoping report summarises the prescribed ESIA process, provides information on the baseline biophysical and socio-economic environments, details the project description, outlines the terms of reference for the assessment phase, and presents a preliminary ESMP (Appendix A).

Public participation is a critical aspect of the ESIA process. The scoping report and appendices will be made available for public review and comment, allowing stakeholders to provide valuable input. The revised scoping report with public input will be submitted to the Ministry of Mines and Energy (MME) as the competent authority for the Project, after which it will be submitted to the Ministry of Environment, Forestry and Tourism (MEFT) - Directorate of Environmental Affairs (DEA) for a record of decision (ROD). The ROD will determine the next stage of the project, if it can proceed or otherwise, and if conditions are to be attached to the ROD.

1.3 THE PROPONENT OF THE PROPOSED PROJECT

Cleanergy Solutions Namibia (Pty) Ltd is the Proponent for the proposed Project. The Proponent has an option to buy a portion of land from Arandis Town Council in the Trekoppje area. This area will be used for the hydrogen production plant and associated solar plant, from which the hydrogen pipeline will transport green hydrogen to the ammonia production plant at Farm 58 near Walvis Bay. A servitude will need to be registered for the pipeline once all the necessary approvals has been granted and the route finalised.

Cleanergy Solutions Namibia (Pty) Ltd was formed in 2021 and duly registered in Namibia. It is a joint venture between the Olthaver & List Group of Companies and CMB.TECH with the latter holding 49% shares and the former holding 51%. The company is already in the process of constructing a hydrogen demonstration plant on Farm 58 outside Walvis Bay. The JV has interests in three interrelated proposed projects, namely: a 12.7 km green ammonia pipeline, the 80 km green hydrogen pipeline project and an ammonia storage terminal project near the Walvis Bay port area. The Proponent details are provided in Table 1.

Table 1 – The Proponent’s contact details.

Company Representative:	Contact Details:
Ms Gloudi De Beer Group Manager: Environment and Sustainability	Ohlthaver & List Group: P O Box 16, Windhoek 7 th floor, South Block 23-33 Fidel Castro Street

	Windhoek, Namibia Gloudi.DeBeer@ol.na +264 (61) 207 5382
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1.4 ENVIRONMENTAL SOCIAL ASSESSMENT PRACTITIONER

Environmental Compliance Consultancy (Pty) Ltd (ECC) (Reg. No. 2022/0593) has prepared this draft scoping report and the preliminary ESMP following relevant national regulations and international best practises on behalf of the Proponent.

This report has been authored by employees of ECC, who have no material interest in the outcome of this report, nor do any of the ECC team have any interest that could be reasonably regarded as being capable of affecting their independence in the preparation of this report. ECC is independent from the proponent and has no vested or financial interest in the project, except for fair remuneration for professional fees rendered based upon agreed commercial rates. Payment of these fees is in no way contingent on the results of this report, the assessment, or a record of decision issued by the Government. No member or employee of ECC is, or is intending to be, a director, officer, or any other direct employee of Cleanergy Solutions Namibia (Pty) Ltd. No member or employee of ECC has, or has had, any shareholding in Cleanergy Solutions Namibia (Pty) Ltd.

All compliance and regulatory requirements regarding this report should be forwarded by email or posted to the address as set out in Table 2.

Table 2 – The EAP contact details.

Environmental and Social Impact Assessment Practitioner	Contact Details
Environmental Compliance Consultancy (Pty) Ltd	P O Box 91193, Klein Windhoek, Namibia Tel: +264 81 669 7608 Email: info@eccenvironmental.com

1.5 ENVIRONMENTAL REQUIREMENTS

The Environmental Management Act, No. 7 of 2007, and its regulations promulgated in 2012, stipulate that an environmental clearance certificate is required before undertaking any of the listed activities that are identified in the Act and its regulations. Table 3 lists the potential activities associated with the Project that are subject to the requirements of the Environmental Management Act.

Table 3 - Activities potentially triggered by the proposed Project.

Source: Environmental Management Act, 2007, and its 2012 regulations.

Listed activity	As defined by the regulations of Act	Relevance to the project
Energy generation, transmission and storage activities	(1.a) The construction of facilities for the generation of electricity. (1.b) The construction of facilities for the transmission and supply of electricity	<ul style="list-style-type: none"> - Power supply may be required for basic needs of temporary facilities during the project such as office space, toilets, temporal storage facilities. - The project includes the construction of a solar power plant near Arandis to provide green energy. - Power supply may be obtained from a local electricity distributor for basic needs during the construction phase.
Waste management, treatment, handling and disposal activities	(2.3) The import, processing, use and recycling, temporary storage, transit or export of waste.	<ul style="list-style-type: none"> - During construction, material waste (e.g. plastics, rubber and glass) may be produced and temporarily stored on-site. - General construction waste will be produced and will be handled and disposed of appropriately. - A waste management plan will be developed and followed on-site.
Hazardous substance treatment, handling and storage	(9.1) The manufacturing, storage handling, or processing of a hazardous substance defined in the Hazardous Substances Ordinance, 1974.	<ul style="list-style-type: none"> - Approximately 22-inch carbon steel pipeline will store up to 15 000 m³ of hydrogen which will be transported at a

Listed activity	As defined by the regulations of Act	Relevance to the project
	<p>(9.2) Any process of activity which requires a permit, licence or other form of authorisation, or the modification of or changes to existing facilities for any process or activity which requires an amendment of an existing permit, licence or authorisation or which requires a new permit, licence or authorisation in terms of a law governing the generation or release of emissions, pollution, effluent or waste.</p> <p>(9.4) The storage and handling of dangerous goods, including petrol, diesel, liquid petroleum gas or paraffin, in containers with a combined capacity of more than 30 cubic meters at any one location.</p>	<p>mass flow of 10 tons/h to the ammonia production plant daily.</p> <ul style="list-style-type: none"> - There will be constant monitoring with a fibre optic cable of possible leakages points, pressure switches and vibrations (external digging). These systems will be monitored from Arandis and Farm 58. - Hydrogen gas is a combustible and flammable fuel and is therefore a hazardous substance. Therefore, the relevant permits relating to the handling of hydrogen will be acquired from the National Radiation Protection Authority, under the Ministry of Health and Social Services (MoHSS).
Infrastructure	10.1 (a) The construction of oil, water, gas and petrochemical and other bulk supply pipelines	<ul style="list-style-type: none"> - The 80 km green hydrogen pipeline will be constructed from Arandis to Farm 58.

2 APPROACH TO THE ASSESSMENT

2.1 PURPOSE AND SCOPE OF THE ASSESSMENT

This assessment aims to determine which impacts are likely to be significant, to scope the available data and identify any gaps that need to be filled, to determine the spatial and temporal scope, and to identify the detailed assessment methodology.

The scope of the assessment was determined by undertaking a preliminary assessment of the proposed Project against the receiving environment, obtained through a desktop review and available site-specific literature. The initial assessment findings were that the proposed project may be associated with visual impacts, potential disturbance to faunal habitats, potential removal of flora species likely to be encountered within the pipeline corridor, potential disturbance to objects of heritage significance and health and safety concerns to the workforce/receiving environment should there be leakages from the pipeline.

The public consultation process commenced in March 2024 and public meetings were held in Walvis Bay, Swakopmund and Arandis. Inputs raised by I&APs and key stakeholders within the region will be considered in determining the scope of the assessment.

2.2 THE ASSESSMENT PROCESS

The ESIA methodology applied to this assessment is compliant with Namibia's EMA 2007 which is applicable to all projects including marine areas located within Namibia's Territorial Waters and Exclusive Economic Zone (EEZ) (Territorial Sea and Exclusive Economic Zone of Namibia Act 3 of 1990). The ESIA methodology has been developed using the International Finance Corporation (IFC) standards and models Performance Standard (PS) 1: 'Assessment and management of environmental and social risks and impacts' (International Finance Corporation, 2012 and 2017) as a guideline, as well as Namibian Draft Procedures and Guidance for EIA and EMP (Republic of Namibia 2008); international and national best practice guidelines and combined relevant ESIA experience from the core project team.

This assessment is a formal process whereby the potential positive and negative effects that the Project may have on the biophysical, social and economic environments are identified, assessed and reported, so that the significance of potential impacts can be taken into account when considering a record of decision for the proposed Project. Final mitigation measures and recommendations are based on the cumulative experience of the consulting team and the client, taking into consideration the potential environmental and social impacts. The process followed, through the assessment, is illustrated in Figure 3 and is detailed further in the following sections.

2.3 SCREENING OF THE PROJECT

The first stages in the ESIA process are to register the Project with the DEA/MEFT (completed) and undertake a screening exercise to determine whether it is considered a listed activity under the Environmental Management Act, No. 7 of 2007 and associated regulations, and if significant impacts may arise from the Project. The location, scale, and duration of Project activities will be considered against the receiving environment. The ESIA process is shown in Figure 3.

The screening phase determined that the project would likely trigger or associated with impacts such as visual impacts, traffic impacts (likely during the construction phase), potential contamination or pollution of surface and groundwater resources, noise impacts (during construction), dust generation, impacts on faunal habitats and pristine flora species of the desert environment, health and safety to the occupational workforce and socioeconomic environment. These are significant impacts and trigger listed activities of the EMA and thus a full ESIA study is required.

1. Project screening	2. Establishing the assessment scope	3. Baseline studies
Complete	Complete	In Progress
<p>The first stages of the ESIA process are to undertake a screening exercise to determine whether the Project triggers listed activities under the Environmental Management Act No.7 of 2007 and its 2012 regulations. The screening phase of the Project is a preliminary analysis, to determine ways in which the Project might interact with the biophysical and economic environments.</p> <p>Stakeholder engagement:</p> <ul style="list-style-type: none"> • Registration of the project • Preparation of the BID 	<p>Where an ESIA is required, the second stage is to scope the assessment. The main aim of this stage is to determine which impacts are likely to be significant; to scope the available data and any gaps that need to be filled; to determine the spatial and temporal scope; and to identify the assessment methodology.</p> <p>The scope of this assessment was determined through undertaking a preliminary assessment of the proposed Project against the receiving environment. Feedback from consultation with the public and the Proponent informs this process. The following environmental and social topics were scoped into the assessment, as there was the potential for significant impacts to occur. Impacts that are identified as potentially significant during the screening and scoping phase are taken forward for further assessment in the ESIA process. These are:</p> <p>SOCIOECONOMIC ENVIRONMENT</p> <ul style="list-style-type: none"> • Employment • Community health, safety and security on-site and off site • Positive socioeconomic impacts- green energy • Visual impacts on sense of place <p>BIOPHYSICAL ENVIRONMENT</p> <ul style="list-style-type: none"> • Noise and air quality, including dust emissions • Road traffic • Biodiversity • Heritage and culture • Mine waste characterisation • Climate change 	<p>A robust baseline is required, in order to provide a reference point against which any future changes associated with a Project can be assessed, and to allow suitable mitigation and monitoring to be identified.</p> <p>The region and general area has been surveyed and studied for various projects and assessments. This literature was available to be referenced. The Project site-specific area has been studied as part of the ESIA process, and the following has been conducted as part of this assessment:</p> <ul style="list-style-type: none"> • Field surveys (on-going) • Desktop studies • Consultation with stakeholders • Specialist field visits, monitoring, and studies (on-going) <p>The environmental and social baselines are provided in this scoping study.</p>



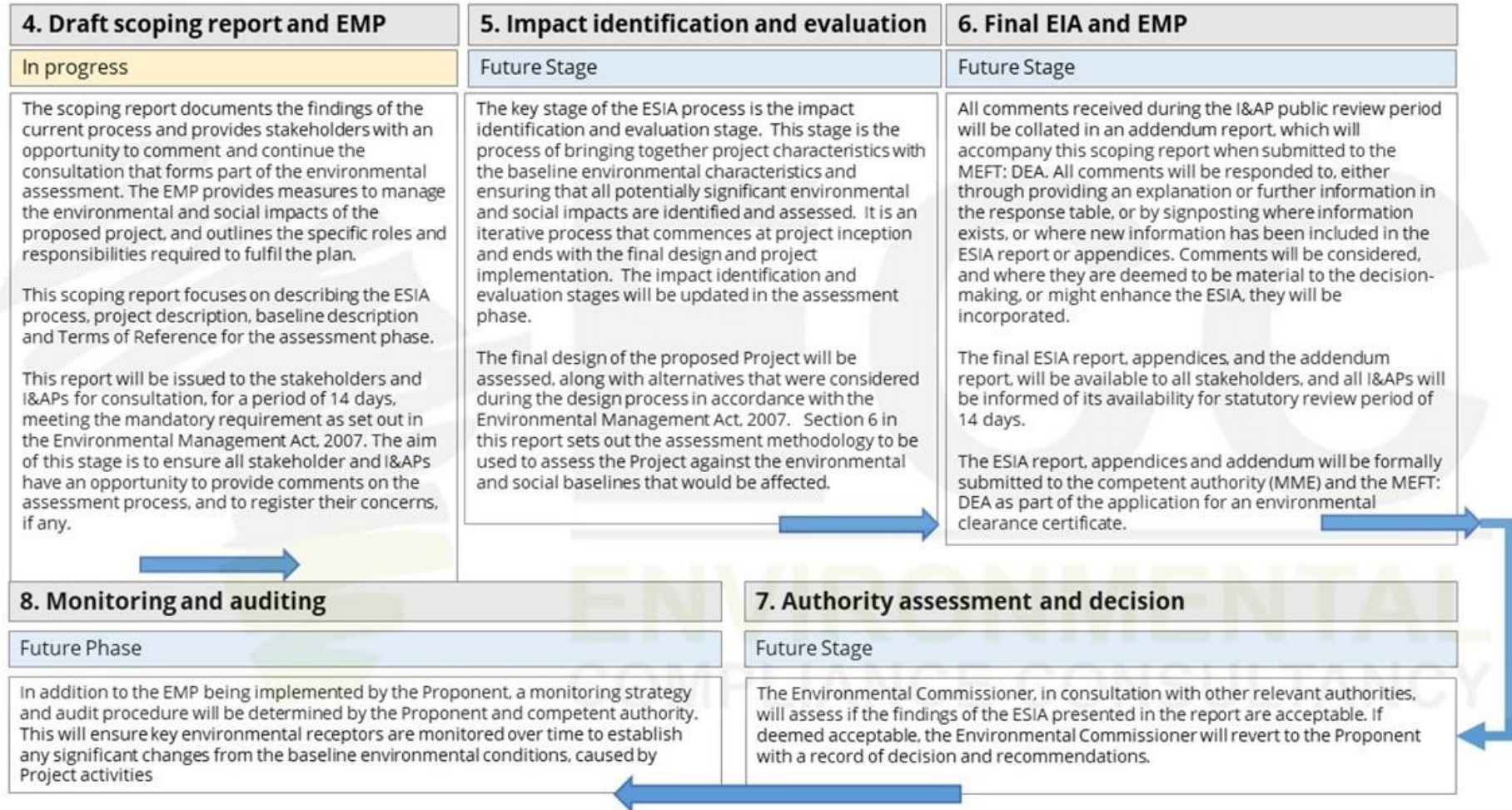


Figure 3 – ESIA process and stages completed.

