ENVIRONMENTAL IMPACT STATEMENT REPORT

FOR THE

COOKING OIL PROCESSING PLANT BY SOLVENT EXTRACTION ON STANDS NO. 5001 AND 5960 MUMBWA ROAD IN LUSAKA DISTRICT

FOR

PARROGATE GINNERIES LIMITED

Prepared By

ESEC LTD
"Offering Environmental Solutions"

June, 2020

Proposed Cooking Oil Processing Plant in Lusaka District

Environmental Impact Statement

Draft Report

June 2020

Parrogate Head Offices
Plot No. 397A, Makeni
LUSAKA

Prepared for
Parrogate Ginneries Limited

Revision Schedule

Rev	Date	Details	Prepared by	Reviewed by	Approved by
0	June 2020	**EIS Report**	**Abiud Banda**	**Ernest Mwape**	**Patson Zulu** Team Leader

Contact:

Abiud Banda
Environmental and GIS Specialist

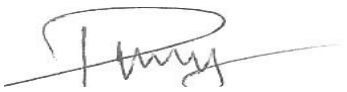
E-mail:abiudb@esecltd.com/info@esecltd.com
Mobile: +260 972590297/953364136

QUALITY CONTROL PLAN

Project Title	Environmental Impact Assessment (EIA) for the Cooking Oil Processing Plant on Mumbwa Road, Lusaka, Zambia.
Contract No.	**05/2020**
Client	Parrogate Ginneries Limited (PGL), Lusaka.
Contact Person	**Mr. Rohit Kumar** General Manager Administration, Parrogate Ginneries Limited

Document Prepared By	Environmental Science & Engineering Consultant Ltd. ESEC LTD, **NDOLA.**
Original Date Prepared	23/06/2020
Revision 1 Date	
Revision 2 Date	

Approved By:



Patson Zulu
(Team Leader)

29th June 2020
(Date)

By signing, I certify, that the document/report has been prepared and reviewed as per the quality assurance measures established by Environmental Science and Engineering Consultants Limited, ***Ndola****.*

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Acronyms and Abbreviations

Abbreviation	Definition
BOD	Biological Oxygen Demand
CBD	Convention on Biological Diversity
COD	Chemical Oxygen Demand
CSO	Central Statistical Office
CSR	Corporate Social Responsibility
BAT	Best Available Techniques
ECZ	Environmental Council of Zambia
EHS	Environment Health and Safety
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMA	Environmental Management Act
EP	Equator Principles
ESEC	Environmental Science and Engineering Consultant
FAO	Food and Agriculture Organisation
GRZ	Government of the Republic of Zambia
GSD	Geological Survey Department
HIV/AIDS	Human Immuno Virus/Acquired Immuno Deficiency Syndrome
HSE	Health Safety and Environment
IAP	Interested and Affected Parties
IFC	International Finance Corporation
LCC	Lusaka City Council
LWSC	Lusaka Water and Sewerage Company
masl	metres above sea level
NCC	National Council for Construction
NWASCO	National Water Supply and Sanitation Council
WARMA	Water Resource Management Authority
SHE	Safety Health and Environment
SI	Statutory Instrument
SHPP	Small Hydro Power Plant
STIs	Sexually Transmitted Infections
TLV	Threshold Limit Value
ToR	Terms of Reference
TWA	Time-weighted Average
UNESCO	United Nations Educational, Scientific and Cultural Org.
USD	United States Dollars
UNZA	University of Zambia
ZEMA	Zambia Environmental Management Agency

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

Overview

This document forms the Environmental Impact Statement Report for Parrogate Ginneries Limited (PGL).

Parrogate is a group of companies with branches in Malawi, Zambia and Zimbabwe. PGL owns the Cooking oil processing plant located on Mumbwa road in Lusaka. This Plant was initially established in early 1960s. For a long time it operated under the name Refined Oil Products (RoP) Ltd. Then Cargill Zambia Limited (Trading as Zamanita) took over the operation of the plant. Recently Parrogate Ginneries Limited bought the plant from Cargill Zambia Limited. The existing facility has about six process operation sections namely; seed preparation/crushing, extraction, oil refinery, cake shed, plastic plant and filling room. The project is operational and involves procurement of the soya bean seed which is cut, heated and squeezed to make vegetable cooking oil. Although there have been changes in ownership of the plant, no EIA was prepared for the entire plant. The new owners (Parrogate Ginneries Limited) of the plant would like to normalize, regularize and ensure environmental sustainability of operations of the plant through preparation of the EIA and therein, an Environmental Management Plan (EMP) as per the Zambian legal requirements

Scope of the EIA study

To determine the environmental and social implications of the project, an EIA must be undertaken according to the Environmental Management Act (Environmental Impact Assessment) Regulations S.I. No. 28 of 1997.

