

ENVIRONMENTAL IMPACT ASSESMENT

CEGEO

PROPOSED STORAGE PLANT: LIQUID PETROLEUM GAS TERMINAL at Portion remainder farm 39, Walvisbay

CENTER FOR GEOSCIENCES RESEARCH

Consulting Geoscientist:
Mining, Petroleum Exploration and Environment Consultancy.
Windhoek-Namibia

PROPONENT

October 2021

Erongo Liquid Petroleum Gas
Terminal (pty) Ltd
Box 4018
Windhoek



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EAP: Consultant:



Centre for Geosciences Research cc

128 A Bach street Windhoek

Windhoek

cegeornam@gmail.com



PROJECT DETAILS

**TITLE: Proposed Storage Plant of Liquid Petroleum Gas Terminal at Portion
Remainder farm 39, Walvis Bay- District, Erongo Region, Namibia.**

AUTHORS:

- Mr Siyambango Mulife (Centre for Geosciences Research cc)

PROPONENT:

Erongo Liquid Petroleum Gas Terminal (Pty) Ltd
P O Box 4018
Windhoek
Namibia

CONSULTANCY:

Centre for Geosciences Research Cc
PO Box 31423
Pioneerspark
Windhoek, Namibia

Contact: Cell:0856419511



NAME	Mulife Siyambango
RESPONSIBILITY	Director of Centre for Geosciences Research cc: Centre Director
QUALIFICATIONS	<i>B. Sc. in analytical, inorganic and physical chemistry, Geography and Environmental Studies.</i> <i>M. Sc. in Industrial Rocks and Minerals, MBA in Banking, Accounting and Strategic Management.</i>
PROFESSIONAL REGISTRATION	<i>Pr.Sci.Nat</i>
EXPERIENCE	<p>Mr Siyambango is the director and founder of Centre for Geosciences Research cc Mr Siyambango is a qualified environmental geologist, and specialist in industrial minerals and rocks. Obtained an MSc in Industrial Rocks and Minerals with majors in Mineral Resource Assessment Estimation; Mineral Extraction & Management Marketing of Industrial Rocks and Minerals, Geology and Technology of Industrial Rocks and Minerals. Mr Siyambango is a fully trained and qualified Chemist with a BSc in analytical, inorganic and physical chemistry; Geography and Environmental Studies. Extensively trained and experienced in analytical instruments that are essential for mineral exploration and mineral processing. Academically and experienced trained Manager, with an MBA in Banking, Accounting and Strategic Management. The qualification supplements the economic assessment of commerciality of mineral resources for assessment of the bankability.</p>



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LIST OF ABBREVIATIONS

API	American Petroleum Institute
BLEVE	Boiling Liquid Expanding Vapour Explosion
CBD	Central Business District
EL PGT	Erongo Liquid Petroleum Gas Terminal (Pty) Ltd
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EMS	Environmental Management System
ENOC	Emirates National Oil Company
GDP	Gross Domestic Product
CEGEOR	Centre for Geosciences Research
HSEQ	Health, Safety & Environment Quality System or Program
I&APs	Interested and Affected Parties
IFC	International Finance Corporation
IMDG	International Maritime Dangerous Goods
IMO	International Maritime Organisation
ISGOTT	International Safety Guide for Oil Tankers & Terminals
ISO	International Standards Organisation
LNG	Liquefied natural gas
LPG	Liquefied Petroleum Gas
MET	Ministry of Environment and Tourism
MT	Metric tonne
NFPA	National Fire Protection Association
NIDS	Namibia Inter Censal Demographic Survey
NPC	National Planning Commission



OCIMF	Oil Companies International Marine Forum's
OSHAS	Occupational health and safety information, guidance and resources
PPPPs	Projects, Plans, Programmes and Policies
psig	pound-force per square inch gauge
SADC	Southern African Development Community
SANS	South African National Standards
SIGTTO	Liquefied Gas Handling Principles on Ships and in Terminals
SIRE	Ship Inspection Report Programme
SOLAS	Safety of Life at Sea
TIA	Traffic impact assessment
UAE	United Arab Emirate
USA	United States of America
VTS	Vessel Traffic Service
VOC	Volatile Organic Compound



1 BACKGROUND, INTRODUCTION AND JUSTIFICATION

1.1 Background to the Development

An Environmental Impact Assessment (EIA) has been commissioned by Erongo Liquid Petroleum Gas Terminal (Pty) Ltd for the construction and operation of a Liquid Petroleum Gas (LPG) and Terminal in Walvis Bay. Erongo Liquid Petroleum Gas Terminal (Pty) Ltd was motivated to fill the gap that has existed in the Liquid Petroleum Industry in Namibia. The COVID19 pandemic has illustrated just how fragile the local LPG industry is due to all imports coming from South Africa. The problem faced by Namibia, and neighbouring land locked countries is that all are 100% dependent on supply from South Africa. Unfortunately, the refineries in South Africa are too old and usually go on unscheduled shut downs leaving all immediate neighboring countries struggling with the supply of the LPG to end users. The only option for the entire country and other importers such as Namibia was to utilize the Port Elizabeth Terminal at higher costs but, which also ran out of gas occasionally then we were left without no other alternative but to go as far as Mozambique to pick LPG GAS. However Mozambique currently is at country is unsafe due to war. Another threat is unpredictable of the uprising and strikes of South African truck drivers towards foreign truck drivers and trucks. This cause significant backlog of various goods and endangers our personnel and company assets. The only solution we have at our disposal is to construct an importing Bulk LPG terminal at Walvis Bay and bring in the LPG product via maritime route into Namibia and truck product to the other land locked countries. The COVID19 pandemic has just exacerbated and compounded the shortage of LPG in the region and there is a need to expedite the construction of the terminal, so that we can supply LPG into the Namibian market and that of our neighboring countries

The main business activity will involve providing bulk LPG to Namibia and the Southern African Development Community (SADC) market for domestic and industrial usage. These activities will be extended to create LPG distribution points throughout Southern Africa. Erongo Liquid Petroleum Gas Terminal (Pty) Ltd with its technical partner wishes to establish the importing terminal at the Walvis Bay Port.

The construction, operational and decommissioning phases entail;

Construction Phase:

- Site preparation as required by geotechnical survey;
- Civil works required for storage tanks and pump rooms;
- New buildings required for administration offices and security guard houses at gates;
- Construction of parking bays and driveways;
- Installation of associated electrical, water and sewerage utilities;

Operational Phase:

- Receiving fuel from a proposed fuel mooring facility (import);
- Storage and handling of products in on-site tanks;
- Loading of products to transportation vehicles and other links, such as pipelines,

rail tankers, trucks and ships, for distribution
to customers.

Decommissioning Phase:

- Removal of all infrastructure not reused during future use of land; and
- Rehabilitation of property.

1.1.1 Introduction

The project site is situated at Portion of Remainder farm 39, measuring 35000m² within the industrial zoned town lands of Walvis bay east of the Trans Kalahari Highway and in proximity to the SADC north port. The site is currently surrounded by industrial land in all directions except the Atlantic Ocean to the west. See Figure1 and 2.