2.4 STUDY AREA

This ESIA study area has been defined according to the geographic scope of the receiving environment and potential impacts that could arise because of the Project. The geographical boundaries of the study area span from areas under communal supervision of the locals to exclusive and pristine environments that are under government supervision and management. The pipeline is anticipated to have a skeleton corridor, therefore a 1 km buffer was set to determine the extent of study area of the proposed pipeline and the alternative routes. Additionally, the pristine desert environment, ecological features, community locations, and other corridors of development were guiding tools employed in determining the study area boundaries. This will aid in sourcing out direct, indirect and cumulative impacts likely to be triggered by the project.

The receiving environment is a summary term for the biophysical and socioeconomic environment that is described in chapter 5 of this report. Alternative pipeline routes are being investigated to the desired option has the least adverse impacts on the environment. The study area is presented in Figure 4.



Figure 4 – The Project study area map.

2.5 PUBLIC CONSULTATION

Public participation and consultation are a requirement as stipulated in the Environmental Impact Assessment Regulations (Regulations 21 and 23) of the EMA, No.7 of 2007 for any project undertaking a listed activity and of which an environmental clearance certificate is sought. Consultation is a

compulsory and critical component of the assessment process for achieving transparent decision-making and can provide a better public perception and reception on the Project. Consultation is ongoing during the ESIA process.

The objectives of the public participation and consultation process are to:

- Identify and engage the relevant government, regional, and local regulating authorities (key stakeholders) to gain insights and increase support- leading to better Project outcomes;
- Provide Project information to the public and competent authorities, introducing the overall project concept and planning in the form of a background information document (BID);
- Capture community issues, record concerns and questions for inclusion in the ESIA study; and
- To explain the ESIA process, the timeframes involved and establish a platform for ongoing consultation.

Public consultation for the Project commenced on 04 March 2024 when stakeholder letters were distributed to focus groups and identified key stakeholders and potentially interested and affected parties (IAPs). Public meetings were deemed necessary by the EAP and the Proponent in order to broaden the scope of the impact assessment. Public meetings were held in Walvis Bay, Swakopmund and Arandis from the 12th - 14th of March 2024. These towns were chosen based on the current scope of influence of the project. The EAP will maintain a high level of engagement throughout the ESIA process as more public and stakeholder engagement meetings will be scheduled during the impact assessment phase.

Matters raised by registered I&APs in relevant stakeholder consultations and the public meetings in Walvis Bay, Swakopmund and Arandis are considered typical for the nature, location and scale of project. The concerns raised relevant to the proposed hydrogen pipeline project are such as:

- Potential safety hazards, safety measures and emergency preparedness plans.
- Potential visual impacts on surrounding residents and tourism.
- Potential risk of hydrogen leakages on the biophysical environment.
- Impacts on sensitive and national protected areas.
- Potential risks associated with pipeline material, design and proximity to other pipelines.
- Lack of national legislation, standards and local regulations to guide various elements of the Project.
- Potential local, regional and national socioeconomic benefits.

The Project adverts and public meetings invitations were placed in local newspapers on the 29th of February and 07 March 2024. The notice and adverts (refer to the public consultation document provided in Appendix B) were placed in the following local newspapers:

- The Republikein;
- The Namibian Sun; and

- Allgemeine Zeitung.

2.5.1 IDENTIFICATION OF KEY STAKEHOLDERS AND INTERESTED AND AFFECTED PARTIES

A stakeholder mapping exercise was undertaken to identify individuals or groups of stakeholders and the method by which they will be engaged during the ESIA process.

Stakeholders were approached through direct communication (i.e. letters and phone calls), indirectly through national press, and directly by email. A summarised list of stakeholders for this project is given below:

- Neighbouring businesses;
- Affected and surrounding conservancies;
- The general public with an interest in the Project;
- Ministry of Environment, Forestry, and Tourism (MEFT);
- Ministry of Mines and Energy (MME);
- Ministry of Agriculture, Water and Land Reform (MAWLR);
- Ministry of Health and Social Services (MoHSS);
- Ministry of Industrialisation and Trade (MIT);
- Ministry of Urban and Rural Development (MURD);
- Ministry of Defense and Veteran Affairs;
- Walvis Bay International Airport;
- National Planning Commission (NPC);
- Namib Naukluft Park;
- Dorob National Park;
- #Gaingu Conservancy;
- NAMCOR;
- NamPort;
- NACSO;
- Erongo Regional Council;
- Walvis Bay Town Council;
- Walvis Bay Municipality;
- Swakopmund Town Council;
- Swakopmund Municipality; and
- Arandis Town Council.

The records of the public consultation process in the form of a summary report are provided in Appendix B and include a list of interested and affected parties (I&APs), evidence of consultation, including notes of public meetings, advertisements in national newspapers, and a summary of the comments or questions raised by the public.

3 REVIEW OF THE LEGAL ENVIRONMENT

This chapter outlines the regulatory framework applicable to the proposed Project. As stated in Chapter 1, an environmental clearance certificate is required for any activity listed in the Government Notice No. 29 of 2012 of the EMA. The proposed Project is within Namibia's maritime zones and bounded by environmental protected areas (i.e. Dorob National Park, #Gaingu Conservancy and Namib-Naukluft Park). Therefore, a comprehensive scoping and impact assessment will need to be undertaken to assess the significance of potential impacts that may be triggered by the project and recommend feasible and practical mitigation, management, and monitoring systems for adoption during different phases of the project.

International best practises, engineering codes and standards will be adopted into the various architectural designs and structural elements of the project for safety, reliability and performance assurance of engineered systems.

A thorough review of relevant legislation has been conducted for the Project. Table 4 identifies relevant legal requirements specific to the Project. Table 5 provides the national policies and plan. Table 6 specifies permits relevant for the Project. Table 7 identifies the international policies and plans relevant to the Project. International codes and standards that will be applied in the design of various project elements are provided in Table 8.

3.1 NATIONAL REGULATORY FRAMEWORK

Table 4 - Details of the regulatory framework as it applies to the proposed Project.

National regulatory regime	Summary	Applicability to the Project
Constitution of the Republic of Namibia (1990)	<p>The constitution defines the country’s position in relation to sustainable development and environmental management.</p> <p>The constitution refers that the state shall actively promote and maintain the welfare of the people by adopting policies aimed at the following: “Maintenance of ecosystems, essential ecological processes and biological diversity of Namibia, and the utilisation of living, natural resources on a sustainable basis for the benefit of all Namibians, both present, and future.”</p> <p>Article 100 stipulates that “Land, water and natural resources below and above the surface of the land and in the continental shelf and within the territorial waters and the exclusive economic zone of Namibia shall belong to the State if they are not otherwise lawfully owned”. This defines the Government position in requiring licences for activities within these operational areas and facilitate control over them.</p>	<p>The proposed project will ensure the sustainable use of the environment, and has aligned its corporate mission, vision, and objectives with the Constitution of the Republic of Namibia (1990).</p> <p>The Proponent is also obligated to ensure its activities do not in any way interfere with any basic human rights as described under the constitution.</p> <p>The government is the ultimate accountable institution for ensuring that policies are put in place to protect natural resources for the benefit of all. This is achieved through the three organs of state: Executive, Judiciary and Legislative.</p>

National regulatory regime	Summary	Applicability to the Project
Territorial Sea and Exclusive Economic Zone Act No.3 of 1990	<p>To determine and define the territorial sea, internal waters, exclusive economic zone and continental shelf of Namibia and activities associated herewith.</p> <p>The continental shelf is defined as State land and the Exclusive Economic Zone (EEZ) extends to 200 nautical miles (~370.4 km offshore).</p>	<p>The Project falls within the Namibian Exclusive Economic Zone (EEZ) and the Namibian coast is governed as a national asset for the benefit of current and future generations.</p> <p>The Proponent commit to conduct its operations to standards that complement long-term national policies on the conservation and management of coastal environments. The Project will commit to boost coastal economics, social development opportunities, coastal ecosystems and processes that maintain them.</p>
Environmental Management Act, 2007 (Act No. 7 of 2007) and its regulations (2012), including the Environmental Impact Assessment Regulation, 2007 (No. 30 of 2011)	<p>The Act aims to promote sustainable management of the environment and the use of natural resources. The Act requires certain activities to obtain an environmental clearance certificate prior to Project development.</p> <p>The Act states that an EIA should be undertaken and submitted as part of the environmental clearance certificate application process.</p> <p>The MEFT is responsible for the protection and management of Namibia's natural environment. The Department of Environmental Affairs, under the MEFT, is responsible for the administration of the EIA process.</p>	<p>This environmental scoping report documents the findings of the screening and scoping phase of the environmental assessment undertaken for the proposed Project.</p> <p>The process has been undertaken in line with the requirements under the Act, its regulations, and international standards such as IFC.</p>

National regulatory regime	Summary	Applicability to the Project
The Regional Councils Act (No. 22 of 1992)	<p>This Act sets out the conditions under which Regional Councils must be elected and administer each delineated region. From a land use and project planning point of view, their duties include, as described in section 28 “to undertake the planning of the development of the region for which it has been established with a view to physical, social, and economic characteristics, urbanisation patterns, natural resources, economic development potential, infrastructure, land utilisation pattern and sensitivity of the natural environment.</p> <p>The main objective of this Act is to initiate, supervise, manage, and evaluate development.</p>	The proposed project area falls under the mandate and municipal development plans of the Erongo Regional Council. In addition, the Arandis Town Council is a custodian responsible for the administration and authorisation of any developmental works within the townland boundaries. These levels of land management and governances will be consulted throughout the ESIA process.
The Namibian Ports Authority Act, 1994 (Act 2 of 1994)	The Act provides for the establishment of the Namibian Ports Authority to undertake the management and control of ports and lighthouses in Namibia, and the provisions of facilities and services related thereto. The Act gives provisions for licence to undertake activities in any port (including entry to a port).	Construction materials may not be available in the local market. Should there be any delivery ship or vessel entering NamPort waters during the construction and mobilisation, compliance to all nautical safety requirements will be mandatory and relevant permits or licences will have to be acquired.
Soil Conservation Act, No. 76 of 1969	This Act makes provision for the prevention and control of soil erosion, and for the protection, improvement, and conservation of soil and vegetation.	The construction phase of the project will entail minimal disturbances to soils structure, soil horizons of the arid, desert environment.

National regulatory regime	Summary	Applicability to the Project
<p>Water Resource Management Regulations of 2023, Water Resources Management Act, Act No. 11 of 2013</p>	<p>This Act provides for the control, conservation and use of water for domestic, agricultural, urban, and industrial purposes; and to make provision for the control of certain activities on or in water.</p> <p>The Act stipulates obligation to prevent the pollution of surface and groundwater resources.</p> <p>The Department of Water Affairs, within the Ministry of Agriculture, Water and Land Reform (MAWLR), is the custodian responsible for the administration of the Act.</p>	<p>The Proponent is to acquire water required for the Project through a local water service provider (Arandis Town Council).</p> <p>It is anticipated minimal waste will be generated during the construction phase and will be handled appropriately by means of the waste management system by disposing them to a waste disposal site. Waste management measures are provided in the ESMP.</p>
<p>Hazardous Substances Ordinance, No. 14 of 1974</p>	<p>This Ordinance provides for the control of toxic substances and can be applied in conjunction with the Atmospheric Pollution Prevention Ordinance, No. 11 of 1976.</p> <p>This applies to the manufacture, sale, use, disposal, and dumping of hazardous substances, as well as their import and export.</p>	<p>Hydrogen gas is a combustible and flammable fuel and is therefore identified as a hazardous substance</p> <p>The Proponent shall guarantee that safe handling, transfer, storage, and disposal protocols are developed, implemented and audited throughout the construction and operation phase of the hydrogen pipeline. This will be based on applicable best international standards. Leakage detection systems will be in place and inspections will be conducted to timely address any leakages. Monitoring frequencies are outlined in the ESMP.</p>

National regulatory regime	Summary	Applicability to the Project
		The Proponent is obliged to ensure a licence to operate as a Group I hazardous substance supplier is in place prior to the project commencement.
National Heritage Act 27 of 2004	The Act provides for the protection and conservation of places and objects of heritage significance and the registration of such places and objects. It also makes provision for archaeological “impact assessments”.	A heritage impact assessment will be conducted during the full ESIA process. The heritage impact assessments will include mitigation measures should archaeological artifacts be encountered during Project construction or operation.
National Ordinance Act No.4 of 1975 and the Amendment of 1996	The Act relates to the conservation of nature and pristine environments through the establishment of national parks and nature reserves.	The Proponent is committed to uphold to conduct its operations in line with the constitutions, conditions and laws related to the governance of nature reserves and conservancies.
Labour Act (No. 6 of 1992)	The Ministry of Labour, Industrial Relations and Employment is aimed at ensuring harmonious labour relations through promoting social justice, occupational health and safety and enhanced labour market services for the benefit of all Namibians. The ministry insures effective implementation of the Labour Act No. 6 of 1992.	The Proponent should ensure the safety and welfare of employees throughout the project development framework by developing occupational health and safety plans and standard operating procedures (SOPs).

3.2 NATIONAL POLICIES AND PLANS

Table 5 - National policies and plans applicable to the Green Hydrogen Pipeline Project.

Policy or plan	Description	Relevance to the Hydrogen Pipeline Project
Vision 2030	<p>Vision 2030 sets out the nation’s development targets and strategies to achieve its long-term national objectives.</p> <p>Vision 2030 states that the overall goal is to improve the quality of life of the Namibian people aligned with the developed world.</p>	<p>The proposed project embraces Namibia’s long-term development goals. The national development goals are aimed at achieving a statutory prosperous and industrialised nation, developed by Namibia’s own natural and human resources.</p> <p>The Project will further build on the achieving the goals through continued employment creation and ongoing contributions to gross domestic product (GDP).</p>
Fifth National Development Plan (NDP5)	<p>The NDP5 is the fifth in a series of seven five-year national development plans that outline the objectives and aspirations of Namibia’s long-term vision.</p> <p>The NDP5 pillars are economic progression, social transformation, environmental sustainability, and good governance.</p>	<p>The proposed Project will complement Namibia’s efforts towards achieving the set targets through employment creation (where and when required). The design of different Project’s elements will ensure that triggered significant impacts towards the biophysical and social environment are reduced to the greatest extent feasible.</p>
The Harambee Prosperity Plan ii (2021 – 2025)	<p>Second Pillar: Economic advancement – ensuring increasing productivity of priority key sectors and the development of additional engines of growth, such as new employment opportunities.</p>	<p>The proposed Project meet government efforts in addressing high unemployment rate through the generation of employment within the regional and national landscape.</p>

Policy or plan	Description	Relevance to the Hydrogen Pipeline Project
Namibia's Green Plan, 1992	Namibia has developed a 12-point plan for integrated sustainable environmental management to ensure a safe and healthy environment and to maintain a viable economy. Clause 2 (f) makes specific mention to guidelines related to sustainable development.	The Proponent is in full cognisance of the 12 clauses under the Green Plan and will commit to ensure that best industrial practises are implemented to sustain the country's renewable resources, secure a safe and healthy environment and a prosperous economy for present and future generations.
Draft Gas Bill, 2001	The draft Gas Bill aims to promote the establishment of a gas transportation and distribution network in Namibia for the purpose of domestic supply and for export; to establish a framework of licensing of the gas industry and a national gas regulator to monitor the performance of licence conditions and promote reliability of services; to ensure safety, efficiency and environmental responsibility in the transportation and distribution of natural gas; to facilitate investment in pipeline infrastructure by private, public, municipal and mixed owned enterprises. The draft bill also aims to promote a competitive market in gas in the long term, and to stimulate cross-border trade in gas between Namibia and its neighbours.	Although not enacted, the Proponent will take note of the draft bill requirements regarding the safe transport and handling of hydrogen gas. The bill promotes the emergence of a green economy through the gas energy industry.
Pollution Control and Waste Management Bill (draft), 1999	This draft Act aims to promote sustainable development by regulating the discharge of pollutants into the air, land and sea. Additionally, to ensure Namibia has an integrated waste	The Proponent to take note of the draft bill requirements and ensure conditions are adhered to with regards to containment of pollutants.