The EIA study has been carried out following the guidelines and requirements of the Zambia Environmental Management Agency (ZEMA) and the project Terms of Reference (see appendices) which were reviewed by ZEMA and approved. The document encompasses an Environmental Impact Statement (EIS) and an Environmental Management and Monitoring Plan (EMMP).

The study addresses issues surrounding the following aspects of the environment:

- Solid waste management and management of other waste during operation phase;
- Soil contamination during operation ;
- Air quality and noise ;
- Wastewater quality;
- Occupational health and safety;
- Traffic management and safety
- Flora and Fauna;
- Socio-economic issues including employment and multiplier effects, HIV/AIDS;
- Public health issues including waste management and vector control.

The Environmental Management and Monitoring Plan outlines obligations and responsibilities of the Developer (PGL), Contractor and other relevant parties to serve as a management tool in the successful implementation of recommended mitigation measures and subsequent monitoring thereof during all project phases.

Project Location

The plant site is located on Mumbwa road, within Parrogate Ginneries Limited premises, situated in Lusaka district. Lusaka district is the provincial headquarters of Lusaka province and capital city of the country, Zambia. Parrogate Ginneries Limited is located at plot number 5001 **and 5960** on Mumbwa Road Chinika Industrial Area, Lusaka, Zambia.

The nearest developments to the site include;

- Food Reserve Agency (FRA), about 120m north;
- ZAMBEEF, about 50m north east of the proposed site.
- Mumbwa Road lies, about 20m south;

- Manal Investments, about 100m west of the proposed site;
- Engen Filling Station, about 155m south east;
- Kanyama Compound lies about 1.5km south west of the Plant;
- Master Meat, about 400m east of the Plant.

Project Objectives

The objective of the project is to continue operating the Cooking Oil Processing Plant by Solvent Extraction on Stand No. 5001/5960 off Mumbwa Road Chinika Industrial Area, Lusaka.

Other objectives and benefits of the project are as follows: -

- To contribute to reduction of public demand for cooking oil in Lusaka and the nation as a whole.
- Contribute to national Growth Domestic Product (GDP) by enhancing infrastructural development in Zambia;
- Provide employment opportunities for skilled, semi-skilled and casual workers through direct and indirect job opportunities.
- Contribute revenue to the Government and the Local Authority through payment of corporate taxes, rates and personal levy; and
- Contribute to reduction of poverty levels in Lusaka District through people employment.

Life Span

The plant is expected to have a lifespan that will last as long as possible within the period of the lease remains relevant to the area. However, processing plants of that nature are expected to last over **40 years** as long as the market remains available for the product.

Project Investment Cost

The cost of the project is estimated at **US$ 10 million** with its implementation expected to commence in the year 2020 or upon acquisition of necessary permits from ZEMA and other Authorizing Agencies.

Legal Framework

In accordance with the Zambian Environmental Laws, the cooking processing facility falls under the Second Schedule; regulation 7 (2) of the Environmental Impact Assessment regulations, statutory instrument No. 28 of 1997 and listed under the category of Processing and Manufacturing Industry: (g**) "Food processing plants - 400 tonnes or more output a year".** The facility has potential adverse environmental impacts that are generally site-specific, and could be readily addressed through mitigation measures. Accordingly, the Zambia Environmental Management Agency (ZEMA) is mandated to evaluate and assess the EIA report and decide whether to approve or disapprove the facility.

Approach and Methodology

ESEC LTD was the Consultant in the Social and Environmental Assessment of the plant. The information generated during the various specialist investigations was continuously reviewed and presented and incorporated during the write-up of the document. .

ESEC LTD used a well-established methodology in assessing the impacts and benefits associated with the project. The methodology, as discussed in the main body of the report, assists in ensuring an objective assessment and clearly indicates the criteria used during the EIA process. With the said methodology, decision making is facilitated and subjectivity prevented in order to ensure an impartial reflection and assessment of the project.

Baseline Conditions

To describe the existing environment, appropriate standard methodologies were used. These included undertaking inventory of physical and biological environments, conducting interviews with stakeholders and reviewing of relevant literature. Information on names of geographical features were checked from the maps and confirmed by interviewing the project proponents who were conversant with the area and specific details. The inventory of the existing physical and biological environment such as vegetation in the proposed project site focused on quality, quantity, density, and distribution. The mapping of the existing surrounding buildings was undertaken to map out the surroundings of the project areas in order to determine the location of the proposed development in relation to any existing critical installations and developments that would be affected by the project. In doing so, the existing environment was categorized into physical, social and biological environments.