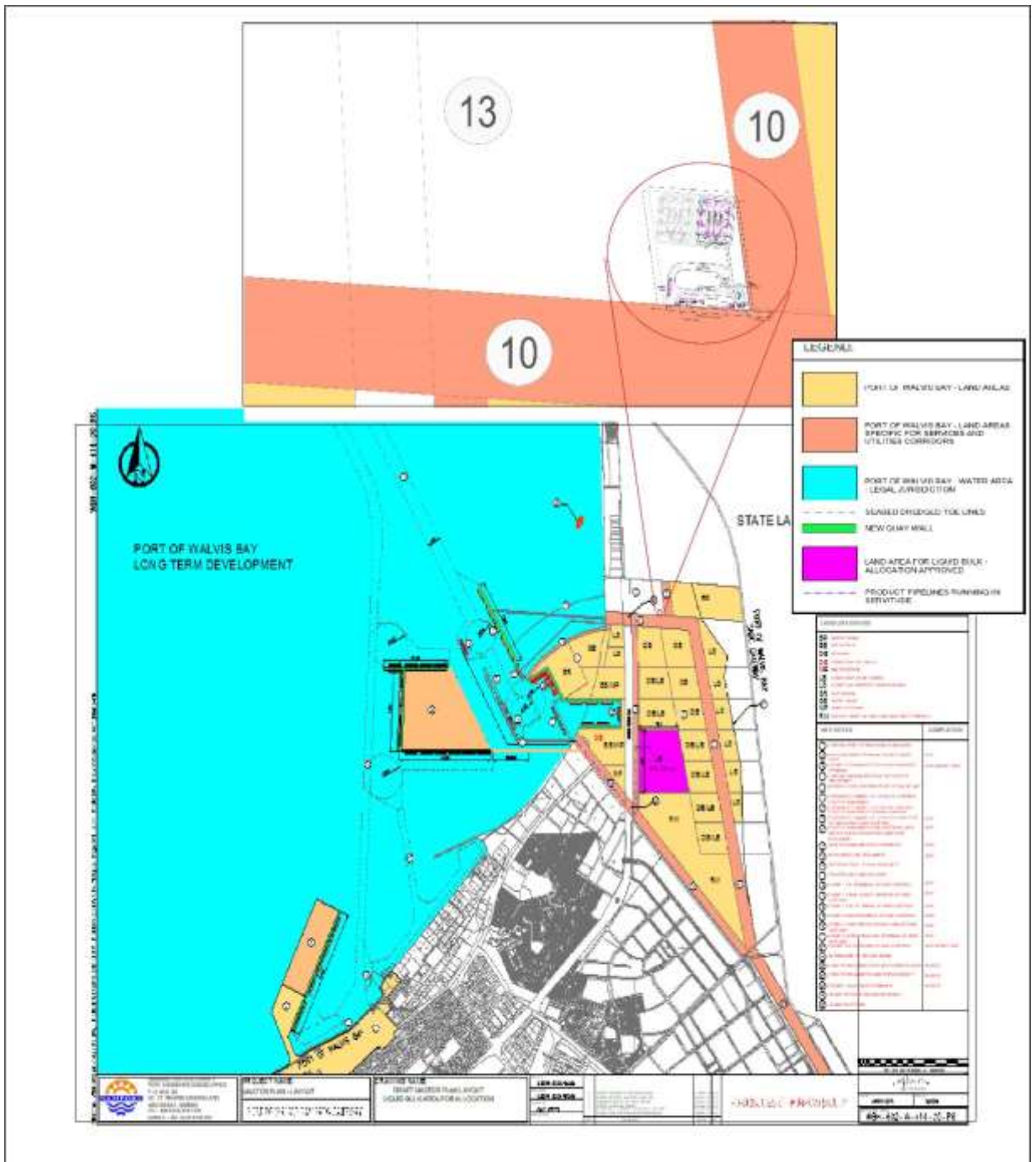


Fig 1, showing the locality of Erongo Liquid Petroleum Gas Terminal (Pty) Ltd Portion of Remainder farm 39, Walvis Bay.

Centre for Geosciences Research cc, an independent consultant, has been appointed to undertake the Environmental Impact Assessment of the proposed LPG storage facility. This study is to enable decision makers to make informed decisions regarding the development from an environmental perspective. The environmental assessment was conducted to comply with Namibia's Environmental Assessment Policy and to the requirements of the Ministry of Mines and Energy.

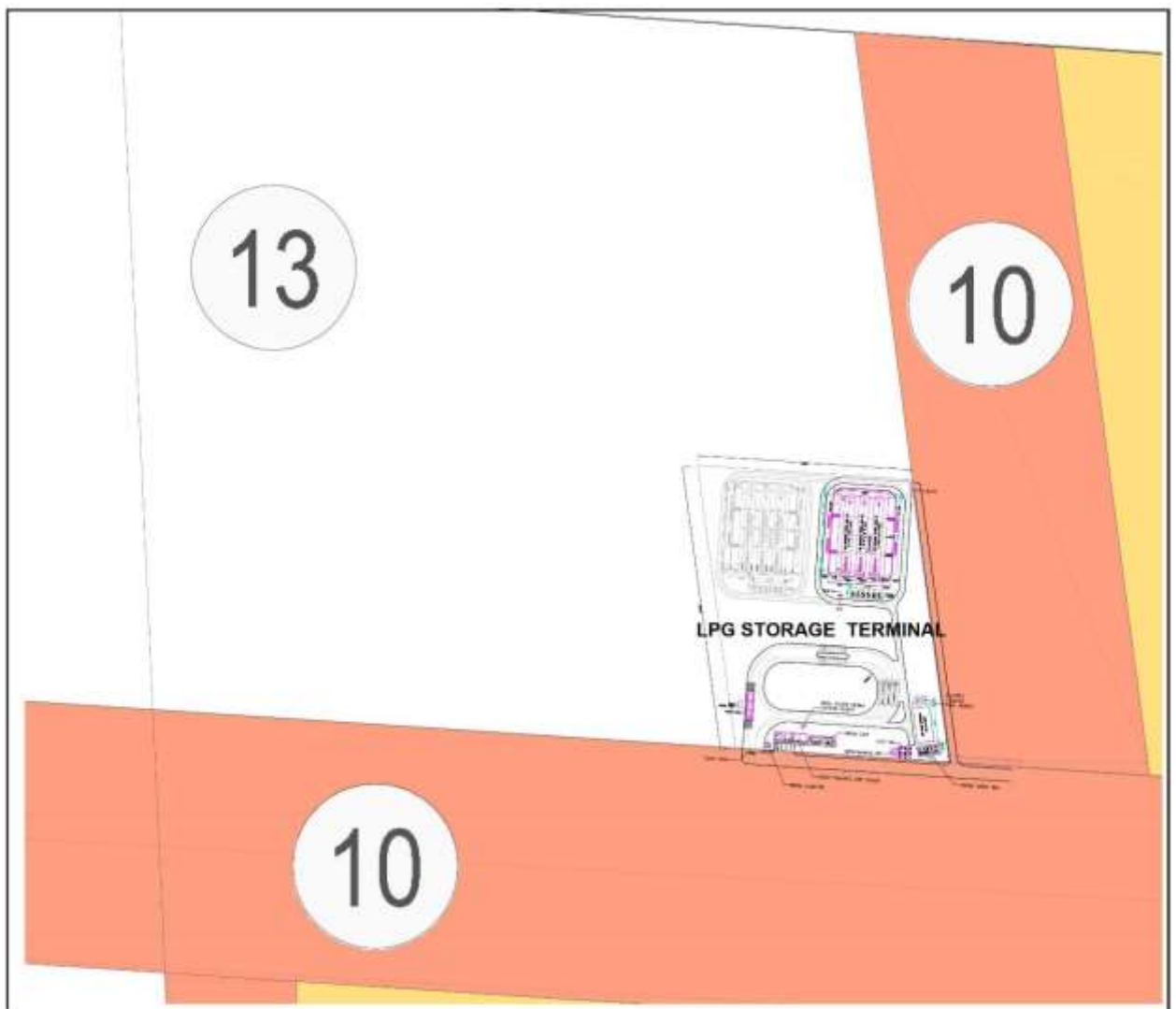


Fig 2, showing the locality of Erongo Liquid Petroleum Gas Terminal (Pty) Ltd Portion of Remainder farm 39, Walvis Bay.

1.1.2 Project Justification

Erongo Liquid Petroleum Gas Terminal (Pty) Ltd , and in particular its constituent companies have been in the LPG bottling and distribution business for a number of years and are well versed in the value that its company adds to the economy. The promotion of LPG is an integral part of their business.

There is a need to have greater control over the supply of LPG to Namibia and Botswana due to recent deleterious fluctuations in the supply of this dependable fuel source. Currently, supply is dependent significantly on South African stockpiles and the surplus once South African needs are met.

The development pace of Southern Africa is growing and the use of electricity and LPG is gaining prevalence over traditional historical sources. As the region becomes more stable politically and economically this trend will strengthen.

There is currently a severe shortage of bulk LPG storage facilities in the SADC region and the establishment of this 3,000 metric tonne (MT) installation will be one of the largest in the region. The capacity of this terminal will ensure that the current demands for LPG can be met and even surpassed in the future thus enabling Namibia to benefit from the distribution of this fuel within and beyond its borders.

Additional to these motivations, environmentally speaking, LPG is a clean, non-polluting fuel and for this reason a preferable fuel source.

In conclusion, the energy industry in Namibia is rapidly advancing in terms of contribution to the GDP in a country that has been for so long dominated by mining. This kind of growth and evident fundamental shift in balance of economics has inspired Erongo Liquid Petroleum Gas Terminal (Pty) Ltd to expand the line of business focusing especially on customers who do not have resources for an expensive energy like electricity. LPG has therefore become a

direct alternative source of energy and the increase in demand herein. Having depots country-wide and sufficient cylinders, Erongo Liquid Petroleum Gas Terminal (Pty) Ltd will be able to meet its demand and increase client base through marketing campaign and customer awareness.