Policy or plan	Description	Relevance to the Hydrogen Pipeline Project
	management approach and complies with international legislation.	Pollution control protocols and monitoring frequencies will be developed for the Project.
The Green Paper for the Coastal Policy of Namibia	The Green Paper provides an outline of the key findings of a long-term study on the conservation and management of the Namibian coast. It sets out the coastal policy and the vision for the coast, as well as principals, goals and objectives for coastal governance. It also presents the options for institutional and legal arrangements towards implementing the emerging Namibia Coastal Policy options for coastal governance in Namibia.	The principles of Integrated Coastal Zone Management will be used as guidance in the ESIA and will be considered and included where applicable in the ESMP.
The National Policy on Coastal Management for Namibia	The National Policy on Coastal Management for Namibia aims to provide a framework to strengthen governance of Namibia’s coastal areas to realise long-term national goals defined in Vision 2030 and specific targets of the National Development Plans, namely: sustainable economic growth, employment creation and reduced inequalities in income. Overall, the policy aims to ensure that our coastal resources are protected, used sustainably and developed to boost the livelihood of the locals.	The Proponent shall be guided by the strategic recruitment plan to ensure fair recruitment of competent locals as the Project requires.

3.3 RELEVANT PERMITS AND LICENCES

Table 6 - Relevant permits and licences required for the Project.

Permit/Licence	Act/Regulation	Related activities requiring permits	Relevant Authority
Environmental clearance certificate	Environmental Management Act, No. 7 of 2007	Required for all listed activities as stipulated in the EMA Regulations of 2012.	Ministry of Environment, Forestry and Tourism
Written approval for the development of infrastructure within the townland boundaries.	The Standard Building Regulations and amendment, 1995	Required for the development of industrial infrastructure within the Arandis townland.	Arandis Town Council
Consent for the construction of an above/below ground pipeline within a communal conservancy.	A procedural requirement of the MEFT to guide the record of decision (RoD) process.	Required for the development of infrastructure within an area that is preserved for the conservation of wildlife and the environment (in this instance #Gaingu Communal Conservancy).	Central Management Committee of #Gaingu Conservancy
Written approval for the development of an above/below ground pipeline within a national park	A procedural requirement of the MEFT to guide the record of decision (RoD) process.	Required for any industrial infrastructure to be developed within the Dorob National Park.	Dorob National Park Management Committee
Written approval for the development of an above/below ground pipeline within a national park	A procedural requirement of the MEFT to guide the record of decision (RoD) process	Required for any industrial development within the Namib-Naukluft Park.	Namib- Naukluft Park Management Committee

Permit/Licence	Act/Regulation	Related activities requiring permits	Relevant Authority
Institutional approval for the development of infrastructure within communal conservancy	A procedural requirement of the MEFT to guide the record of decision (RoD) process.	Approval to be acquired from NASCO. NASCO closely collaborate, promote and support community-based natural resources management (CBNRM) activities in Namibia. NASCO administer operations of communal conservancies in Namibia	Namibian Association of CBNRM Support Organisation (NASCO)
A licence required to for the handling and transport of a Group I hazardous substances	Hazardous Substances Ordinance No.14 of 1974	Required and authorises the Proponent to supply and transport hydrogen (a Group I hazardous substance).	The National Radiation Protection Authority under the Ministry of Health and Social Services (MoHSS).
Waste water discharge permit	Water Act No.11 of 2013	Required for waste disposal activities.	Ministry of Agriculture, Water and Land Reform

3.4 INTERNATIONAL CONVENTIONS

Table 7 - International policies and plans applicable to the Project.

Policy or plan	Description	Relevance to the Project
United Nations Law of the Sea Convention (UNCLOS), 1982	The UNCLOS provides an international legal framework to govern the seas and oceans of the world. Namibia as the designated State is required to administer exploitation, protection and preservation of the marine environment and natural resources on	This is achieved though the EMA Act. The manufacturing, storage, handling or processing of hazardous substances is a listed activity under the EMA Act and requires an environmental clearance certificate. An environmental impact

Policy or plan	Description	Relevance to the Project
	the Namibian Continental Shelf and Exclusive Economic Zone.	assessment study is conducted in this regard to assess the significance of potential impacts. Mitigation /management measures will be provided in the ESMP.
The International Finance Corporation Standards (IFC), 2012	<p>Through eight (8) Performance Standards, the standards draw a framework and strategic commitments for Proponents to promote sustainable development through integrated environmental and social risks assessments, and setting standards and management techniques to avoid, minimise and where residual impacts remain, to compensate/offset for risks and impacts to workers and affected communities.</p> <p>Performance Standard 3 state that consumption of finite resources, threats to air, water, land and the projected atmospheric concentrations of greenhouse gases (GHG) are a threat to public health and welfare of current and future generations.</p>	<p>The potential impacts likely to be triggered by the proposed project are assessed thoroughly as part of the ESIA and management mitigation measures to guide standards of operation are provided in the ESMP.</p> <p>The Proponent is committed to adopt where applicable, international best practises to ensure impacts are lessened to the greatest extent feasible.</p>
Paris Agreement, 2015	<p>The Paris Agreement's main aim is to strengthen the global response to climate change threats by maintaining a global temperature rise well below 2 °C above pre-industrial levels.</p> <p>Namibia is a Non-Annex 1 Party to the Paris Agreement, ratified in 2016. The government is</p>	Namibia's approach to climate change regulation is closely drawn to commitments made through sustainable development goals (SDGs) programs, particularly at community level.

Policy or plan	Description	Relevance to the Project
	actively engaged in addressing climate change and works in collaboration with international organisations and partners to boost the nation's capacity to meet its climate-related objectives.	
The United Nation Convention for the Protection of the Ozone Layer, 1985	<p>The overarching objective of the convention is to protect human health and the environment against adverse effects resulting from modification of the ozone layer. Parties commit to cooperate in research concerning substances and processes that modify the ozone layer on human health and environmental effects of such modifications, and on alternative substances and technologies and systematic observations.</p> <p>Currently Namibia isn't signatory to the convention, however best practises are key parameters towards the country's effort in meeting its climate-related objectives.</p>	Namibia is a net carbon sink at present. However, commitments are drawn to achieve national climate change objectives through sustainable development goals (SDGs) programs.
United Nations Framework Convention on Climate Change (UNFCCC), 1992	The objective of the convention is to reduce and stabilize greenhouse gases at an atmosphere level to reduce impacts on climate systems, to allow ecosystems time to adapt to these changes, reduce food shortages and promote economies to develop in sustainable manners.	Although Namibia is a net carbon sink at present, Namibia developed the National Policy Climate Change Strategy and Action Plan (NCCSAP) to facilitate and enhance energy efficiency and promote sustainable low carbon development and sustainable energy through technology and innovations. This is relevant to the project as the

Policy or plan	Description	Relevance to the Project
	Namibia ratified the UNFCCC in 1995 and thus is obligated to prepare and submit national communications, biennial update reports and NDCs (a climate action plan to cut emissions and adapt to climate impacts).	innovative scope of work proposed builds on an emerging green hydrogen/ammonia industry in the country.
The Stockholm Declaration on the Human Environment, Stockholm 1972	Namibia has adopted the declaration in 1996 with the following Principle 3 and 21 most relevant to the proposed Project. Principle 3 states that the earth has capacity to produce, maintain, restore and improve vital renewable resources, wherever practicable. Principle 21 states Namibia has the right to explore her own resources but to ensure that there are effective policies to regulate these activities as to not cause detrimental harm to the environment.	Namibia has shown support to newly developed green hydrogen pilot projects. Across southern Africa, Namibia is one of the countries with abundance renewable energy resources and has potential to lead the transition into green economy.

3.5 INTERNATIONAL CODES AND STANDARDS

Table 8 – Relevant international codes and standards applicable to the Project.

International standard/code	Description	Relevance to the project
IEC 60079 Hazardous Area Classification Standard	The IEC 60079 series is a compilation of standards that cover all permitted protection techniques for equipment in potentially hazardous areas. It is maintained by the International Electrotechnical Commission (IEC) and has been generally adopted worldwide.	The Project involves the transportation of a flammable substance, i.e. hydrogen under controlled temperatures and pressures. The Proponent will ensure apparatus to be used in the construction of various project elements meet these standards.

International standard/code	Description	Relevance to the project
IEC 61508 Functional Safety of electrical, electronic and programmable electronic (E/E/PE) safety-related systems	This standard allows for the development of a uniform technical approach that can be applied to all safety systems in electronics and related software. The standard requires the analysis of the potential risks or hazards of a given system or device. It provides categories to determine the level of likelihood of a potential hazard and the consequences should it occur.	Similarly, the Proponent is committed to ensuring that advanced electronics and software's are in place to timely detect potential hazards and launch the necessary remediations.
IEC 61511 Functional safety - Safety instrumented systems for the process industry sector	<p>The standard provides the benchmark for the management of functional safety in the process industries. It defines the safety lifecycle and describes how functional safety should be managed throughout that lifecycle.</p> <p>It also defines requirements for management processes (plan, assess, verify, monitor and audit) and for the competence of people and organisations engaged in functional safety. An important management process is Functional Safety Assessment (FSA) which is used to make a judgement as to the functional safety and safety integrity achieved by the safety instrumented system.</p>	The standards allow for periodic monitoring of functional systems for malfunctions. This allows for streamlined and efficient operations various system units.
AS 1940 Storage and Handling of Flammable liquids and combustible liquids	Australian Standard 1940 (Storage and Handling of Flammable and Combustible Liquids) was formally updated in August 2017. This change is important,	Hydrogen is a combustible gas; therefore, these standards and the associated handling guidelines are applicable and would be

International standard/code	Description	Relevance to the project
	<p>because the standard forms an important reference for the State and Territory fuel storage legislation. AS 1940-2017 provides requirements for the planning, design, construction, and safe operation of all installations in which flammable or combustible liquids are stored or handled.</p>	<p>integrated in different departments of the project as required.</p>
American Society of Mechanical Engineers (ASME)		
<p>ASME B31.12 Hydrogen Piping and Pipelines</p>	<p>ASME B31.12 is applicable to piping and pipelines handling gaseous hydrogen and gaseous hydrogen mixtures and to piping in liquid hydrogen service. This Code is applicable up to and including the joint connecting the piping to associated pressure vessels and equipment but not to the vessels and equipment themselves. It is applicable to the location and type of support elements but not to the structure to which the support elements are attached. The design for pressure and temperature shall be in accordance with the requirements of Part IP for industrial piping and Part PL for pipelines.</p>	<p>A hydrogen pipeline is proposed to transport hydrogen from Arandis to Farm 58. Mechanically engineered systems such as joint connections and pressure vessels are to meet the required standards to limit the potential for leakages.</p>
<p>ASME B31.3 Process Piping (1922)</p>	<p>American Society of Mechanical Engineers (ASME) B31.3 contains requirements for piping typically found in petroleum refineries; chemical, pharmaceutical, textile, paper, semiconductor, and cryogenic plants; and related processing plants and terminals. It covers materials and components,</p>	<p>The piping specifications as may be deemed appropriate for the local desert environment would be considered. This specification allows to corrosion resistance etc.</p>

International standard/code	Description	Relevance to the project
	<p>design, fabrication, assembly, erection, examination, inspection, and testing of piping.</p> <p>This Code applies to piping for all fluids including:</p> <ul style="list-style-type: none"> • raw, intermediate, and finished chemicals; • petroleum products; • gas, steam, air and water; • fluidized solids; • refrigerants; and • cryogenic fluids. 	
South African Bureau of Standards		
SANS 10260-2	The South Africa National Standards (SANS) deals use of verified equipment for industrial distribution of hydrogen.	The standards allow for the use of verified, best available technologies. This ensures streamlined, efficient and modernized operations.

4 PROJECT DESCRIPTION

4.1 NEED FOR THE PROJECT

Global economies are still largely reliant on carbon-based fossil fuels. However, with the ever-present risk of climate change, industries and governments are embracing a drive for economic decarbonisation. While Namibia can still be considered a net-carbon sink, all aspects of life in the country are vulnerable to the short, medium and long-term impacts of climate change. According to WWF (2023), climate change is experienced through intensified droughts and floods. Within Namibia, these impacts threaten ecological resources, ecosystems functions and economic and social sustainability and development. Climate change is expected to affect the annual rainfall patterns and seasonality, likely adding to water scarcity and threatening food security.

Namibia has abundant solar and wind energy resources. These renewable energy sources can be leveraged in the development of a local green economy. Sustainable energy provides an opportunity for new career paths, creating new jobs through green energy production plants and contributing to the economy whilst reducing reliance on non-renewable resources, (Constellation, 2024). Green hydrogen is produced by splitting water through electrolysis using renewable energy. The process does not generate carbon dioxide as a by-product (only oxygen). Green hydrogen is often converted to green ammonia, which has a higher energy density, is less costly to transport, and presents fewer technical obstacles, hence it is much easily stored in bulk (Amelang, 2023). Green ammonia is viewed as a key energy vector to accomplish global decarbonisation supporting Vision 2030 goals of reducing greenhouse gas emissions (Acciona, 2020).

Currently, limited national policies and legislation regulate the green hydrogen and/green ammonia industry in Namibia. This project, along with lessons learned from similar ongoing green hydrogen pilot projects in the country, would serve as a foundation for developing and refining these policies and regulations.

This project is proposed to develop the skills, competence, and standards of the Namibian market. It presents a significant opportunity for growth and development within the country. In the future, the project aims to export green ammonia.

This project proposes transporting 15 000 m³ of hydrogen gas with a mass flow between 10 tons/h from a hydrogen production plant to an ammonia production plant on Farm 58 via an 80 km green hydrogen pipeline. The pipeline will also function as a buffer capacity storage to maintain the ammonia plant's operations during the night.

4.2 CONSTRUCTION PHASE

The activities for the proposed pipeline construction phase are discussed in the section below .

4.2.1 CONSTRUCTION OF STAGING AREAS AND STORAGE YARDS

Staging areas and storage yards will be strategically located along the planned right-of-way (ROW) and cleared of vegetation (if required). These areas are used to stockpile the pipes, store fuel tanks, sandbags, silt fencing, stakes, and equipment parts. They will also provide parking for construction equipment and employee vehicles.