1.2 Potential Direct Benefits:

- ▮ Direct capital investment;
- ▮ Stimulation of skills transfer: Due to the nature of their operations, Erongo Liquid Petroleum Gas Terminal (Pty) Ltd has no other option but to implement a training programme for all staff. Training programmes will be advanced and staff will permanently benefit from these training programmes. Many of the training programmes will be targeting specifically semi-skilled Namibian workers.
- ▮ Stimulation of economic development (e.g. supply of materials and goods for construction purposes; new businesses, employment, housing, better markets and access to public services etc.).
- ▮ Security of fuel supply: the new Erongo Liquid Petroleum Gas Terminal (Pty) Ltd aims to avert risks associated with volatile international and regional fuel supplies. Fuel is regarded as a strategic commodity and the country as a whole depends on reliable fuel supplies. If Namibia's economic growth targets (Vision 2030) are to be met, then fuel supply must never be in short supply or compromised. It is therefore in national interest for the country to pursue a project of this nature as soon as possible. In recent years, when refineries in South Africa malfunctioned this impacted Namibia's economy. Similar, but larger breakdowns in future may have catastrophic impacts on the Namibian economy. With this Installation it is estimated that Namibia would have increased LPG storage for 45days consumption.

- ▮ Job creation: 65 persons will be employed initially to get the Installation to the operational phase. Approximately 100 new jobs will be created for the long term. Some of the jobs will go to persons living in Walvis Bay. Given the unemployment rate of 34% for the Erongo (Census, 2011) Region, hence this in itself is regarded as a significant benefit to the socio-economic situation in the region that has been hit by decline in fishing activities.

1.3 Potential Indirect Benefits:

- ▮ More competitive conditions that could lower costs of consumer goods;
- ▮ Expansion of trade and industrial activity in the town;
- ▮ Inducement of additional investments;
- ▮ Creation of new long-term employment opportunities outside the bulk LPG storage facility;
- ▮ General enhancement of the health conditions and quality of life in the town of Walvis Bay.
- ▮ Of significance is the prospect of diversification of the Walvis Bay economy, which is presently mainly predominantly on fishing, container cargo handling and controlled petroleum products industry such as diesel and petrol grade.

2 SCOPE

The scope of the EIA is to determine the potential environmental impacts emanating from construction, operations and possible decommissioning of the proposed bulk LPG storage facility. Relevant environmental data is to be compiled by making use of secondary data, from reconnaissance site visits and from various meetings with stakeholders. Potential environmental impacts and associated social impacts will be identified and addressed in this report. A Risk Based Assessment is included in addition to the impact assessment and this is included in the EIA report. An Environmental Management Plan has been created and has been added to the Assessment Report.

The aims and objectives of this EIA report is to:

1. Provide sufficient information to determine whether the proposed project will result in significant adverse impacts;
2. Identify a range of management actions which could mitigate the potential adverse impacts to acceptable levels;
3. Comply with Namibia's Environmental Assessment Policy and Environmental Management and Assessment Act, and
4. Provide sufficient information to the Ministry of Environment & Tourism and Ministry of Mines and Energy to make an informed decision regarding the proposed development;
5. Present and incorporate comments made by Interested and Affected Parties during Public Participation meetings.

3 METHODOLOGY

The following methods were used to investigate the potential impacts on the social and natural environment due to the construction and operation of the bulk LPG storage facility fig 3:

1. Baseline information about the site and its surroundings was obtained from existing secondary information as well as from a reconnaissance site visit.
2. As part of the scoping process to determine potential environmental impacts, Interested and Affected Parties (I&APs) were consulted and their views, comments and opinions are put forward in this report.



Figure 3. Location Map for Proposed Installation in Walvis Bay

4 ADMINISTRATIVE, LEGAL AND POLICY REQUIREMENTS

To protect the environment and achieve sustainable development, all projects, plans, programmes and policies (PPPPs) deemed to have adverse impacts on the environment require an EIA according to the Namibian legislation. The following legislation governs the EIA process in Namibia, pertaining to the proposed development. Additional legislation is listed which is required for bulk LPG shipping and storage and distribution in smaller tankers and containers. These pertain to the health and safety of the social and ecological aspects of our environment.

4.1 The Namibian Constitution

Article 95 of Namibia's constitution provides that:

“The State shall actively promote and maintain the welfare of the people by adopting, inter alia, policies aimed at the following:

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

This article recommends that a relatively high level of environmental protection is called for in respect of pollution control and waste management.

4.2 Environmental Management Act of Namibia (2007)

The Environmental Management Act of Namibia (2007) requires that all projects, policies, programmes, and plans that have detrimental effect on the environment must be accompanied by an EIA. The Environmental Assessment Procedure is depicted in Figure 3.

It further provides a guideline list of all activities requiring an impact assessment. The proposed development is listed as a project requiring an impact assessment as per the following points in the policy:

1. Transportation of hazardous substances & radioactive waste.
2. Storage facilities for chemical products.
3. Industrial installation for bulk storage of fuels.

The Act provides a broad definition to the term “*environment*” - land, water and air; all organic and inorganic matter and living organisms as well as biological diversity; the interacting natural systems that include components referred to in sub-paragraphs, the human environment insofar as it represents archaeological, aesthetic, cultural, historic, economic, paleontological or social values.

Cumulative impacts associated with proposed developments must be included as well as public consultation. The Act further requires all major industries and mines to prepare waste management plans and present these to the local authorities for approval.

Apart from the requirements of the Environmental Management Act, the following sustainability principles need to be taken into consideration, particularly to achieve proper waste management and pollution control:

4.2.1 Cradle to Grave Responsibility

This principle provides that those who manufacture potentially harmful products should be liable for their safe production, use and disposal and that those who initiate potentially polluting activities should be liable for their commissioning, operation and decommissioning.

4.2.2 Precautionary Principle

There are numerous versions of the precautionary principle. At its simplest it provides that if there is any doubt about the effects of a potentially polluting activity, a cautious approach should be adopted.

4.2.3 The Polluter Pays Principle

A person who generates waste or causes pollution should, in theory, pay the full costs of its treatment or of the harm, which it causes to the environment.

4.2.4 Public Participation and Access to Information

In the context of environmental management, citizens should have access to information and the right to participate in decision-making.

4.3 Petroleum Products and Energy Act of Namibia (Act No. 13 of 1990)

The Act makes provision for impact assessment for new proposed fuel facilities and petroleum products known to have detrimental effects on the environment.

4.4 Pollution Control and Waste Management Bill (guideline only)

Of particular reference to the above, the stated project, Parts 2, 7 and 8 apply. Part 2 provides that no person shall discharge or cause to be discharged any pollutant to the air from a process except under and in accordance with the provisions of an air pollution licence issued under section 23.

Part 2 also further provides for procedures to be followed in licence application, fees to be paid and required terms of conditions for air pollution licences.

Part 7 states that any person who sells, stores, transports or uses any hazardous substances or products containing hazardous substances shall notify the

competent authority, in accordance with sub-section (2), of the presence and quantity of those substances.

The competent authority for the purposes of section 74 shall maintain a register of substances notified in accordance with that section and the register shall be maintained in accordance with the provisions.

Part 8 provides for emergency preparedness by the person handling hazardous substances, through emergency response plans.

4.5 Atmospheric Pollution Prevention Ordinance of Namibia (No. 11 of 1976)

Part 2 of the Ordinance governs the control of noxious or offensive gases. The Ordinance prohibits anyone from carrying on a scheduled process without a registration certificate in a controlled area. The registration certificate must be issued if it can be demonstrated that the best practical means are being adopted for preventing or reducing the escape into the atmosphere of noxious or offensive gases produced by the scheduled process.

4.6 Hazardous Substances Ordinance (No. 14 of 1974)

The Ordinance applies to the manufacture, sale, use, disposal and dumping of hazardous substances, as well as their import and export and is administered by the Minister of Health and Social Welfare. Its primary purpose is to prevent hazardous substances from causing injury, ill-health or the death of human beings.

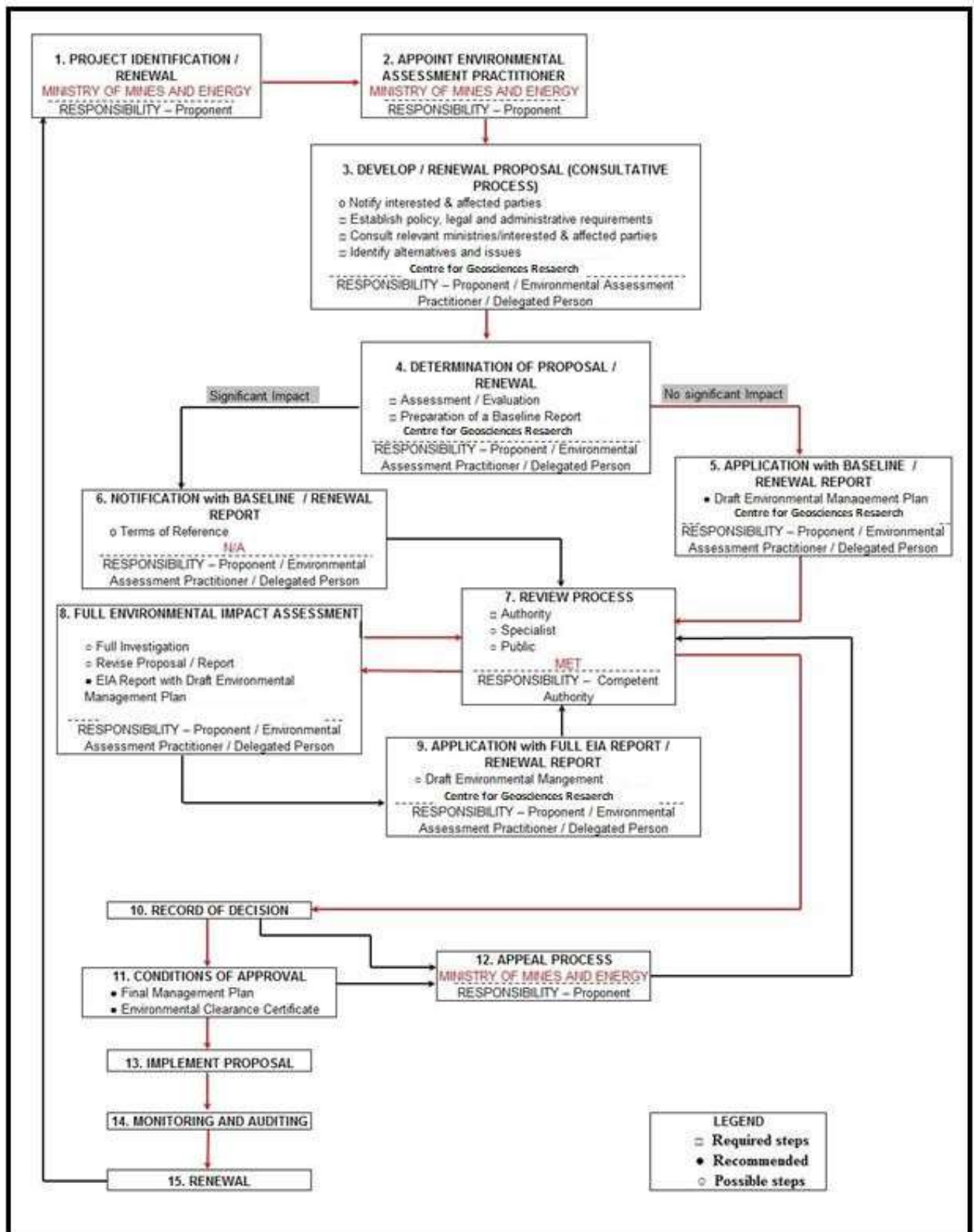


Fig 4, Environmental Assessment Procedure of Namibia (Environmental Management Act of Namibia (2007))

4.7 The Draft Gas Bill

The Ministry of Mines and Energy has drafted the Gas Bill in order to promote the establishment of a natural gas transportation and distribution network in Namibia for the purposes of domestic supply and for export; to establish a framework of licensing for the gas industry and a national gas regulator to monitor the performance of licence conditions; 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. It is envisaged to establish a Gas Regulatory Authority to make recommendations to the Minister to inter alia grant licences for gas transportation, storage, distribution and marketing; monitor and approve of gas transportation, storage, and distribution tariffs and charges; approve tariffs and charges to gas distributors and customers who do not have choice of suppliers; to assist the Minister in the preparation of gas supply regulations; monitor the operation of the gas system; and to settle disputes between licensees and between licensees and customers at the request of a licensee or any interested party.

A comprehensive licensing regime has been developed based on the principle that no activity in connection with the transportation, storage or distribution and marketing of gas may be carried out by any person other than a company authorised to do so by the Minister under the licensing regime set out in this Act.

The Bill further explicitly recognises the importance of environmental protection in that it provides in Section 38 that:

1. No pipeline infrastructure shall be laid without an environmental impact assessment first taking place and the results assessed, in accordance with the Environmental Management Act 1998, the Pollution Control and Waste Management Act and the Parks and Wildlife Management Act, where appropriate, including the Petroleum (Exploration and Production) Act, 1991:

Regulations relating to the health, safety and welfare of persons employed, and protection of other persons, property, the environment and natural resources, in at or in the vicinity of exploration and production areas, 1999.

2. Provision shall be made for the proper restoration of the operating environment to its natural condition, with plans for pipeline decommissioning being submitted according to the environmental laws and the appropriate regulations.

Although the second draft of the Bill dates back to June 2001, the Bill has not materialised.

4.8 Namibian Ports Authority Act (Act No. 2 of 1994)

The Regulations promulgated under the Namibian Ports Authority Act (Act No. 2 of 1994) crucially codify the applicability of the International Maritime Dangerous Goods (IMDG) Code and numerous aspects of the International Safety Guide for Oil Tankers & Terminals (ISGOTT) Code and the Code on Liquefied Gas Handling on Ships and in Terminals. The Namibian Port Regulations of 2001 (GN No. 117 of 2001) are relevant in so far as the regulations control the nature of and manner in which activities may be undertaken within any Namibian Port. The Regulations importantly stipulate that the handling of all dangerous goods in Namibian Ports must be in accordance with the IMDG Code. The Regulations also comprehensively regulate how flammable liquid bulk cargoes must be managed within a Namibian Port. Refer to Appendix A.

4.9 Municipality of Walvis Bay (Environmental By-laws, Guidelines and Regulations)

Environmental Impact Assessment procedure guidelines

The Development is located within a medium groundwater control zone, which requires that a partial EIA be conducted. It provides a procedure to be followed for new projects to be established within the jurisdiction of Walvis Bay. It requires the submission of project a proposal to the office of the Chief Executive Officer, which in turn forwards the proposal to different departments within the Municipality for comments. The Environmental Management Section decides based on comments, EIA policy and Environmental Management Act as to whether the proposal requires an EIA or not.

Draft Structure Plan of the Municipality of Walvis Bay

The main objective of the Structure Plan is “to Set Guidelines that will ensure the best possible living conditions and environment for the residents of Walvis Bay.” The secondary goals and objectives of the Structure Plan are as follows:

- Γ “Provide sufficient infrastructure to all erven;
- Γ Lessen the shortage in housing and accommodation; and
- Γ Establish and develop a diversified economic base by looking at tourism, manufacturing, fishing, services and sectors and the port/harbour for example”

Integrated Environmental Policy of Walvis Bay (Agenda 21 Project)

The Integrated Environmental Policy indicates the directions that the Municipality of Walvis Bay will move towards in the forthcoming years to fulfil its responsibilities to manage the environment of Walvis Bay together with the town’s residents and institutions. It is a statement of purpose that commits the municipality to certain principles, policy directions, and tools. It serves as an adaptive, flexible framework for a series of sectoral strategies and action plans, these inspired by visions of a better environmental future.

The Policy is directed at assuring the longer-run management of Walvis Bay's environment for the benefit of all its residents and its visitors.

The policy has identified ten (10) priority areas that need to be tackled by the Municipality, these are:

- ▮ Managing Walvis Bay's Ramsar Wetland Site
- ▮ Minimising the Consumption of Water
- ▮ Reducing Marine Pollution in Walvis Bay itself
- ▮ Improving Walvis Bay's Air Quality
- ▮ Understanding and Solving Ground Pollution Issues
- ▮ Conserving Threatened Species and their Habitats
- ▮ Managing Off-Road Driving and other Recreational Activities
- ▮ Improving Sanitation Facilities for shack dwellers
- ▮ Eradicating Litter Hotspots in Walvis Bay and on the Seashore
- ▮ Educating Residents, particularly Learners, about Walvis Bay's Environment and its Ecosystems.

Local Authorities Act and Bylaws

The Local Authorities Act (Act 23 of 1992) prohibits, without municipal approval, the discharge into the sewer system of the following:

- ▮ any gas or steam;
- ▮ any liquid other than domestic waste water of a temperature higher than 40 degrees Celsius;
- ▮ any petrol or oil or substances containing petrol or oil;
- ▮ any liquid refuse from any abattoir;
- ▮ any chemical refuse;
- ▮ any industrial, trade or manufacturing waste.

The Walvis Bay Municipality further apply the Drainage and Plumbing By-Law of 1958

(updated in 1982), which state:

“If it is ascertained that the introduction into a municipal sewer of any solid matter, suspended matter, mud, chemical or manufacturing or trade or other refuse (inclusive of vapours or gaseous matters) or of any steam, condensing water, heated waters or other liquid (such water or other liquid being of a higher temperature than 110 degrees Fahrenheit), whether alone or in combination with other matter or liquids, and whether directly or through any drain or channel communicating with such sewer, either does, or may cause a nuisance, or involve danger to health of persons entering the sewers, or others, or is or may be injurious to the structure of materials of the sewers or works of the Council, or to any ground used by the Council for the disposal of sewage, the Council may, by order, absolutely prohibit from a date to be named in such order, not being earlier than 14 days from service of such order, any such matter or matters being caused or permitted to fall, flow or enter, or to be carried or washed into any sewer either directly or indirectly.”