4.2.2 RIGHT OF WAY CLEARING

Once the site has been established, the ROW will be cleared of vegetation and obstacles. Sensitive, rare and important vegetation may be removed and relocated to a suitable environment.

4.2.3 TRENCH EXCAVATION

The trench for the pipeline will be excavated in segments where the pipeline will be buried. If rocks ledges are encountered, track hoes equipped with jackhammers will be used to excavate the trench. Sandbags will be placed within the trench to support the pipe during installation.

4.2.4 PIPE TRANSPORT, STRINGING AND ASSEMBLY

After trench excavation, 12 metre pipe segments will be transported from the staging area to the ROW. Pipes will be laid either above ground beside the trench or within the trench, supported by sandbags in steep terrain. The final placement will be determined through the ESIA process. Pipe sections will be bent using a pipe bending tool to allow the pipeline to follow the planned route and the terrain. Pipe sections will be welded together, potentially sandblasted, and the weld joints coated to prevent corrosion. For added protection against corrosion, Denso™ wrapping and cathodic protection will be applied. Cathodic protection wire must be foreseen in the same trench of the pipeline. X-ray inspection will be used to ensure the quality of each weld joint. Finally, connected pipe lengths of pipe will be carefully lowered into the trench.

4.2.5 OBSTACLES: ROADS AND STREAMS

The pipelines route crosses existing roads, highways, streams, rivers and wetlands. Pipelines will be constructed underneath these obstacles using techniques like boring for shallow depth or using horizontal directional drilling (HDD) for deeper placement. Each obstacles requires a unique construction method and order of operations to minimise negative impacts.

4.2.6 TESTING AND RESTORATION

After the pipe installation and inspection, the trench is carefully backfilled. Pipeline integrity will be verified using hydrostatic testing before project completion. This process involves pumping water through the pipeline at a pressure exceeding the maximum operational level. If the

pipeline remains intact, it is deemed operational. Following testing, the ROW will be seeded, fertilized, and marked with above-ground markers. An additional safeguard measure is to tape along the pipeline route positioned 500 mm above the pipeline. This to indicate the approach of an underground line while excavating a trench in future situations.

4.2.7 SUPPORTING INFRASTRUCTURE

Supporting infrastructure will be required and constructed during the hydrogen pipeline project. Compressor stations and valve stations will be built above the pipeline allowing operators to shut off sections of the pipeline due to either maintenance or emergency response to a potential leakage of incident. A fiber optic cable will be following along the pipe route (secured to the pipe) to ensure the monitoring of all parameters such as temperature, pressure and vibrations.

To ensure pipeline integrity, welds must be x-rayed and the pipe hydrotested. This process involves pumping in clean water, pressured above the expected maximum average operating pressure (MAOP). Then, all water is removed, and pipeline intervention gadgets (pigs) are inserted into the pipe to clean it out. Pigs are devices used to inspect and remove dirt and other construction debris while pipelines are being assembled. An intelligent pig will also be used to inspect the underground hydrogen pipeline. When the pigs eventually exit the far end of the pipe, the line will be filled with dry air. Air compressors pump up the air, and the air is run through a drier. The air will be sampled and tested for moisture content. When those parameters get low enough, the complete pipeline is filled with nitrogen to absorb more of the remaining moisture. The pipeline is then deemed fit to transport hydrogen.

Valve stations, pig senders/receiver will be incorporated for security where required for potential above ground installations.

4.2.8 EQUIPMENT AND MATERIALS

The equipment listed below will be used during the construction phase though this list is comprehensive at the time of writing, operational requirements may result in the introduction of additional equipment and materials during construction):

- Trenchers
- Skid steer loaders
- Rock grinders
- Backhoe loaders
- Dozers
- Excavators
- Articulated trucks
- Trackhoe with Jackhammer
- Weld Decks
- Pipelayers
- Directional drilling equipment

- Weldings stations
- Transportation trucks
- Truck to load and transport pipes to designated locations

The hydrogen pipeline will consist of approximately 22-inch carbon steel pipe with a 75 mm insulation layer. It will be painted and wrapped with Denso™ wrapping tape which is used to prevent corrosion should the pipeline be constructed underground. If the pipeline is constructed above ground, the Denso™ wrapping tape will provide protection against the saline environment.

Table 9 provides the specifications and design details of the hydrogen pipeline.

Table 9 - Hydrogen pipeline design specifications.

Parameter	Unit	Hydrogen pipeline
Transported fluid	-	Hydrogen
Design pressure	barg	70-110
Design temperature	°C	50.0
Material	-	Carbon steel
Line pipe type	-	SAW
Material grade	-	API 5L X52
Specified minimum yield stress	MPa	360
Insulation layer	mm	75
Corrosion allowance	mm	1.0

4.2.9 POWER SUPPLY

Power supply for basic needs during the construction phase may be provided by a local electricity distributor for the Erongo Region. Power supply will be used for temporary facilities during the project such as office space, toilets and changing areas during the construction phase. A solar power plant will be constructed near Arandis to generate and provide energy required during operations.

4.3 OPERATIONAL PHASE

The pipeline will transport 15 000 m³ hydrogen gas (with a mass flow of 10 tons/h) from the production plant to the ammonia production plant on Farm 58. It will also act as a buffer storage to maintain ammonia plant operations during the night. Trained personnel will continuously monitor operations and ensure safety procedures are followed.

There will be constant monitoring with a fibre optic cable of possible leakages points, pressure switches and vibrations (external digging). These systems will be monitored from Arandis and Farm 58. Infield surveys will also be conducted on a regular basis and/or when required.

4.3.1 WATER SUPPLY

Water for construction and operational needs (worker facilities) may be sourced from the local municipality/ town council, however no such agreements have been made as of yet. The Project's water requirements are not anticipated to impact local water supply.

4.3.2 WORKERS AND ACCOMMODATION

Approximately 30 to 100 workers will be hired during construction, with two security guards on night duty. Employees will likely reside in Arandis, Walvis Bay, or Swakopmund; no on-site accommodation is planned.

4.3.3 WASTE MANAGEMENT

A waste management plan will be developed and overseen by the engineering, procurement and construction (EPC) contractor. Temporary waste bins will be available on-site varying in waste categories such as general household waste, plastic, steel, concrete and hazardous waste. The waste management plan will include:

- On-site waste separation and collection (general waste, plastic, steel, concrete, hazardous waste).
- Proper waste disposal procedures.
- Regular toolbox talks to keep workers informed about waste management requirements.
- Mitigation measures will be further detailed in the environmental and social management plan (ESMP).

4.4 DECOMMISSIONING STAGE

The ESMP will outline auditable decommissioning and rehabilitation procedures and actions for the Proponent to ensure careful and sustainable management measures are implemented. The proponent will have to implement rehabilitation measures at the Project decommissioning stage as outlined in the ESMP.

4.5 ALTERNATIVES CONSIDERED

In terms of the Environmental Management Act, No. 7 of 2007 and its regulations, alternatives considered should be analysed and presented in the EIA report. This requirement ensures that during the design evolution and decision-making process, potential environmental impacts, costs, and technical feasibility have been considered, which leads to the best option(s) being identified.

Potential alternatives that have been identified during the ESIA process so far is whether the pipeline should be designed to be placed above or below ground. Stakeholder suggestions and specialist studies will inform the decisions made for the benefit of all parties involved. Additionally, different pipeline routing options have been proposed. Inputs from the specialists will determine the best option. More alternatives may be proposed and will be assessed.

4.6 NO-GO ALTERNATIVES

Should the project not occur, the socio-economic and environmental benefits associated with the green hydrogen initiative in Namibia will be lost. Namibia has the opportunity to be a leader in the emerging green energy markets and be an international exporter of green ammonia, which may be a vital source of foreign investment. The green hydrogen vision leads to the creation of career paths, employment, contribution to the economy in terms of reducing energy reliance and income generation and provides a solution to present environmental concerns. According to the Nationally Determined Contribution (NDC) registry, Namibia has set bold goals to reduce greenhouse gas emissions by 2030 and pursuing green energy projects locally will strategically allow Namibia to reach milestones.

5 ENVIRONMENTAL AND SOCIAL BASELINE

5.1 BASELINE DATA COLLECTION

This section sets out the findings from the desktop study, which involved reviewing existing literature, spatial data, and publicly available reports, on the biophysical and socio-economic environments of the receiving environment in the project area. It is an important part of the scoping component of the assessment, as it determines whether there are any knowledge gaps that require additional information prior to the assessment phase, where it will serve as the foundation for impact analysis and mitigation planning. Preliminary findings suggest that further investigation is required regarding endangered species in the project area, heritage artifacts in the project area, traffic flow on the B2 road and regional hydrology and hydrogeology flow patterns intercepting the project area. This chapter will be expanded with specialist baseline information (including hydrological modelling, biodiversity surveys, and socioeconomic assessments) once all field studies have been completed.

5.2 LAND USE

The proposed 80-kilometer hydrogen pipeline will be located between Arandis and Farm 58. This pipeline will facilitate the storage and transportation of hydrogen from the hydrogen production plant near Arandis to the ammonia production plant at Farm 58. The proposed hydrogen production plant and its associated solar plant will be situated along Trekoppje road, outside of Arandis. However, the proposed hydrogen plant does not fall within the scope of this ESIA process and will be conducted separately.

Farm 58 encompasses approximately 3,000 hectares (ha) in extent and is located east of Dune 7. Originally designated as a conservation area, this land was rezoned for industrial use after the approval of an environmental clearance certificate. It is currently divided into several portions, each granted to various businesses, including Cleanergy Solutions Namibia (Pty) Ltd.

Figure 5 provides a visual representation of the proposed green hydrogen pipeline route in proportion to surrounding local and national conservation areas.

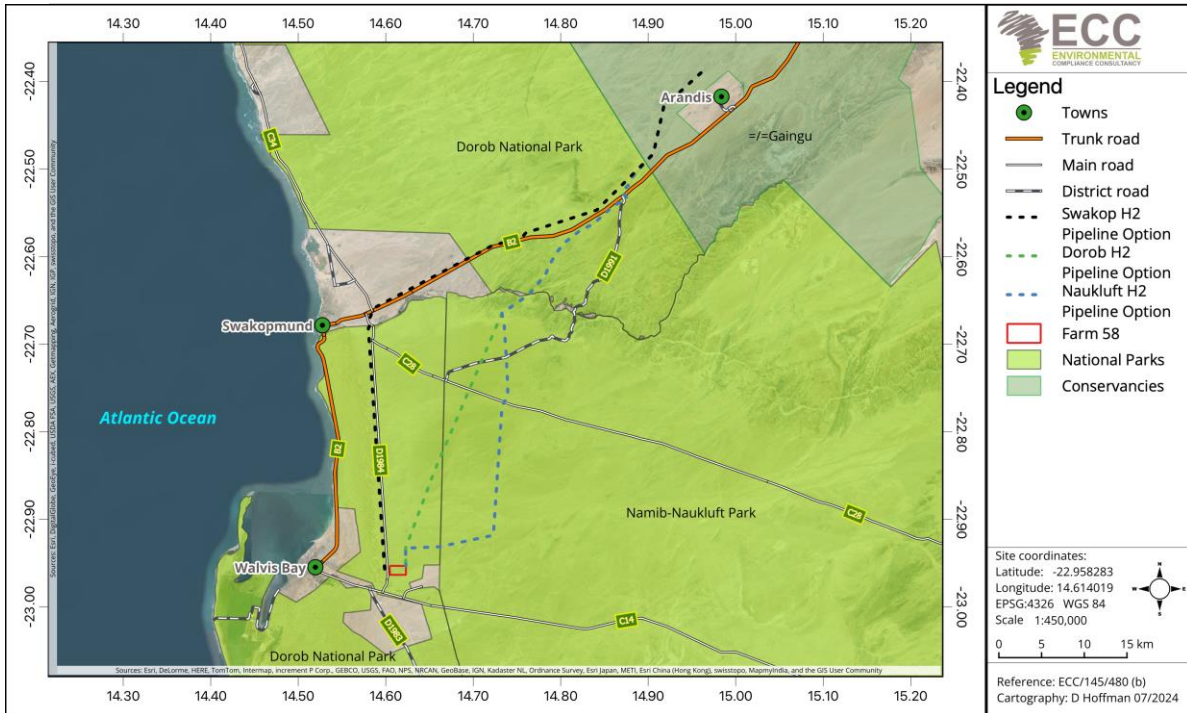


Figure 5 - The proposed green hydrogen pipeline in proportion to local conservation areas.

5.3 CLIMATE

Climate and weather data from Meteoblue (2024) along with desktop QGIS data for the site has been used to provide the data for the project area. Summer months are between October and May and are characterised by warm temperatures with an average maximum temperature of 32 °C and average minimum temperature of 15 °C (Figure 6). Winter months span from June to September are cooler with maximum temperatures reaching 28 °C and minimum temperatures reaching 8 °C (Figure 6). The overall annual temperatures are relatively stable and steady.

The average solar radiation annual is between 5.4 to 5.6 kWh/m²/day which is low due to the frequent cloud and fog cover experienced along the coast. The approximate number of days that project area receives fog are more than 125 days which is the most compared to the inland and eastern areas of Namibia (Mendelsohn, Jarvis, Roberts, & Robertson, 2002). Partly cloudy skies are commonly observed between October and February whereas in winter, there are more clear skies (Figure 7). The months with the highest humidity, have relative humidity (RH) of approximately more than 90% while the driest months have a relative humidity between 40 and 50%. The project area is located within the Desert biome that is predominated by dry conditions and receives less than 50 mm of rainfall annually on average.

Potential evaporation is between 1680 and 1820 mm per year (Mendelsohn, Jarvis, Roberts, & Robertson, 2002). Maximum wind speed reaches up to 38 km/h, with dominant southwest (SW) and East-Northeast (ENE) winds (Figure 8) Meteoblue (2024).

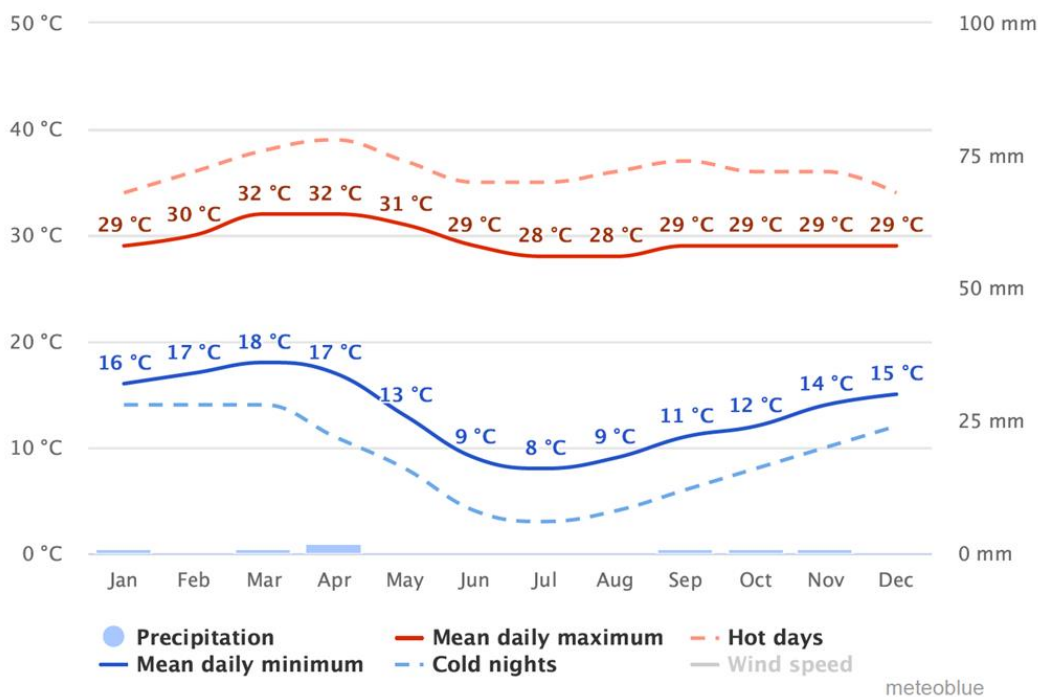


Figure 6 - Average temperature and precipitation in the general project area (Meteoblue, 2024).

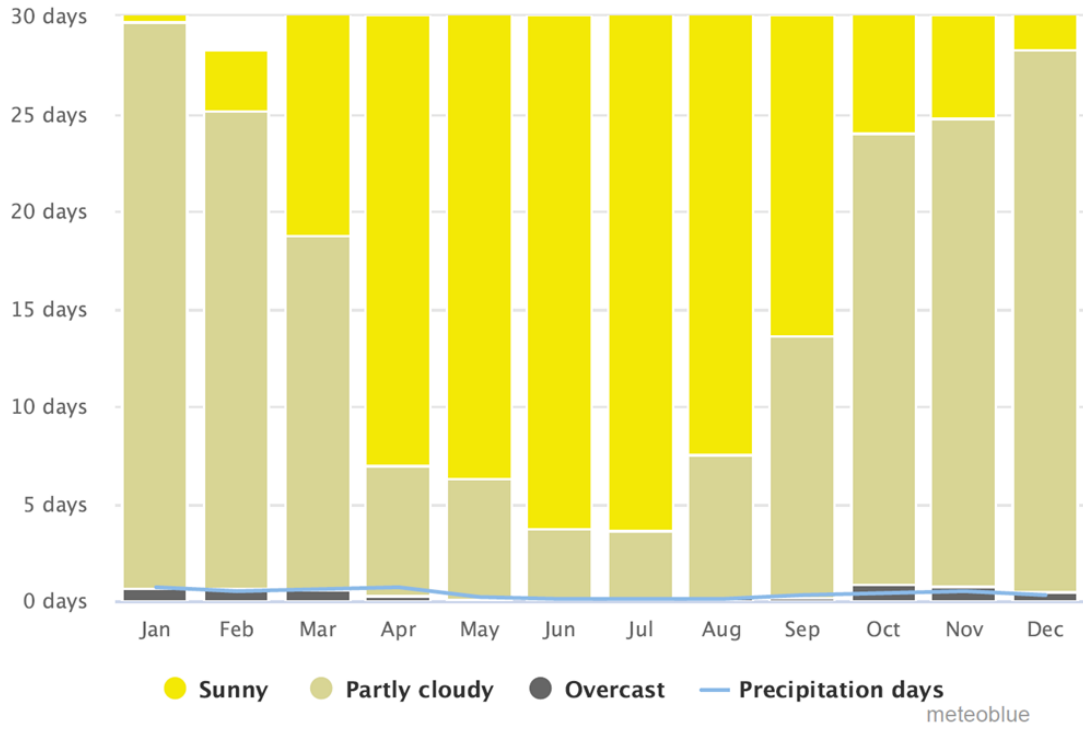


Figure 7 - Annual cloud cover in the general project area (Meteoblue, 2024).

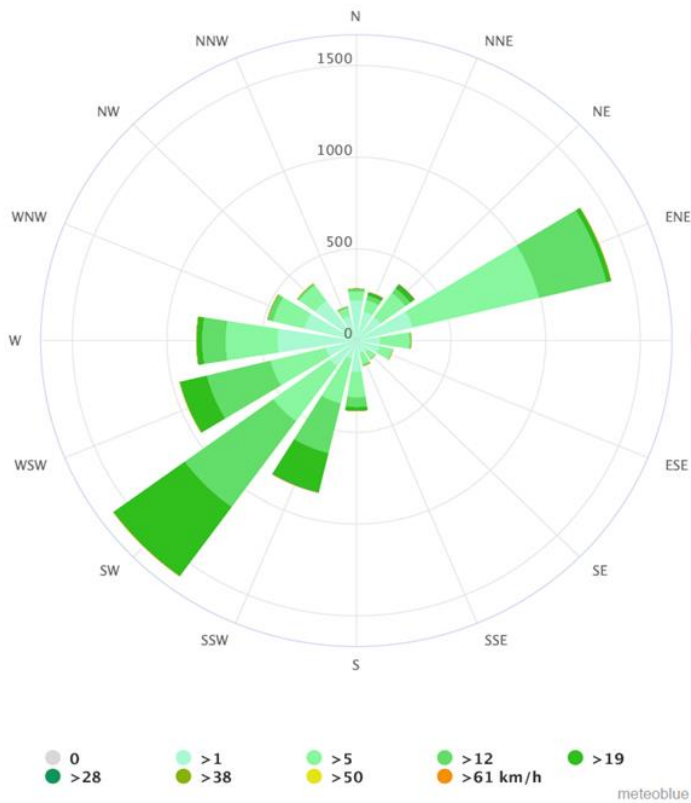


Figure 8 - Average wind speed and direction in the general project area (Meteoblue, 2024).

5.4 SOILS, GEOLOGY AND TOPOGRAPHY

The regional geology of this area consists partly of the Kalahari Group with the rock type characterised as Kalahari and Namib Sands and the Swakop Group (Figure 9). The Kalahari Group covers an extensive section along southern part of Africa and form a low-relief landscape dominated by considerable unconsolidated sand (Matomon, et al., 2014). The Swakop Group is underlain by the predominantly coarse-clastic Nosib Group, which represents the oldest part of the Damara succession. The main rock types for this area are dune sand and calcrete. Calcrete is commonly found in in arid to semiarid regions and are described as a calcium-rich duricrust, a hardened layer in or on a soil (Britannica, 2008).

The soil type in this area is dominated and characterised by Gypsisols and partly rocky outcrops as shown in Figure 10. Gypsisols are found in the driest parts of the arid climate zone. Gypsisols are soils with a significant secondary accumulation of gypsum rich in nutrients, which develop on alluvial, colluvial and aeolian sediment commonly found on flat and rocky areas in arid conditions (Jordan, 2023). Calcium sulphate is dissolved out of the rock and soil, carried by percolating water beneath the surface, where it remains in various forms such as powder, pebbles, stone or gypsum crystals (Mendelsohn, Jarvis, Roberts, & Robertson, 2002). These soils form where evaporation is much higher than precipitation, therefore indicating poor moisture in soil (Atlas of Namibia Team, 2022). Rocky outcrops areas are covered with large, hard rocks and may include a wide variety of physical landscapes, including escarpments, overhangs, cliffs, tors, boulder-heaps and inselbergs (Fitzsimons & Michael, 2017). Large rocky outcrops play a vital role in conserving specialised plants and animals that inhabit these rocks, producing small water puddles, contributing to soil nutrients and providing livestock with protection for wind and sun (Australian National University Sustainable Farms, 2024). Rocky outcrops provide micro-habitats supporting species diversity, endemism and nesting sites.

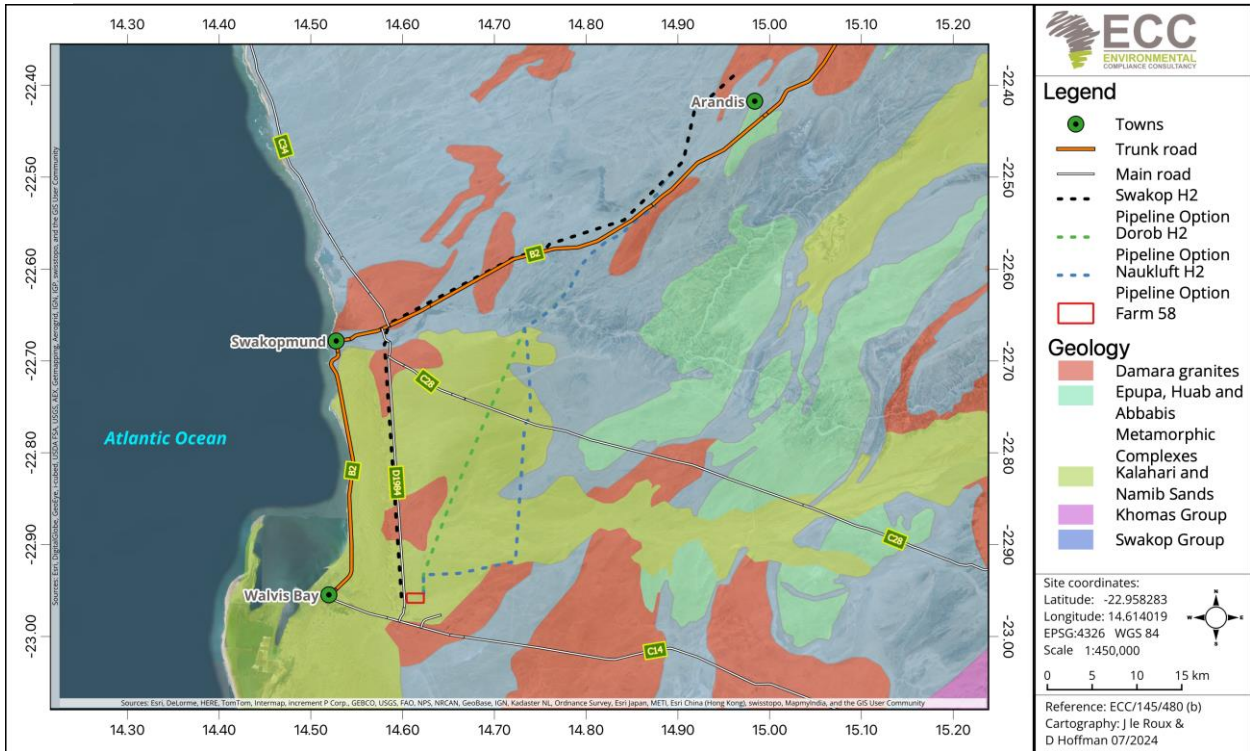


Figure 9 -Geology formation in the project area.

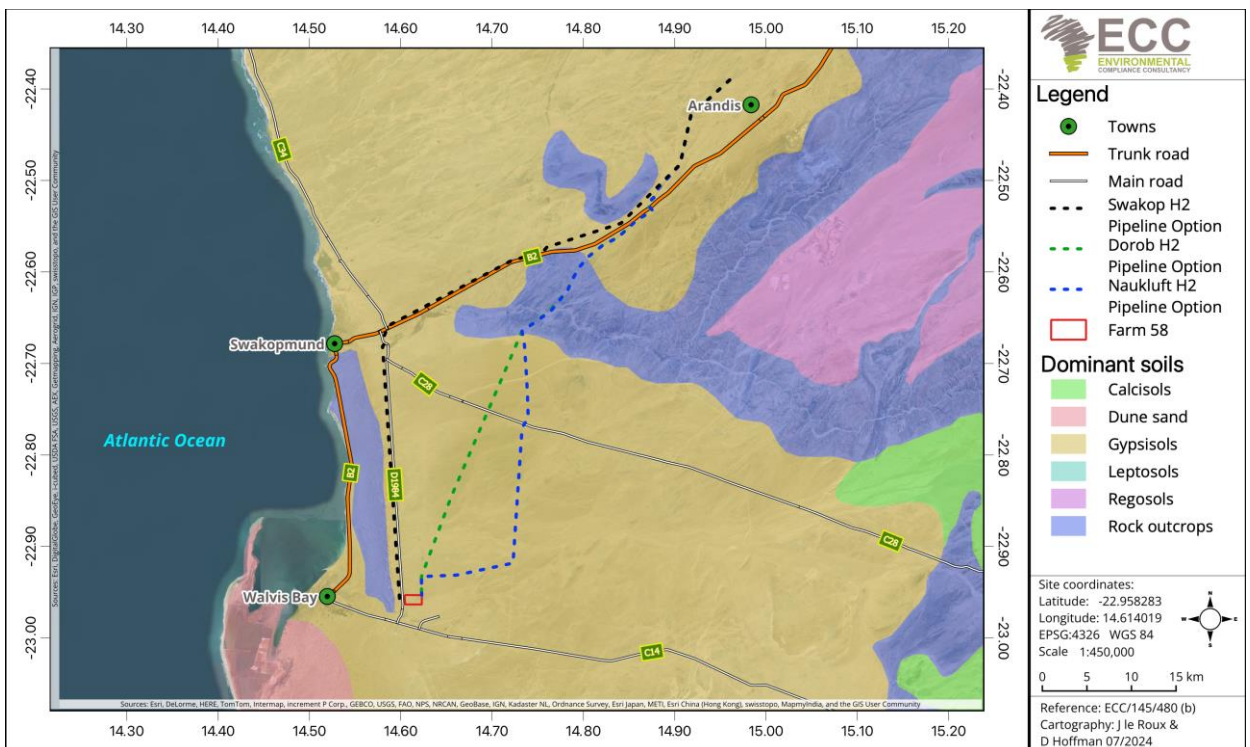


Figure 10 - Soil composition in the project area.

The topography of the Project site is relatively flat. The elevation increases toward the eastern direction of Namibia. The overall elevation of the proposed site varies between 0 and 100 m (Figure 11).