4.10 Relevant International Standards, Codes, Treaties, Guidelines and Conventions for LPG

4.10.1 International Maritime Dangerous Goods Code (IMDG)(2006)

The handling of dangerous goods is stipulated in this document. The code regulates the transport of dangerous goods in packaged form across the sea. From the 1st January 2004, this code became mandatory, in terms of chapter 7 of the Safety of Life at Sea (SOLAS) Convention under the auspices of the International Maritime Organisation (IMO). Namibia ratified SOLAS on 27 February 2001. The IMDG code is revised and republished every two years, and is based on the recommendations published by the United Nations Committee of Experts on the Transport of Dangerous Goods. See Appendix A on page 51 for applicable details.

4.10.2 International Codes for the Carrying of Bulk Liquid Gases

Part 10 of the Namibian Port Authority Act Regulations extensively regulates how flammable liquid bulk cargoes are to be transported, handled and transferred in Namibian ports. Butane and propane, the principal constituent gases of LPG, are listed in the IMDG Dangerous Goods List, inter alia:

Category E gases. (see part 7 of IMDG Code) Gases that must be kept clear of living organisms.

Flammable hydrocarbon gases.

Various bulk liquids and gases have associated hazards due to their inherent chemical properties. Many of these have low flashpoints, representing serious potential explosion and fire hazards. Due to these inherent risks, together with

the volumes of cargoes stored and handled, such bulk gases and liquids are generally supposed to be handled at purpose-built terminals, situated away from the main port facilities.

Internationally recognised guidelines and procedures for handling bulk liquids and gases are regulated by:

- Γ International Safety Guide for Oil Tankers & Terminals (ISGOTT)
- Γ International Safety Guide for Chemicals Tankers & Terminals
- Γ Safety Guide for Terminals Handling Ships Carrying Liquefied Gases in Bulk
- Γ Liquefied Gas Handling Principles on Ships and in Terminals (SIGTTO)

These International Codes are specifically intended to regulate the carrying of bulk gases with the objective of ensuring safety at sea and at terminals. Although these codes regulate extensively the manner in which LPG's must be carried and handled at terminals, the regulations outlined more fully in Appendix A on page 51 are particularly pertinent for the purposes of this assessment and should be incorporated into the EMP.

4.10.3 South African National Standards (SANS) and Codes of Practice

The South African National Standards (SANS) and Codes of Practice relating to all Gases, agreed upon by the Liquefied Petroleum Gas Safety Association of Southern Africa are discussed in Appendix A below. They are also required by the Namibian Ministry of Mines and Energy Erongo Liquid Petroleum Gas Terminal (Pty) Ltd has incorporated in its design of the proposed LPG terminal, the prevailing SANS standards. They are as follows: SANS 10087-3:2004 (LPG storage facilities), SANS 1774:2005 (Liquefied Petroleum Gas). The Emergency Response Guidebook (2008) must be read in conjunction with SANS 1023-3 (Emergency Response Guides for transporting dangerous goods). The latter references must be incorporated into the Emergency

Response Plan that is required for the operational manuals. Additional relevant standards are referred to in Appendix A.

4.10.4 National Fire Protection Association Code 58 – USA

Erongo Liquid Petroleum Gas Terminal (Pty) Ltd has stated that this code holds priority with regards to safety and that all other safety measures will be subservient to the NFPA. This code is most widely used in internationally acknowledged LPG standard in the industry. The standard forms the backbone of many of the recognised International Standards operating throughout the world including South African National Standards.

4.10.5 American Petroleum Institute Standards

This standard (2510) covers the design, construction, and location of LPG installations at Marine and Pipeline terminals. The Standard covers storage vessels, loading and unloading systems, piping and or related equipment. API Standards also form a reference of many of the International Oil & Gas Companies and recognised International Standards operating throughout the world. It is necessary that Erongo Liquid Petroleum Gas Terminal (Pty) Ltd considers this particular standard when partnering with their technical partners. Standard 2510A addresses the prevention and control of releases, fire protection design and fire control measures. This supplements 2510 but does not supersede it. Alternative designs are acceptable provided equal safety can be demonstrated.

5 DEVELOPMENT AND RELATED ACTIVITIES

5.1 Proposed Tank Specifications for the LPG Storage Facility

The development will entail the construction of a storage installation for LPG. Three mounded tanks of each 1,000MT capacity with subsidiary facilities are proposed for the site, see Figure 5 & 6 , for a schematic of the tanks on the site.

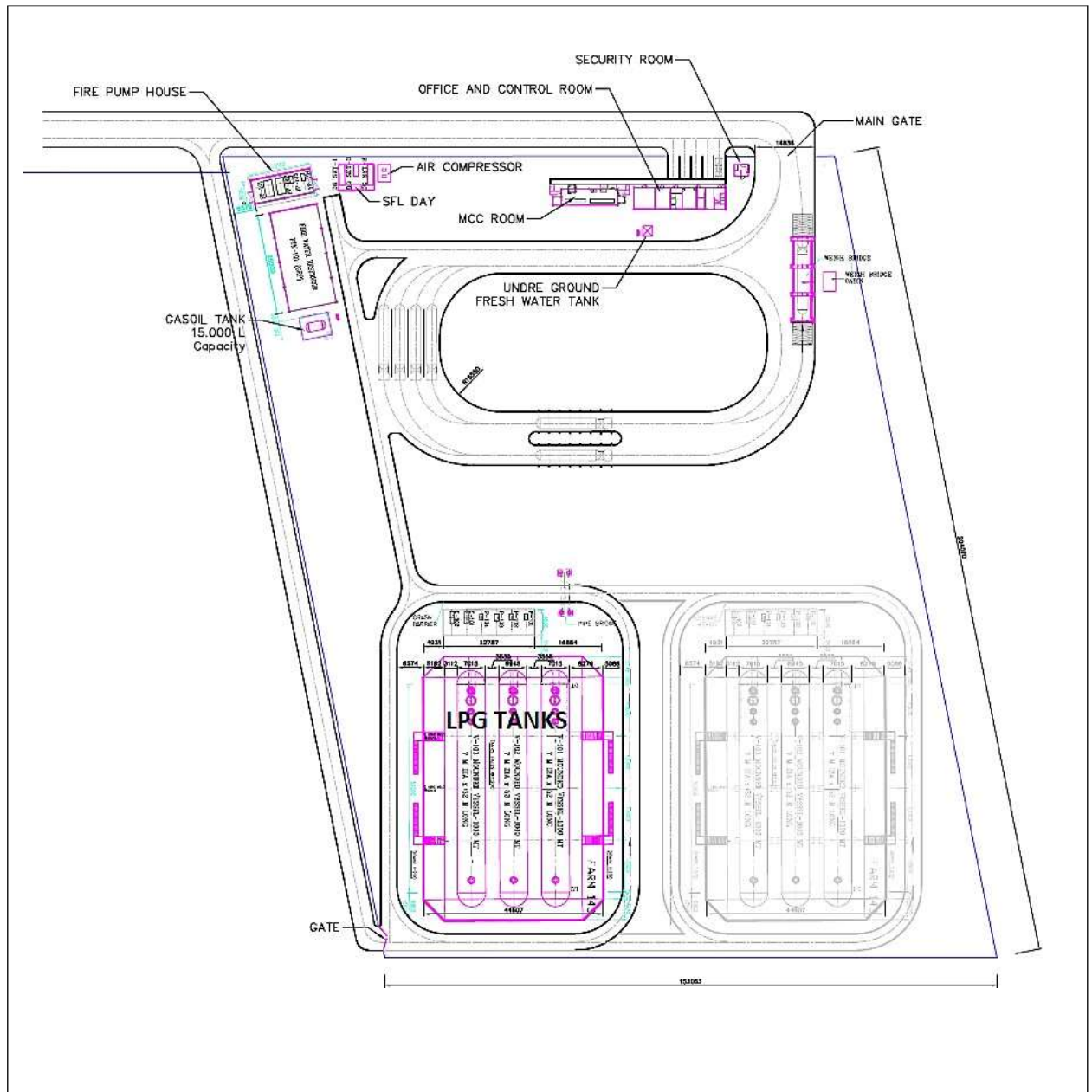


Figure 5. Tank Schematic in the Context of the Proposed Site, Portion of Remainder farm 39, measuring 35000m².