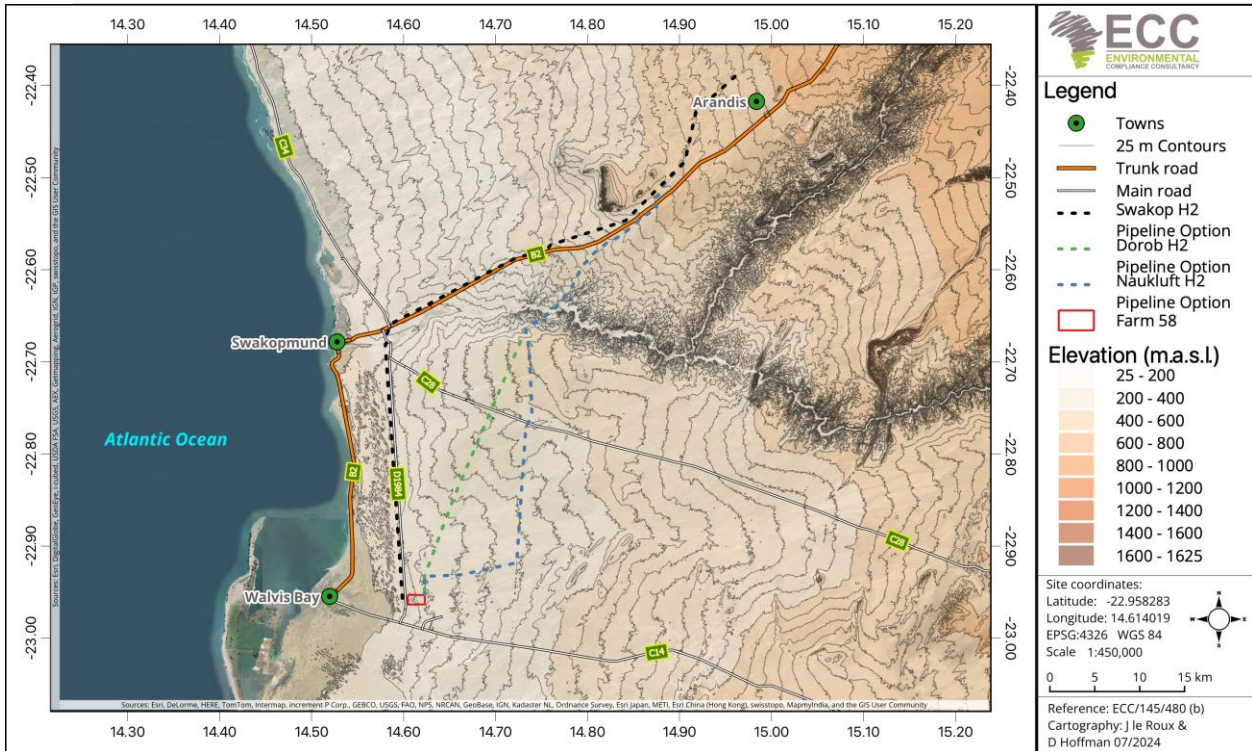


Figure 11 - Elevation in the project area.

5.5 HYDROLOGY AND HYDROGEOLOGY

The proposed project site covers the Erongo groundwater basin (Figure 12). The rock body over which the site falls contains very limited groundwater potential, yielding less than 0.5 m³ of water per hour. This water may be explored as an emergency water supply; however, it is highly unlikely that water will be found in this area. The groundwater quality in the general area is unknown or limited information may be available (Atlas of Namibia Team, 2022).

Drainage in the area is dentritic with ephemeral streams and rivers steeply incised forming tributaries of the Swakop River, where the flow during peak flood events is directed westward to the Atlantic Ocean (Figure 12). Major surface drainage lines in the Project area include the Khan, Zawichab and Tumas Rivers. The watercourse upstream comprises of small streams which also flows into the Swakop River where boreholes have been drilled to supply water to farmsteads and industrial developments.

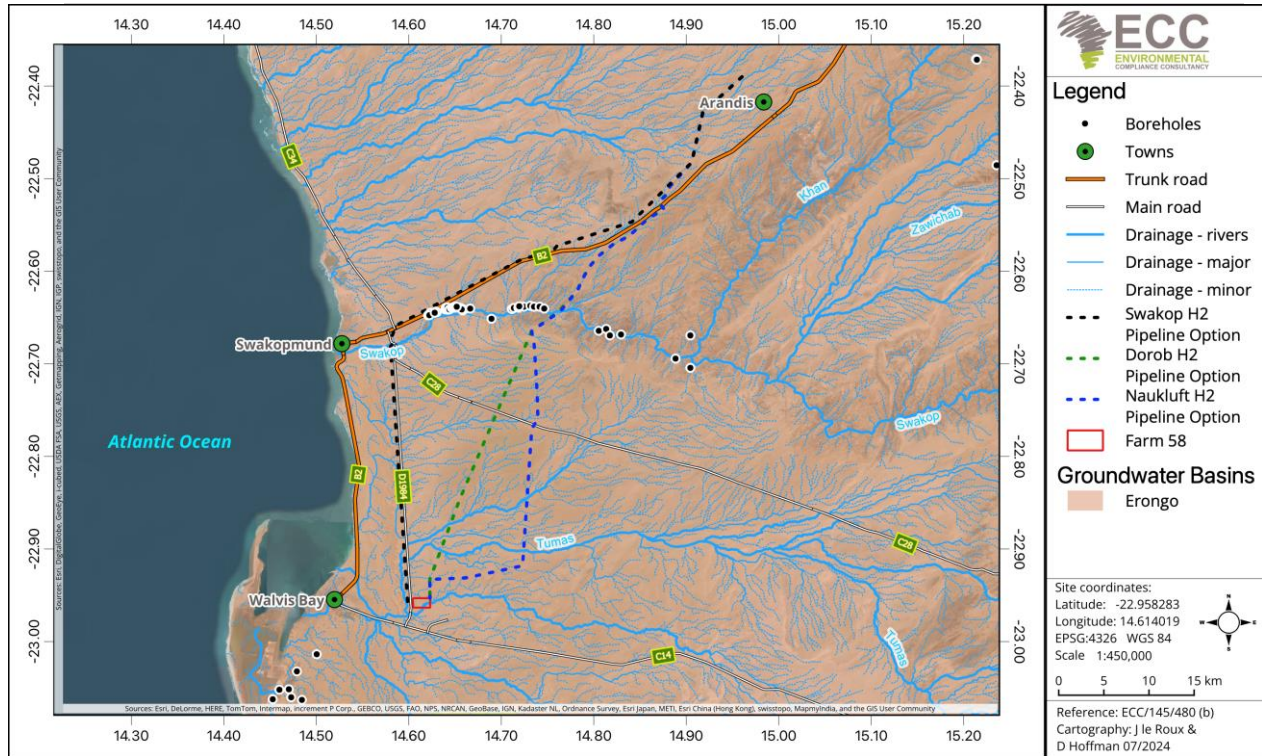


Figure 12 – Surface water flow showing ephemeral rivers, drainage line and groundwater boreholes in the project area

5.6 BIODIVERSITY BASELINE

5.6.1 GENERAL BIOME CHARACTERISTICS AND FLORA

The proposed project area is located within the central and southern area of the Namib Desert. Despite the extreme and unfavourable climatic conditions, the Namib Desert's biotic communities are extraordinarily appealing and unique, comprising of the well vegetated ephemeral Khan River, *Welwitschia mirabilis* flats, large inselbergs, rocky ridges/outcrops and small riparian vegetations along minor ephemeral drainage lines (Wassenaar, et al., 2013). The dominant structure is grassland and dwarf shrublands. The vegetation in the desert biome is characterised by a dominance of therophytes which persists in the form of seeds during unfavourable conditions (Cunningham, 2024). plant diversity is characterised as extremely low with less than 50 species. The project area supports less than 50 species, reflecting the low plant diversity characteristics of the central Namib Desert (Cunningham, 2024).

The floristic group refers to the geographical distribution of seemingly unrelated vegetation species overlap in such a way that suggests that they have an origin in common – similar evolutionary history (Atlas of Namibia Team, 2022). The floristic group of the proposed area is the *Welwitschia* Desert where up to 200 species are co-inhabitants. In relation to the project area, *Welwitschia mirabilis* flats which is 138 km² in extent north of the Swakop River in the Husab Mine area support moderate to high densities of *Welwitschia mirabilis*. This could be attributed to the "fog trap" between Khan and Swakop River valleys (Cunningham, 2024). The vegetation map for the project area is shown in Figure 13.

The potential impacts of the hydrogen pipeline and associated infrastructure on the plant communities includes habitat fragmentation, soil disturbance during construction, potential for invasive species introduction, and edge effects along the pipeline corridor.

Specific mitigation measures to minimise potential negative impacts will be included in the assessment and ESMP, examples of the mitigation measures will include:

- Pipeline route selection: carefully select the pipeline route to avoid sensitive habitats or areas with high plant diversity.
- Construction practices: implement erosion control measures, restrict vehicle traffic to designated areas, and minimise vegetation clearing during construction.
- Revegetation and restoration: develop and implement a restoration plan for any disturbed areas, using native plant species.
- Invasive species management: monitor for and control invasive plant species along the pipeline corridor.
- Long-term monitoring: outline a plan for long-term monitoring of vegetation communities within the project area to assess the effectiveness of mitigation measures and detect any unforeseen impacts.

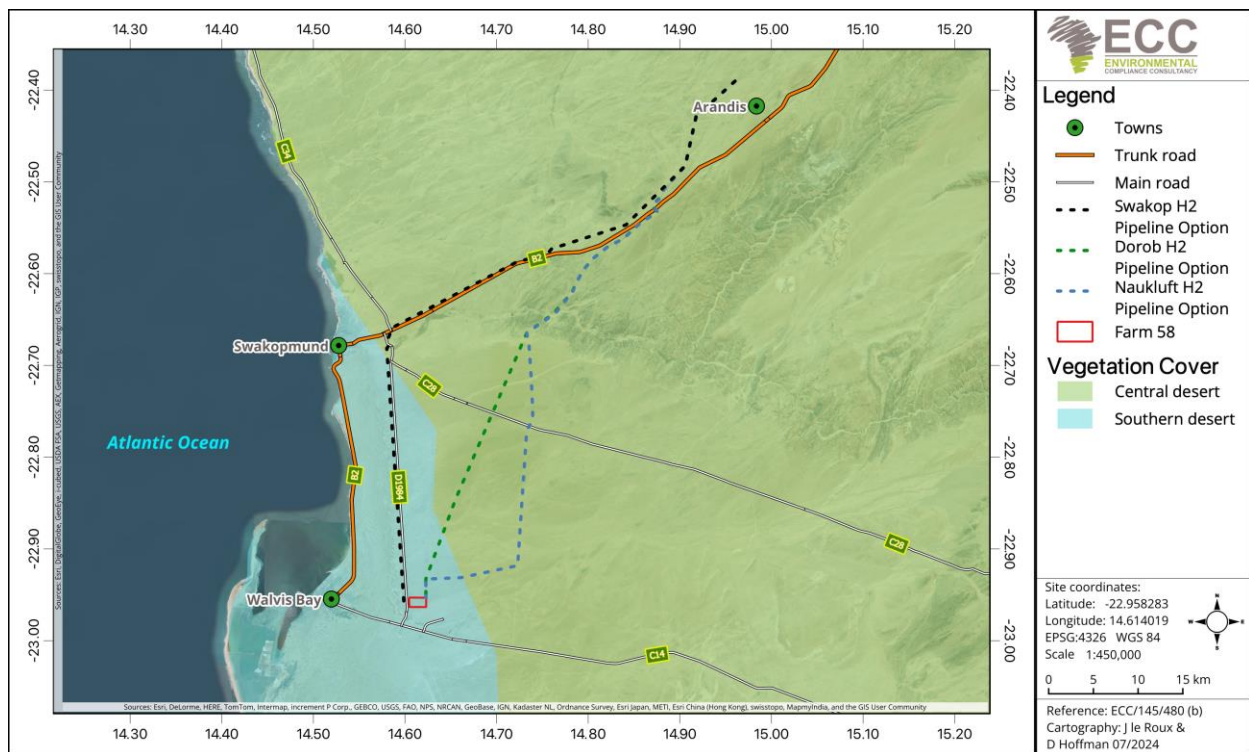


Figure 13 - Vegetation map for the project area.

5.6.2 FAUNA

The overall terrestrial diversity of the proposed area is low in comparison to the central and northeastern parts of the country. The overall bird diversity is moderate with ~141 to 170 species. The Walvis Bay area tends to be a hotspot for bird life, as birds are attracted to the species richness and abundance because of the nutrients brought by the highly productive upwelling system of the Benguela Current (BirdLife International, 2024). The diverse and unique bird life presents a huge attraction for tourists with ~100 000 birds, e.g., flamingos and pelicans. The reptile diversity is described as low (~41-50 species), with lizards making up majority of the reptile species with ~24 to 27 species and local snakes – 10 to 14.

Amphibian patterns are closely related to average rainfall due to the breeding habits in water and the reliance on moist habitats during the frog lifecycle. Due to the low average rainfall in this area, amphibians are quite scarce with ~1-3 species likely to be found in the area. The overall mammal diversity is low with ~16 to 30 species of which half is endemic.

5.7 SOCIAL AND SOCIO-ECONOMIC BASELINE

The proposed green hydrogen pipeline will be constructed between Arandis to Farm 58 traversing through the #Gaingu Communal Conservancy, the Dorob National Park and in the jurisdictions of municipal lands. All land developments are governed and mandated by the Erongo Regional Council. The Erongo Region is found on the central western area of Namibia covering ~63586 km² and comprises 7.7% of Namibia's total area.

5.7.1 POPULATION AND GROWTH RATE

In 1991, the Namibian population stood at 1.4 million people and the Erongo Region had a population of 55 470 (Iipumbu, 2024). The preliminary population and housing census reported that Namibia's population after 32 years has doubled to 3 022 401 with Erongo Region making up 240 206 (Namibia Statistic Agency, 2023). The first main population increase in 1994 was noted due to the inclusion of Walvis Bay into Namibia from South Africa. The increase between 2001 and 2011 can be attributed to the increase in industrialisation in the coastal towns and mining activities. Currently Erongo Region is the fifth most populated region in the country with a population density of 3.8 persons per km² and the average household size of 3.1 persons per household which is below average of 3.8 (Namibia Statistic Agency, 2023).

The growth rate in the Erongo increased greatly in the past decades, with more males residing in the Erongo Region than females, with a difference of ~4 400. This is mainly attributed to job availability in the industrialised market at the coast, whereby traditionally certain skill sets were not associated to be 'female jobs'. Moreover, a high rate of urbanisation is experienced in the Erongo Region and is directed towards the Walvis Bay-Swakopmund area.

The Arandis population recorded in 2011 was ~10 200, of which females were 5 300 and males – 4 900 and the population density 0.8 (Erongo Regional Council, 2015). In 2023, Arandis had a population of 13 542 with an annual growth of ~2.5% (Namibia Statistics Agency, 2024).

5.7.2 POVERTY AND UNEMPLOYMENT

The industries in which most Namibian citizens are employed are agriculture, forestry and fishing, accommodation and food services activities and wholesale and retail trade. It was reported in 2018 that 53.4% of employed Namibians work in the private sector and 21.5% are employed by the state (Namibia Statistics Agency, 2019). State-owned enterprises provide jobs for 7.6% of Namibians and private individuals - 16.6%. Wages and salaries were reported as the main income sources for 47.4% of the households in Namibia.

It has been reported that the overall unemployment rate is ~35%, with youth unemployment rate estimated at 50% (Shikololo, 2023). The highest education obtained by most of the country (~32%) is Junior secondary level of secondary school (Namibia Statistics Agency, 2019). The Labour Force Survey conducted in 2018 stated that out of all the fourteen regions, Erongo Region has the lowest unemployment rate (~21.9%) in the country (Namibia Statistics Agency, 2019).

5.7.3 ECONOMIC ENVIRONMENT

5.7.3.1 *Mining*

Arandis is often referred to the “Uranium Capital of the World” due to the largest open-pit uranium mine in the world located ~15 km from it (Schneider, 2014). Arandis was established as a home for Rössing Uranium Mine employees in the late 1970’s. At the end of 2022, Rössing Uranium had a workforce of ~901 with 98% of the workforce being Namibians. Between 2006 and 2010, Rössing has contributed over N\$2.6 billion to government revenue in taxes, which represents about 8% of Namibia’s total tax on income and profits annually (Rössing Uranium Limited, 2011).