Table 1. Proposed Fuel Storage Showing Details of Storage

ContainersTank No	1	2	3
Product	Butane/Propane Mix	Butane/Propane Mix	Butane/Propane Mix
Capacity (MT)	1,000	1,000	1,000
Diameter (m)	5	5	5
Length (m)	64	64	64
Pressure (psig)	250	250	250
Pressure (KPa)	1724	1724	1724
Type	Tank	Tank	Tank
Material	Steel	Steel	Steel
Type of roof	Enclosed	Enclosed	Enclosed

5.2 Proposed LPG Offloading Site

The proposed development is planned for between the existing fuel storage facilities in the industrial area of Walvis Bay and Portion of Remainder farm 39, measuring 35000m², an area not previously developed, just north of Walvis Bay and south of the Afrodite Beach development. NAMCOR on 15th September has given way to Erongo Liquid Petroleum Gas Terminal (Pty) Ltd to use its existing new jetty to construct an LPG pipeline along its existing infrastructure connecting to its offshore offloading mooring of LPG from the supply vessels, see Figure 7.

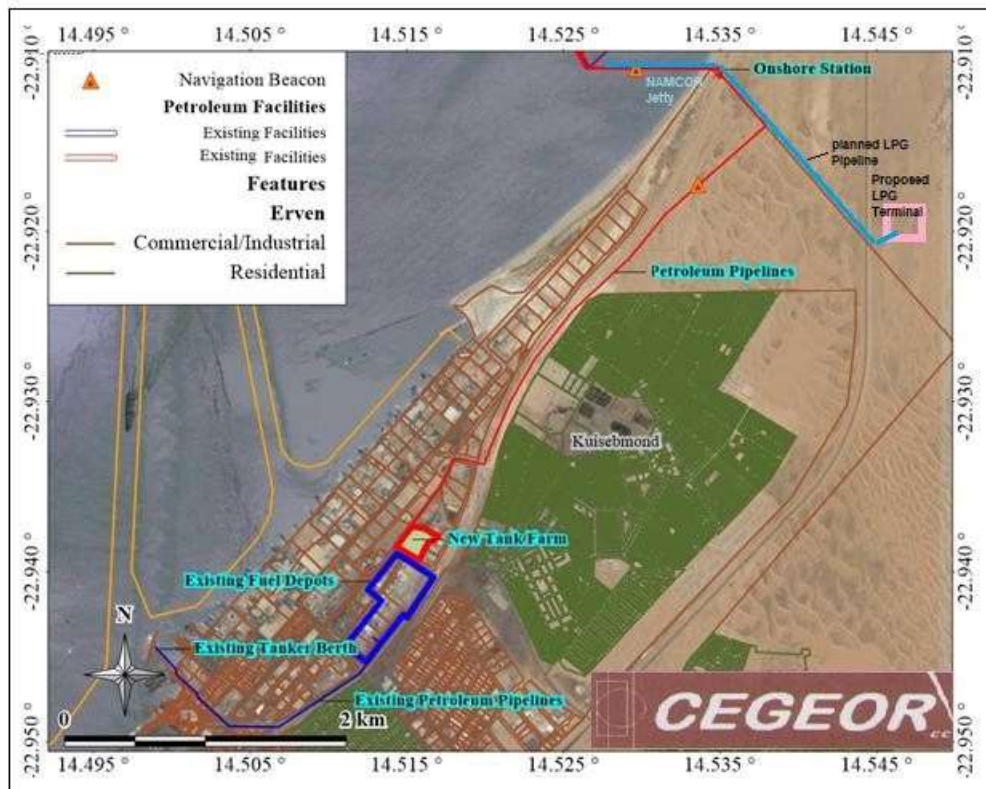


Fig 7, showing the locality of the LPG pipeline to the LPG terminal.

The harbour where the LPG vessels offload is sufficient for the LPG vessel to moor and offload its cargo. By utilizing a pipeline along the NAMCOR fuel jetty will extend from this point to the LPG bulk facility . Necessary structures will be erected or stored close to the quay where the vessel will moor. This pipeline and its pumps and valves will meet international standards.

The vessel will anchor in the channel and offload to a floating quay upon which all the necessary pumps and connections will be fitted. The pipeline would extend from this point back to the bulk LPG storage tanks. The quay itself would be moored and taken to the vessel during the offloading process. It is the author's opinion that this option is suitable due to NAMCOR's existing infrastructure of which previous EIA studies of December 2013 was cleared (appendix: NAMCOR Confirmation letter).

6.0 THE RECEIVING ENVIRONMENT

This section lists the most important environmental characteristics of the study area as well as a short statement on the potential impacts/implications of the proposed development on each.

6.1 Locality and Surrounding Land Use

The proposed development is planned for between the existing fuel storage facilities in the industrial area of Walvis Bay and Remainder farm 39, measuring 35000m², an area not previously developed, just north of Walvis Bay and south of the Afrodite Beach development.

Walvis Bay is the biggest coastal town in Namibia with a population of approximately 61,400 inhabitants (National Planning Commission, 2012). Various aspects of Walvis Bay and its surroundings make it an economically and ecologically important town in Namibia. It hosts one of only two ports in Namibia. The Walvis Bay port, also being the larger of the two, is strategically situated taking into account the location of ports on the southern African western coast. It is the hub for marine fishing, one of the major contributors to the Gross Domestic Product (GDP) of Namibia, and mariculture is also an emerging and growing enterprise.

Ecologically Walvis Bay is of importance due to the Walvis Bay lagoon in the southern part of the bay. This lagoon has been declared a Ramsar site and is home to thousands of resident and migratory birds. The southernmost end of the Bay is the location of the artificial salt pans where salt is extracted for commercial purposes. This too forms an important site for many bird species and is included in the Ramsar area. Walvis Bay is bordered to the west by a narrow sand spit peninsula known as Pelican Point. This shelters the Port of Walvis Bay from the mostly south- westerly offshore swell (DMC-

CSIR, 2010).

The port consist of the commercial harbour handling mainly cargo and the fishing harbour with approximately 15 fish processing factories and their vessels. The general layout of Walvis Bay is shown in Figure 7. Walvis Bay and the port is connected to central Namibia and the neighbouring countries by the TransNamib operated railway line, as well as the B2 Highway which also linksto the B1, Trans-Kalahari and Trans-Caprivi highways.

Two national parks are of importance in the Walvis Bay area. These are the Namib-NaukluftPark, the largest park in Namibia as well as the recently proclaimed Dorob National Park. The approximately 50,000 km² Namib Naukluft Park is situated about 15 km east of Walvis Bay and the proposed tanker berth site, and contains a unique collection of desert landscapes with rich and often endemic biodiversity. The Dorob National Park was declared in 2010 and comprises of most of the previous National West Coast Tourist Recreation Area. The park is situated from the Kuiseb Delta area south of Walvis Bay to the Ugab River in the north. It excludes the municipal areas of Walvis Bay, Swakopmund, Henties Bay and Wlotzkas Baken. The declaration of the Dorop National Park effectively places the whole of the Namibian coastline under protection,with the exception of small areas, mostly around populated places. The proposed pipeline route does not fall within either of the national parks, see Figure 8.

The pipeline crosses proposed and existing residential areas as well as an established industrial area.

Implications and Impacts

Walvis Bay and the Port, being a strategic Namibian asset, would benefit significantly by theproposed development.

Underground installation of the pipelines are advised. The development is located in one of thefew coastal areas that is not within a national park.

6.3 Climate

The LPG tank storage at remainder farm 39, measuring 35000m² is located in coastal area with is almost totally rainless, yet its air is almost always at or near the saturation point. The cold Benguela Current flows northward along the coast, chilling the air above it and thus producing fog. This cool air moves inland as a southwest sea breeze, creating a temperature inversion about (300 metres) thick, with fog below and hot, dry air above.

At the coast there is little difference in temperature between day and night or between winter and summer. Temperatures are usually between (10 and 16 °C). Along the inland margins, summer temperatures normally reach the upper (low 30s C). Only in areas sheltered from the cooling sea breeze (lee sides of mountains and bottoms of canyons) do temperatures frequently approach those expected in low-latitude deserts—i.e., in excess of (38 °C). Freezing temperatures occur occasionally along the inner edge of the desert. A few days each year, usually in fall or spring, berg (mountain) winds blowing from the east bring high temperatures (above 100 °F), together with dry air and clouds of dust, across the desert to the coast itself. The rare rains occur usually as short-lived torrential thunderstorms.

Average annual precipitation is generally about (13 mm) at the coast, increasing inland until it reaches (51 mm) at the foot of the escarpment. In some years, however, no rain falls at all. Dew, on the other hand, is heavy and for some types of vegetation is more important than the rainfall. In the extreme south, some winter precipitation occurs from frontal storms passing farther south over the Cape region; on rare occasions, snow may fall on the higher southern mountains.

Table 2, indicates rainfall, temperature and evaporation data of Walvis Bay in relation to the rest of Namibia.

Average annual rainfall (mm/a)	0-50
Variation in annual rainfall (%)	<100
Average annual evaporation(mm/a)	2400-2600
Water deficit (mm/a)	1701-1900
The climatic conditions	Description
Temperature	Average maximum: Between 24 °C in March/April and 19.3 °C in September Average minimum: Between 16.5 °C in February and 9.1 °C in August Average annual >16 °C
Fog	Approximately 900 hours of fog per year
Wind	Prevailing wind is average to strong south westerly

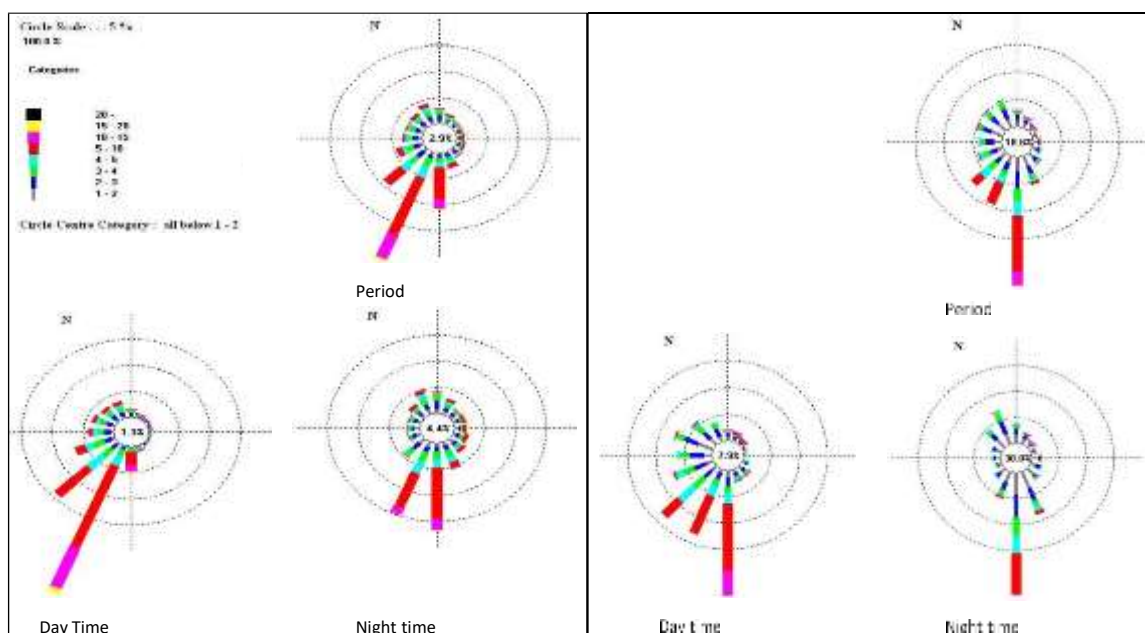


Figure 8. Average period, daytime and night-time wind roses for 1 January to 31 December at Pelican Point (left) and Walvis Bay Town

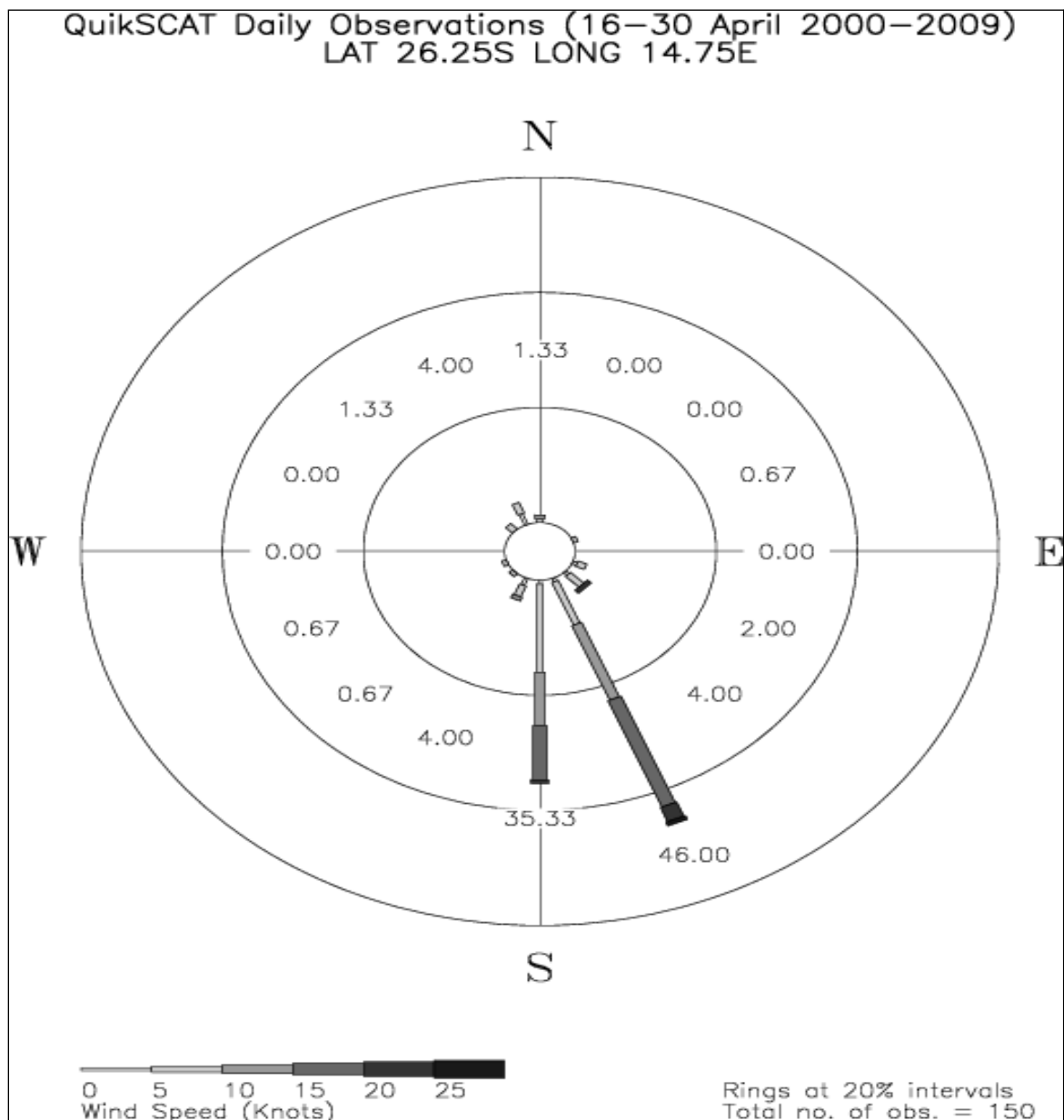


Figure 9. Predominant Wind Direction for the Sea Surface in the area NW of Walvis Bay from 2000 to 2020 for the 2nd half of April (QuikSTAT) Table 2.

Summary of Climate Data

Average annual rainfall (mm/a)	0-50
Variation in annual rainfall (%)	80-90
Average annual evaporation (mm/a)	2400-2600
Water deficit (mm/a)	1701-1900
Average annual temperatures	<16

6.4 Corrosion Environment

Walvis Bay is located in a very corrosive environment, which may be attributed to the frequent salt- laden fog, periodic winds and abundance of aggressive salts (dominantly Sodium Chloride (NaCl) and sulphates) in the soil. The periodic release of hydrogen sulphide (H₂S) from the ocean is expected to contribute to corrosion.

The combination of high moisture and salt content of the surface soil can lead to rapid deterioration of subsurface metal (e.g. pipelines) and concrete structures. Chemical weathering of concrete structures due to the abundant salts in the soil is a concern.

Consulting with Erongo Liquid Petroleum Gas Terminal (Pty) Ltd the following points make it clear that these impacts will be minimised.

- ▭ pipes will be covered with a non-corrosive substance.
- ▭ distance between concrete and the tanks exists to prevent corrosion
- ▭ The tanks will be covered with sand. (partly buried).

6.5 Topography and Surface Water

Walvis Bay and the project area are located in the Central Western Plain of Namibia. The Kuiseb River forms the southern boundary of this landscape group, with the Namib Dune Field being present south of the Kuiseb River. A bay is formed by a peninsula commonly known as Pelican Point. East of this bay is the town of Walvis Bay. On the southern part of the bay is a lagoon which used to be the mouth of the Kuiseb River. Dune migration forced the flow of the Kuiseb River to the north. This flow was stopped through the construction of a flood control wall to prevent flooding of the town of Walvis Bay, thus forcing the flood waters to move through the dune area to the lagoon. The Kuiseb River now rarely reaches the lagoon.