Husab Mine is also one of the biggest uranium mines in the world and is situated 22 km south of Arandis. During 2022, Husab Mine contributed N\$3.2 billion into the local economy through local procurement, taxes and royalties, employee salaries, and benefits as well as social investments (Namibia Economist, 2023). The mine employs ~1,700 permanent employees and over 500 contractors, making it the largest employer in the Namibian mining industry, and one of the biggest employers in the country (Chamber of Mines of Namibia, 2020)

5.7.3.2 *Sustainable practices*

Bush encroachment, covering 45 million hectares (ha) of Namibia’s entire surface area, hampers agricultural productivity causing an overall reduction in biodiversity, a decreasing carrying capacity and a noticeable change in the water cycle, which threatens the livelihood of Namibians. Namibian farmers identified the opportunity of using encroaching bush to produce sustainable charcoal. In 2023 a green charcoal production facility was inaugurated in Arandis. The factory is operated by Green Charcoal Namibia, a subsidiary of the Belgium-based Tolefi Group, and sister company to Carbobois, a prominent charcoal distributor in Europe. Approximately 50 full-time jobs and 850 indirect jobs are expected to be generated, with an injection of N\$ 200 million into the economy of the country, foreseen by 2024 (Hartman, 2023).

Green hydrogen is a potential fuel in which hydrogen molecules are separated from water through the process of electrolysis, powered by renewable energy. Green hydrogen has the potential to reduce the use of fossil fuels especially in the transport sector while mitigating climate change; reduce reliance on imported fuel and secure economic growth in Namibia (WWF Namibia, 2023).

Cleanergy Solutions Namibia launched the construction of Africa’s first green hydrogen plant, refueling station and hydrogen academy in Walvis Bay in 2023. The main goal of the Hydrogen Academy is to provide the skill and training related to the production and usage of hydrogen as fuel for heavy duty and mining equipment. This produces a whole new exciting field that explores new initiatives and provides new career and employment opportunities (Cleanergy Solutions Namibia (Pty) Ltd, 2023).

5.7.4 COMMUNITY HEALTH

Namibia's health services are twofold: private (serving ~18% of the population with medical aid) and public (serving the remaining 82%) (Christians, 2020). Public health falls under the Ministry of Health and Social Services (MoHSS), which operates a four-tiered health system, consisting of primary healthcare (PHC) sites, district hospitals, intermediate hospitals and a referral hospital (Christians, 2020). Overcrowding is common at hospitals due to higher quality of care compared to rural clinics. (Namibia Ministry of Health and Social Services, 2017). Health care facilities in the project area include the Swakopmund District Hospital, Mondesa Clinic, Tamariskia Clinic (Swakopmund), Arandis Clinic (Arandis) Walvis Bay District Hospital, Walvis Bay Clinic, Kuisebmund clinic and Narravile Clinic (Walvis Bay).

Best practises should be employed during construction and operational activities to prioritise the safety and health of the occupational workforce and sensitive receptors. This includes measures such as water spraying during construction to control dust, covering trucks, scheduling noisy activities to minimise disturbance, using quieter equipment and providing information to workers and communities on project related safety, hygiene, the spread of communicable diseases, exposure to hazardous materials due to pipe leaks or accidents and disease prevention.

5.8 CULTURAL HERITAGE

Information gathered from the Namibian GIS data, Atlas of Namibia and other sources, suggests that although the Walvis Bay town is rich in history, the project area itself shows no evidence of heritage sites. A chance finds plan will be incorporated into the ESMP, should discoveries of heritage remains be found during the project activities.

6 IMPACT IDENTIFICATION AND EVALUATION METHODOLOGY

6.1 INTRODUCTION

Chapter 2 provides an overview of the approach used in this ESIA process, and details each of the steps undertaken to date. Prediction and evaluation of impacts is a key step in the ESIA process. This chapter outlines the methods that will be followed, to identify and evaluate the impacts arising from the proposed Project. The findings of the assessment will be presented in the full assessment report.

This chapter provides comprehensive details of the following:

- The assessment guidance that will be used to assess impacts.
- The limitations, uncertainties, and assumptions regarding the assessment methodology.
- How impacts will be identified and evaluated, and how the level of significance will be derived.
- How mitigation will be applied in the assessment, and how additional mitigation will be identified.
- The cumulative impact assessment (CIA) method that will be used.

This assessment will aim to determine which impacts are likely to be significant; to scope the available data and identify any gaps that need to be filled; to determine the spatial and temporal scope; and to identify the assessment methodology.

The scope of the assessment was determined by undertaking a preliminary assessment of the proposed Project against the receiving environment, and was obtained through a desktop review, available site-specific literature, monitoring data, and site reports, as set out in this scoping report.

6.2 ASSESSMENT GUIDANCE

The following principal documents will be used to inform the assessment method:

- International Finance Corporation standards and models, in particular performance standard 1: 'Assessment and management of environmental and social risks and impacts' (International Finance Corporation, 2012 and 2017).
- International Finance Corporation Cumulative Impact Assessment (CIA) and Management Good Practice Handbook (International Finance Corporation, 2013).
- Namibian Draft Procedures and Guidance for EIA and EMP (Republic of Namibia, 2008).

6.3 LIMITATIONS, UNCERTAINTIES AND ASSUMPTIONS

Table 10 below shows the potential limitations, uncertainties and assumptions associated with the proposed Project.

Table 10 - Limitations, uncertainties and assumptions.

Topic	Limitation/uncertainty/assumption
Project Design and Technology	<ul style="list-style-type: none"> - Pipeline routing - Above-ground vs. below-ground pipeline construction - Pipeline materials and their environmental interactions - Hydrogen production methods and their environmental footprints - Potential for leaks and safety measures
Environmental and Social Baseline Data	<ul style="list-style-type: none"> - Data gaps in specific environmental or social indicators - Spatial and temporal variability of baseline data - Accuracy and reliability of existing data sources
Green Hydrogen Industry and Regulations	<ul style="list-style-type: none"> - Lack of established regulatory frameworks (elaborate on specific gaps) - Uncertainties in market demand and project viability - Evolving technologies and best practices for green hydrogen
Climate Change	<ul style="list-style-type: none"> - Potential impacts of climate change on project infrastructure and operations (e.g., extreme weather events, sea-level rise) - Uncertainty in climate projections and their influence on long-term assessments

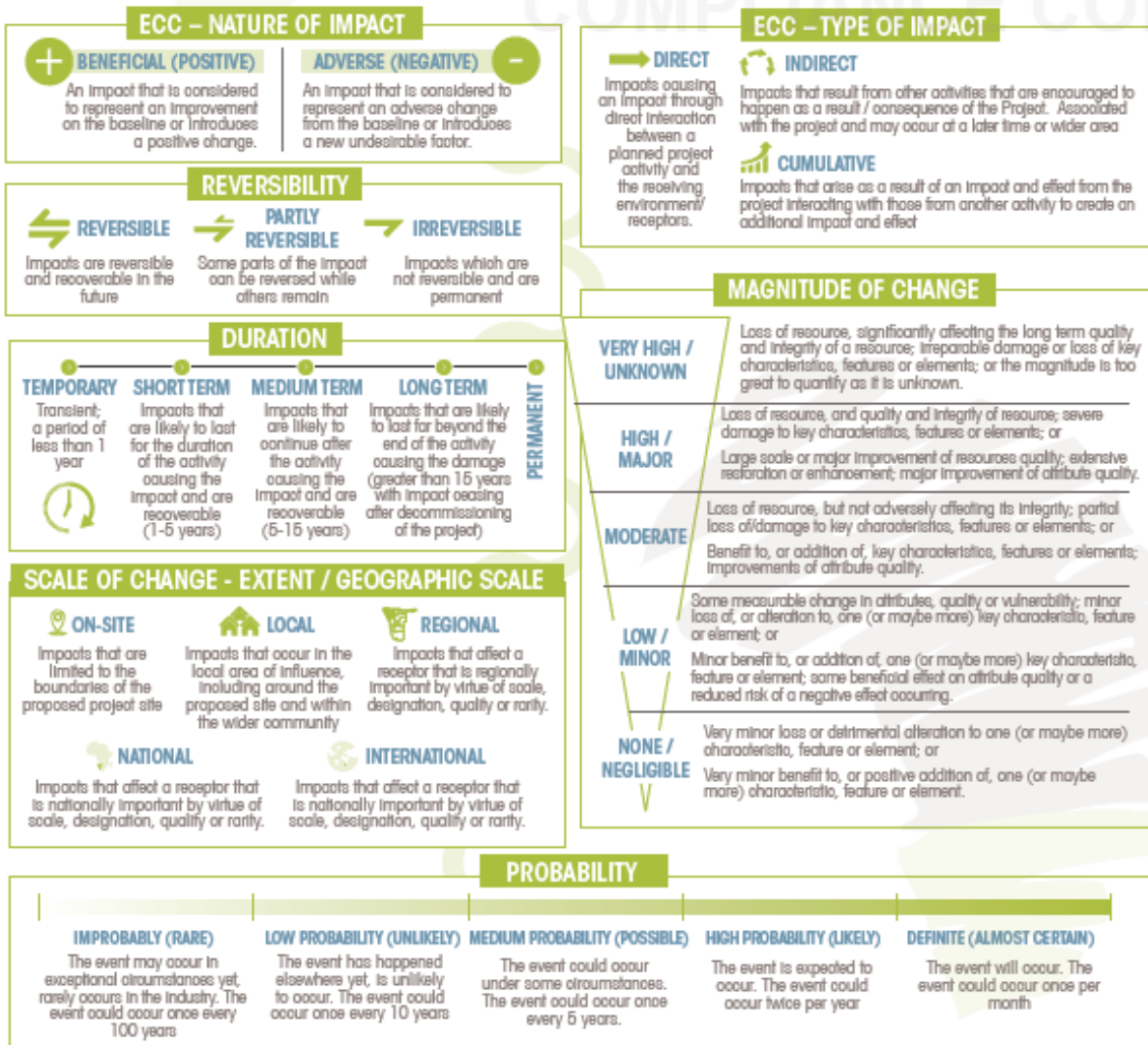
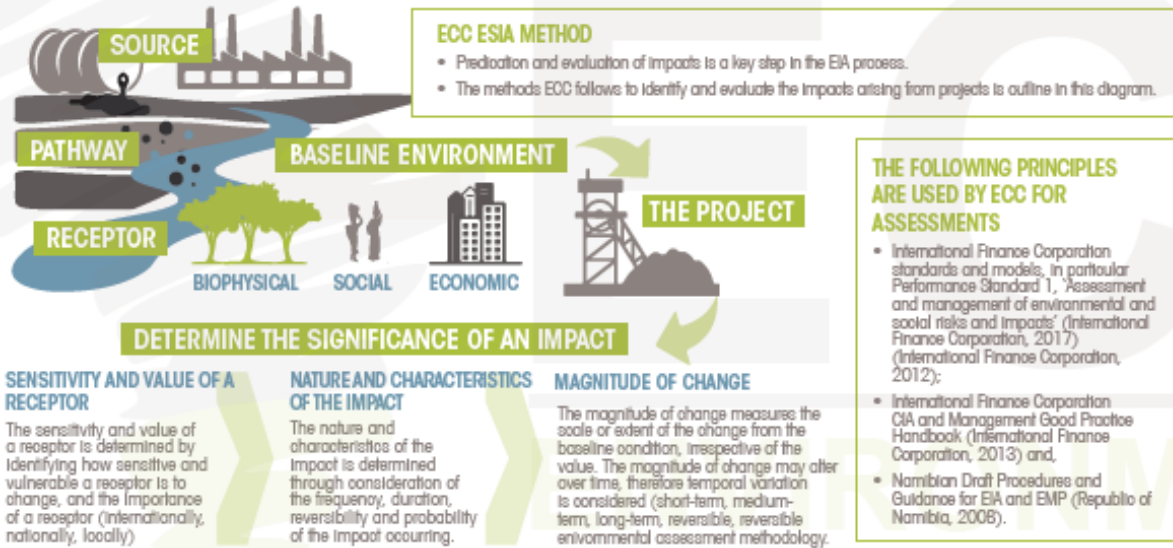
6.4 ASSESSMENT METHODOLOGY

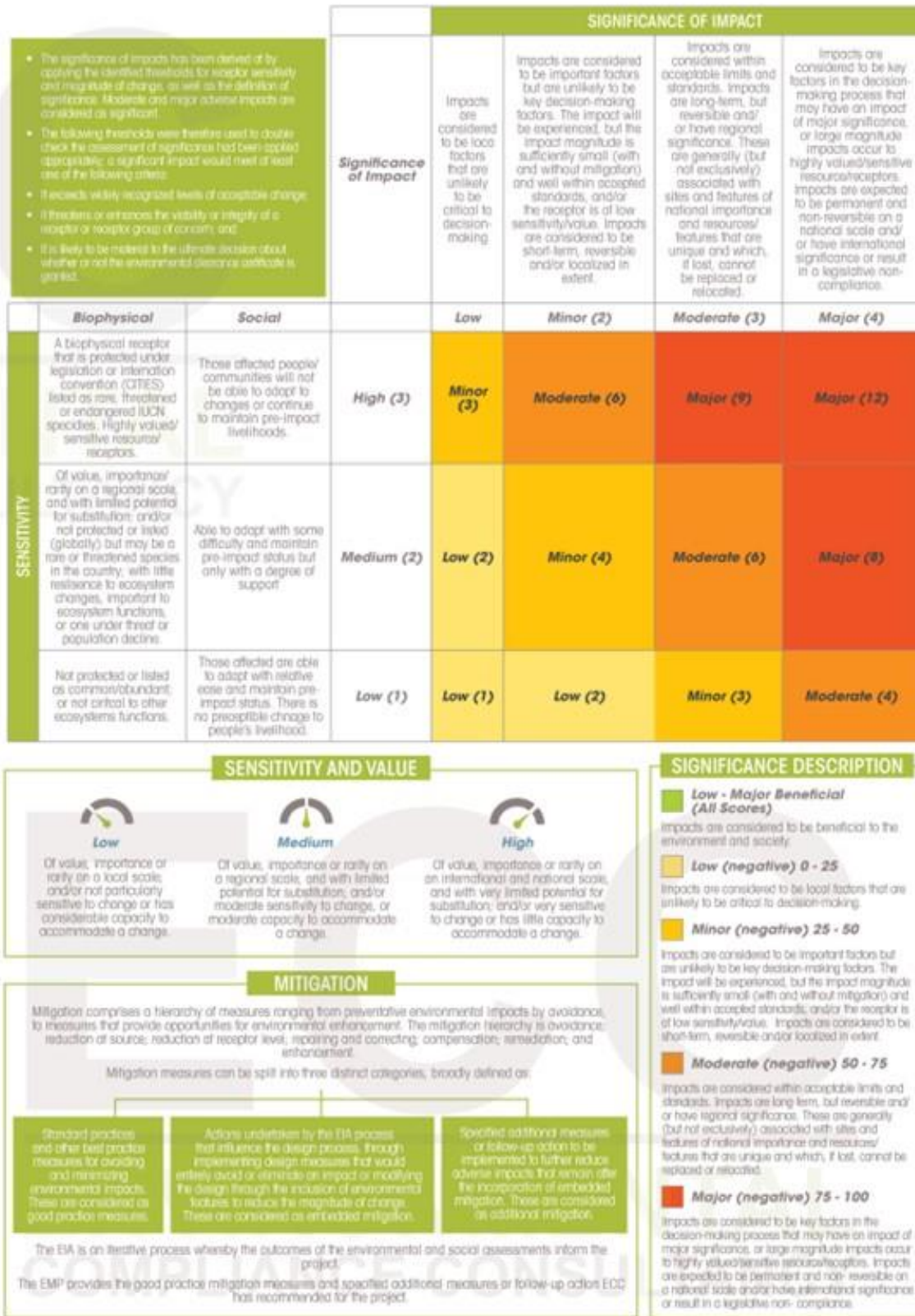
The ESIA methodology applied to this assessment has been developed by ECC using the International Finance Corporation (IFC) standards and models, in particular performance standard 1: ‘Assessment and management of environmental and social risks and impacts’ (International Finance Corporation, 2017); Namibian Draft Procedures and Guidance for EIA and EMP (Republic of Namibia, 2008); international and national best practice; and over 25 years of combined ESIA experience. The methodology is set out in Figure 14.