. Compound transverse sand dunes is present in a north-south band, east of main road B2 connecting Walvis Bay and Swakopmund forms boundary with the project area. East of these dunes is a gravel plain with some inselbergs. To the west of the dunes is a relative flat area with a mainly gentle slope towards the ocean. Various small barchan dunes are present in this area in the project area.

Drainage is poorly developed due to the lack of rainfall <50 mm/annum received in the area.

6.6 Geology and Hydrogeology

The site generally has a relative thin soil/stone cover (50m) which was deposited by the prevailing Benguela current and persistent south westerly winds that deposited the aeolian sands onshore. Generally the area formed when South Atlantic started filling in over the pediplain, with marine conditions established around 80 Ma ago. Towards the end of the Cretaceous (70 – 65 Ma ago) a relative level surface was created, on which later deposition of sediments took place. Marine deposition took place in the parts covered by the newly formed South Atlantic Ocean, while terrestrial deposits took place on land. Further continental uplift moved the shoreline to its present position. Northerly dune migration is forcing the Kuiseb River in a northerly direction, with Kuiseb River paleochannels being present as far south as Sandwich Harbour.

As a result of the above, a baseline geotechnical analysis must be done prior to construction to know exact conditions in terms of subsidence of the subsurface materials.

6.7 Walvis Bay's Water Supply

Walvis Bay derives all of its water from the Namwater water supply. Groundwater in this area is not abstracted for human consumption. The Municipality of Walvis Bay currently purchase fresh/potable water from NamWater, which source water from the Kuiseb Water Supply Scheme.

6.8 Fauna and Flora

Six vegetational regions are found in the Namib: (1) the coastal region, with highly succulent vegetation, which uses moisture derived from the fog, (2) the almost completely barren Outer Namib, (3) the steppes of the Inner Namib, which in many years are barren but which in wet years are covered with short grasses, both annual and perennial, (4) the dunes of the Inner Namib, which produce a surprisingly rich flora of bushes and tall grasses, (5) the larger river channels, along which large trees, particularly acacias, grow, and (6) the southern winter rainfall area, where a succulent bush growth occurs. A curious Namib plant is the tumboa, or welwitschia (*Welwitschia mirabilis*), whose two gigantic leaves sprawl over the surface of the ground from the crest of its huge root crown (see Welwitschiaceae).

The plains and the dunes of the Inner Namib support large numbers of several varieties of antelope, especially gemsbok (oryx) and springbok, as well as ostriches and zebras. Elephants, rhinoceroses, lions, hyenas, and jackals are found in the northern Namib, especially along the rivers that flow from the interior highlands to the Atlantic. The dunes of the Outer Namib provide habitats for various types of insects and reptiles, especially beetles, geckos, and snakes, but virtually no mammals. The shore area is densely populated by marine birds—notably flamingos, pelicans, and, in the southern part, penguins—as well as a few jackals, some rodents, and a few colonies of seals. Large quantities of guano are

scraped annually from the rocks of several offshore islands. The proposed site is located within an urban set-up where the ground was disturbed when constructing the road previous land use activities. The habitat for fauna is therefore fragmented and is expected to degrade consequently. There is little indigenous fauna or flora present at the site.

In light of the facts about the area's fauna summarised in Appendix B, there is a tremendous opportunity for Erongo Liquid Petroleum Gas Terminal (Pty) Ltd to give impetus to the conservation efforts of the organisations working in the area around Walvis Bay. This can be done through assisting these organisations financially thereby bringing greater awareness of their efforts and helping them especially in the realm of research and education.



Photo 1. Site Vegetation north of Walvis bay.

Table 3 and Table 4 below indicate the fauna and flora found in the biome in which Walvis Bay is situated. It is unlikely that many of the species listed for this Biome occur in the vicinity of the proposed LPG storage facility.

Table 3. General Flora Data (Atlas of Namibia)

Biome	Succulent Karoo
Vegetation type	Succulent steppe
Vegetation structure type	Dwarf shrubland
Diversity of higher plants	Medium (Diversity rank = 4 [1 to 7 representing highest to lowest diversity])
Number of plant species	150 – 300
Percentage tree cover	<0.1
Tree height (m)	2-5
Percentage shrub cover	<0.1
Shrub height (m)	1-2
Percentage dwarf shrub cover	0.1-1
Dwarf shrub height (m)	<0.5
Percentage grass cover	<0.1
Grass height (m)	<0.5
Dominant plant species 1	Zygophyllum decumbens
Dominant plant species 2	Rhigozum trichotomum

Mammal Diversity	16 - 30 Species
Rodent Diversity	4 - 7 Species
Bird Diversity	51 - 80 Species
Reptile Diversity	31 - 40 Species
Snake Diversity	15 - 19 Species
Lizard Diversity	24 - 27 Species
Frog Diversity	1 - 3 Species
Termite Diversity	1 - 6 Genera
Scorpion Diversity	6 - 9 Species

Table 4. General Fauna Data (Atlas of Namibia)

6.9 Socio-Economic Status Quo

This section provides an overview of socio-economic characteristics of the study area. It provides regional and local information on the, economic activities, population dynamics, vulnerability, and social services currently available in the area.

Regional Context

The Erongo Liquid Petroleum Gas Terminal is situated in Walvis bay, Erongo Region of Namibia for which the total current population (2011) is estimated to be 150,400 (79,700 males and 70,700 females) (NPC, 2011). The Erongo Region shows promise in terms of socio-economic factors. It has one of the lowest unemployment rates of all regions in Namibia (22.6 %) and only 5.1 % of households in the Erongo Region is considered to be poor (Namibia Statistics Agency, 2009/2010). Furthermore, 97 % of the population is considered to be literate and 72 %, the highest for any Namibian region, has education on secondary level.

Implications and Impacts

The Region will benefit from more employment opportunities, skills and technology transfer during construction and operations of the Development. A more secure supply of fuel benefits all fuel users and specifically also the growing mining sector.

Local Context

Economic Activities

Walvis Bay, the principal port of Namibia, is an import/export facility for processed fish, mining products and beef. Mining products and raw material imports/exports are on the rise with the present upheaval in the mining industry.

The area is linked to Namibia's air, rail and road network, making its port well situated to service Zambia, Zimbabwe, Botswana, Southern Angola and South

Africa. The fishing industry is the major employer of low skilled workers on a permanent and seasonal basis. The total employment of this sector is estimated at 2 % of the total Namibian workforce, although it has significantly declined recently past year. The major constraints of industrial development are the lack of sufficient water supply, the lack of a large enough local market and the excessive focus on the fishing industry. Most industries that exist at the coast are either secondary or tertiary suppliers to the fishing industry.

Industrial activities in Walvis Bay are linked to port-related activities. More and more demand is and will be, generated to obtain industrial and commercial land in close proximity to the port (as is the general nature of harbour towns). Most industries that are dependent on the port-related activities need to limit operational costs by being located as close as possible to the port itself.

Implications and Impacts

Walvis Bay will benefit from more employment opportunities, skills and technology transfer during construction and operations of the Development. The construction phase will boost local economy.

Demographics

According to the preliminary 2011 census results (NPC, 2012), the current population of the Walvis Bay Municipal area is 61,300 people. The number of females is 28,600 and males 32,700.

Implications and Impacts

The new Development may lead to an influx of people looking for employment in Walvis Bay.

Employment (Job Opportunities)

Unemployment in Namibia remains a pressing issue. The National unemployment rate is 34% although the Erongo Region has an unemployment rate of 22.6% (Namibia Statistics Agency 2009/2011).

Implications and Impacts

The new tanker berth is larger than the old tanker jetty and can handle more than one tanker ship at a time. During the operational phase of the Development a 30% to 40% increase in permanent staff, compared to the old tanker jetty, is anticipated.

Livelihoods

Economic activities in Erongo Region are limited and livelihoods are heavily dependent on the fishing and mining industry with tourism also playing an important role.

Implications and Impacts

The livelihoods of the local community are likely to be maintained.

Procurement

Local businesses will deliver products and services during the construction phase of the Development.

Implications and Impacts

Local businesses are to benefit from the envisaged construction phase of the Development.

Tourism

Walvis Bay is a popular tourist destination along the coast. The tourist attractions are mainly the lagoon, rich biodiversity (particularly the bird life) and excursions from the port. Tourism is considered an important industry that will diversify the economy of the town and decrease the dependence on the natural fish stocks.

Implications and Impacts

It is unlikely that the Development will impact on tourism.

Mariculture

Mariculture of oysters and mussels are practiced within Port limits. In Figure 1 the existing mariculture areas are shown. There are plans of a future land based mariculture area just north of the future Walvis Bay SADC Gateway Port.

Implications and Impacts

The location of the new pipeline reduces the likelihood of impacts related to spilled petroleum products reaching the existing mariculture areas.