The evaluation and identification of the environmental and social impacts require the assessment of the Project characteristics against the baseline characteristics, ensuring that all potentially significant impacts are identified and assessed.

The significance of an impact is determined by taking into consideration the combination of the sensitivity and importance/value of environmental and social receptors that may be affected by the proposed Project, the nature and characteristics of the impact, and the magnitude of any potential change. The magnitude of change (the impact) is the identifiable changes to the existing environment that may be negligible, low, minor, moderate, high, or very high; temporary/short-term, long-term or permanent; and either beneficial or adverse.

ECC IMPACT PREDICATION AND EVALUATION METHODOLOGY





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Figure 14 - ECC ESIA methodology based on IFC standards.

6.5 CUMULATIVE IMPACTS

6.5.1 CUMULATIVE IMPACT ASSESSMENT METHOD

Cumulative impacts may arise as a result of other Project activities, or due to the combination of two or more projects in the Project area. A cumulative impact assessment (CIA) will be undertaken by applying the IFC CIA Good Practice Handbook (International Finance Corporation, 2013), which recommends that a rapid CIA is undertaken.

A rapid CIA takes into consideration the challenges associated with a good CIA process, which include a lack of basic baseline data, uncertainty associated with anticipated development, limited government capacity, and the absence of strategic regional, sectoral, or integrated resource planning schemes.

The following five-step rapid CIA process will be followed:

- Step 1:** Scoping – Determine spatial and temporal boundaries
- Step 2:** Scoping – Identify valued environmental and social receptors and identify reasonably foreseeable developments
- Step 3:** Determine the present condition of valued environmental and social receptors (The baseline)
- Step 4:** Evaluate the significance of the cumulative impacts
- Step 5:** Identify mitigation measures to avoid or reduce cumulative impacts

The following information will be applied to the assessment in line with the above steps and IFC guidance:

- The spatial and temporal boundaries of the CIA are the extent of the Project boundaries and the duration of the construction and operation phases of the proposed Project.
- Valued environmental and social receptors that may be affected.
- A review of existing and reasonable, anticipated and/or planned developments has been undertaken, which is based on the information presented in chapter 4.
- The predicted future conditions of sensitive and common environmental and social receptors have been taken into consideration in the assessment.
- The assessment findings will be presented in the assessment report and will have the CIA applied in combination with professional judgment and published environmental assessment reports.
- A review of mitigation and monitoring measures will be undertaken, with any additional ones identified.

6.6 MITIGATION

Impacts that are identified throughout the ESIA process will be subjected to a process of impact mitigation, which is inherent in all aspects of the ESIA system. Embedded mitigation and good practice mitigation will be considered in the assessment. Additional mitigation measures will be identified when the significance of an impact requires it and causes the impact to be further reduced.

The principal of impact mitigation comprises a hierarchy of measures ranging from preventative environmental impacts by avoidance, to measures that provide opportunities for environmental enhancement and will be applied to all impacts associated with the proposed Hydrogen Pipeline Project. The mitigation hierarchy is avoidance; reduction at source; reduction at receptor level; repairing and correcting; compensation; remediation; and enhancement. The environmental and social management plan (ESMP) for the Project provides good practice measures of the impact mitigation and specifies additional measures or follow-up action where required. The preliminary ESMP is appended to this report (Appendix A – ESMP). On completion of the impact assessment, the mitigation measures from the impact assessment and recommendations from the specialist studies are then incorporated into the Final ESMP, which forms an appendix of the Final ESIA (Appendix A – ESMP).

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

- Actions undertaken by the ESIA process that influence the design process, through implementing design measures that would entirely avoid or eliminate an impact, or, modifying the design through the inclusion of environmental features to reduce the magnitude of change. These are considered embedded mitigation;
- Standard practices or other best practice measures for avoiding and minimising environmental impacts. These are considered good practice measures;
- Specified additional measures or follow up actions to be implemented, to further reduce adverse impacts that remain after the incorporation of embedded mitigation. These are considered additional mitigation measures.

Where additional mitigation is identified, a final assessment of the significance of impacts (residual impacts) will be carried out, taking into consideration the additional mitigation.

The ESIA is an iterative process whereby the outcomes of the environmental assessments inform the environmental management of the proposed Hydrogen Pipeline Project through the ESMP .

The preliminary ESMP in Appendix A provides an outline of the good practice measures and specified additional measures or follow-up actions to be undertaken. The project ESMP will be finalised on completion of the impact assessment process and included in the final ESIA report.

7 ASSESSMENT TERMS OF REFERENCE

7.1 TERMS OF REFERENCE FOR THE APPOINTED ENVIRONMENTAL ASSESSMENT PRACTITIONER

The EAP has the responsibility to submit an application for an environmental clearance certificate in accordance with the Environmental Management Act, Act No. 7 of 2007. Additionally, the EAP is to prepare an Environmental and Social Impact Assessment (ESIA) and an Environmental and Social Management Plan (ESMP) that reflect the current state of the biophysical and social environmental baselines, in compliance with the Environmental Management Act 2007, associated regulations, and applicable international best practices.

7.2 TERMS OF REFERENCE FOR THE SCOPING REPORT

The TOR for the scoping report involves:

1. Providing the public and authorities with the background information document (BID) on the Project.
2. Consulting with I&AP's and the relevant stakeholders and authorities about the proposed Project.
3. Conducting public and stakeholder meetings with relevant authorities via invitations and notices in national newspapers.
4. Registering interest in the Project and recording concerns and issues.
5. Ensuring transparency in the process.
6. Allowing adequate opportunities for comments from I&APs and the authorities during the participation process.
7. Including appropriate specialist studies in the scope of the impact assessment report to address key concerns raised during consultations.
8. Completing and submitting the application and scoping report to the Competent Authority in the prescribed manner.

A full environmental and social impact assessment (ESIA) will be completed, taking into account inputs raised by stakeholders and IAPs during the public participation phase. The ESIA aims to:

- Address the issues and concerns raised by authorities, the public and specialist consultants through public consultation and scoping.
- Identify and evaluate actual and potential impacts resulting from the Project on the receiving environment.
- Recommend management, mitigation and monitoring programmes during construction, operations and decommissioning.
- Define an appropriate environmental and social management plan for the proposed green hydrogen pipeline.

The scope of the ESIA report that will be developed will comprise an updated impact assessment in two primary components based on both existing and new data from related specialist studies as noted below. The terms of reference (ToR) for the various studies are described within this chapter.

7.3 SOCIOECONOMIC ASSESSMENT

A socio-economic study will be conducted in-house to assess the impact of the project on the current socio-economic state of the locals and impacts on a regional and national scale.

Scope of work:

The assessment will look at the impact of the project associated with the potential increase in foreign investment that comes with exportation of green energy, potential emerging green career opportunities and increase in revenue.

The deliverables include:

- Receptor identification;
- Baseline socio-economic assessment;
- Mitigation recommendations; and
- Alternative options.

7.4 VISUAL ASSESSMENT

The assessment will be conducted in-house and should include a study of the visual impact and its effects on the local tourist businesses, industrial businesses and residential areas. The assessment will also take into consideration the landscape impacts.

Scope of work:

The following should be assessed during the visual study:

- Visual receptors ;
- Existing visual landscapes;
- Potential impacts on the local residents and businesses; and
- Mitigation and recommendations.

7.5 HEALTH AND SAFETY ASSESSMENT

The objective is to assess potential health and safety impacts associated with the construction and operation of the hydrogen pipeline project. The assessment will identify hazards, evaluate risks, and recommend measures to mitigate and manage health and safety concerns.

Scope of Work:

The assessment will include:

- Identification of potential health and safety hazards related to construction and operation activities.
- Evaluation of risks to workers, nearby communities, and the environment.
- Review of relevant health and safety regulations and guidelines.
- Assessment of emergency response plans and procedures.
- Consultation with stakeholders, including workers and local communities.
- Cumulative risk associated with neighbouring activities.

7.6 CLIMATE CHANGE ASSESSMENT

A climate change assessment will be commissioned to assess the emission baseline of the biophysical environment and formulate recommendations for the management or mitigation of any potential impacts that the Project may contribute to climate change. Additionally, contribute to the potential benefits of the project to set climate change goals.

Scope of work:

- Study of the impacts the project may have on the receiving biophysical and socio-economic environment due to current and project climate scenarios.
- The impacts on international markets, national and international policies and carbon pricing policies.
- The use of a standard scenario to assess the resilience of their strategies to climate change and make recommendations for improvement.
- Recommendation of a process for identifying, assessing and managing climate-related risks and integrating such risks into existing processes.
- Recommendations of ways in which the Project can best mitigate and adapt to climate-related risks.

7.7 AIR QUALITY ASSESSMENT

The assessment should include a study of the legal requirements pertaining to air quality applicable to international legal guidelines, limits and dust control regulations.

Scope of work:

To prepare a comprehensive air impact assessment report that will include:

- A review of available technical project information or any existing information related to air quality in the Project area.
- A review of the air quality legislative and regulatory context, including ambient air quality guidelines.
- A study of the baseline environment which includes determining the potential air quality receptors, existing sources of dust emissions at and around the site.
- Air quality impacts will be reported, and suitable mitigation measures and monitoring requirements will form part of the recommendations.
- Likely pollution pathways in the event of a leak.

7.8 NOISE ASSESSMENT

The objective is to assess the potential noise impacts of the proposed project on surrounding sensitive receptors, including residents, businesses, and the tourism sector.

Scope of work:

To prepare a comprehensive noise impact assessment report that will include:

- Study of current baseline noise levels and impacts in the project area.
- Identification of affected receptors and their exposure levels.
- Assistance with monitoring site selection and baseline data analysis.
- Analysis of topography and emissions inventory.
- Attenuation modelling to predict noise propagation.
- Assessment of impacts using ECC's methodology.
- Provision of mitigation recommendations and alternatives.

7.9 TRAFFIC ASSESSMENT

A traffic assessment will be commissioned to assess the implications relevant to the project with regard to additional vehicles on the current D1984, C28 and B2 road.

Scope of Work:

The increase in traffic volume from the proposed project also to be evaluated, to see whether the route would be able to manage an increase in traffic volume from the proposed Project and existing surrounding receptors. The deliverables include:

- Receptor identification
- Baseline traffic assessment
- Mitigation and control recommendations

- Alternative options

7.10 BIODIVERSITY ASSESSMENT

The objective of the biodiversity assessment will be to assess the bio-physical (vertebrate fauna & flora) issues relevant to the project and assess the significance of development and environmental impact that the project may have on the vertebrate fauna and flora at the proposed site including general comment. A visit to the proposed project area (applicable portions only) will be conducted to assess the development site. Sensitive areas and species will be identified within the Walvis Bay – Farm 58 area.

Scope of work:

The necessary verification fieldwork for the project site will include the following:

- Small mammal transects to determine small mammal diversity in the area;
- Larger mammal presence will be determined in the area;
- Reptile & amphibian transects (diurnal & nocturnal) to determine reptile & amphibian diversity in the area;
- Bird transects to determine avian diversity in the area; and
- Flora transects to determine plant diversity in the area.
- Surveying the proposed Project footprint considering alternative layouts.
- Propose mitigation measures which will be included in the drafted reports.

7.11 HERITAGE ASSESSMENT

A heritage assessment will be required to comply with the Namibian national legislature, including the National Heritage Act, 2004 (Act No 27 of 2004) and the National Heritage Regulations (if applicable), Government Notice (GN) 3490 of 2005.

Scope of work:

- Receptor identification, nearby infrastructure and users, residents, tourist hot spots, other receptors susceptible to impacts from the project raised in the study.
- Baseline assessment (including a minimum site visit and physical data collection if the consultant proposes additional monitoring/data collection locations.
- The study must assess the impacts on project receptors.
- The assessment must provide suggested mitigation and control recommendations or inclusion in the EIA.
- Provide alternatives and options if the proposed project options are not viable to reduce impacts.
- Applicable mitigation and management measures should be recommended subject to the significance of the impact.
- A site survey may need to be conducted if baseline data is not available.

7.12 GROUNDWATER AND SURFACE WATER ASSESSMENT

To assess the potential hydrology and hydrogeological issues relevant to the Project and assess the significance of the operational and environmental impacts that the Project may have on the hydrological and hydrogeological environments at and beyond the proposed site.

Scope of work:

To prepare a detailed surface and groundwater assessment report that will entail:

- A review of the existing information on the revised site layout and associated surface and groundwater documents, including a review of design recommendations for ground and surface water control measures.
- A study on the surface and groundwater flow regimes and potential interception with various proposed pipeline routes.
- To prepare detailed surface water and groundwater impact assessment along with recommended mitigation (where required), to be incorporated into the ESMP. This include recommendations on where sections of the pipeline should be below/above ground to minimise potential disruption to natural flow systems.
- To include potential alternatives and recommendations in the final report that may reduce potential impacts on the environment and local communities.

8 CONCLUSION

This scoping report has established the baseline data, project description, impact assessment methodology, and scope of studies required for a thorough Environmental and Social Impact Assessment (ESIA). The study identified that the terrestrial landscape, biodiversity, heritage, and the health and safety of the community as potentially vulnerable to project activities, highlighting the need for detailed impact analysis in the ESIA. ECC is committed to undertaking a rigorous assessment to identify and mitigate potential impacts. Public comments received during this scoping period will be carefully considered and incorporated into the subsequent ESIA to address community concerns. The ESIA will culminate in the development of a detailed environmental and social management plan (ESMP) designed to minimise negative impacts and maximise social and environmental benefits. This scoping report represents the first step in a continuous assessment and engagement process. ECC is dedicated to working collaboratively with stakeholders and employing adaptive management throughout the project lifecycle to ensure responsible and sustainable development.

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APPENDIX A – PRELIMINARY ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

APPENDIX B – PUBLIC CONSULTATION DOCUMENT

APPENDIX C – EAPS CVS