The plant site is a brown area which has no vegetation cover, and no animals.

The project area is currently served by a municipal water supply and two boreholes. Water supply is from the Lusaka Water & Sewage Company (LWSC) mains with two additional standby borehole on site leading to ground water reservoir tanks. Sanitation infrastructure is from LWSC with existing lines which include plant effluent sewage network servicing all components and units at the plant. Average and maximum water requirements of the development have been estimated at 250m^3/day.

The climate in the area around the project site is tropical characterised by three distinct seasons in the year: During the rainy season, extending from early November to April, maximum temperatures may vary from about 24°C to 29°C. The Annual minimum temperatures range between 11°C and 15°C. The range between daily maximum and minimum temperatures is about 7°C. The typical average rainfall in the Lusaka area is 850mm (min: 527mm and max 1,318mm over a 30-year period), with the majority of precipitation occurring during the months of November to March (90% of annual rainfall).

The terrain of the project site is relatively flat and the soils at the project site are described as an association of: shallow to moderately shallow and friable. The soils are mainly composed of cracking clays dark in colour and poorly drained.

The general atmospheric air quality and noise conditions of the project area are normal to high and typical of an industrial area.

The vegetation at the project site is characterised by grass cover and a few scattered indigenous trees.

Being a brown area, the plant site has no endangered flora or fauna species.. None of the IUCN Red List of threatened fauna species was recorded at the project site.

Alternatives Considered

Field visits undertaken during the course of study assisted the Consultant team to consider available alternatives to the plant site.

The following alternatives were considered: -

- **Project need alternative:** The Cooking Oil Processing Plant has exchanged owners since its inception. Although there have been changes in ownership of the Plant no EIA or EMP was prepared for the entire Plant. The new owners (Parrogate Ginneries Limited) of the Plant would like to normalize, regularize and ensure environmental sustainability of operations of this plant through preparation of the EIA and EMP as per the Zambian legal requirements.

- **Site alternatives:** The alternative of constructing the plant at another site was compared to the plant at their premises. The first option was not feasible as the project was already operational and the project activities were interrelated. The second option was preferred. No other sites were considered as the development project site is already under PGL ownership.

- **Water Supply and sewerage alternatives:** The project site is located in an area serviced by Lusaka Water and Sewerage Company water and sewer mains which renders easy connection to the proposed project. A decentralized sewer disposal system may not provide

a better option than the existing sewer main considering the presence of other businesses in the immediate adjacent properties. The nature of the development calls for a back-up water supply source and as such two boreholes fully equipped with storage tanks are integrated into the development (water treatment plant at the back of the plant helps provide clean water for different purposes). The existing boreholes are located one at Manal Investments and the other at the plant.

- **Waste Management alternatives:** Two alternatives were considered – recycling and disposal at designated sites. The proponent utilize the later considering that it is costly to establish waste recycling chambers within the plant site. The proponent usually engages solid waste collectors at the plant to ensure the plant is well maintained. All non-organic waste is collected and temporarily stored in a secure site and then disposed of using a reputable company and taken to the local municipal dumpsite.

- **Power alternatives:** The principal source of electricity both during construction and operational phase of the project is hydro-power energy sourced from a nearby ZESCO main which is found within reach of the project site. The ZESCO main was picked as a major source of power as it provides the clean and less costly power alternative which is also environmentally friendly. The site is also furnished with powerful generators in the absence of ZESCO power.

- **Raw Materials alternatives:** Since the project is already in full operation, the material alternatives include the vegetable oil types. The plant has been processing soya seed since its inception. Other raw material could include, sun flower, groundnuts, cotton seed and palm seed. The soya seed was preferred due to its availability in bulk and constant supply.

- **Alternative Technology:** Since the Plant is already in full operation with a good production rate, the option of continuing using the existing machinery was preferred against the installation of new machinery.

- **Domestic Waste Disposal Facilities:** The option of using waste bins was analysed against using a skip bin. The first option meant that the company needed to buy many waste bins, which have a limited holding capacity. The second option was opted as the skip bin has a huge carrying capacity.

- **Sewage Management:** The use of septic tank was analysed against connecting to existing sewer line. The first option meant constructing septic tanks, which are not environmentally reliable. The second option was opted as it meant connecting to the existing Lusaka Water and Sewerage Company main trunk line, which passes through the premises (Plant).

Potential Socio and Environmental Impacts

The main issues arising during operational phase include gaseous and dust emissions. The Developer is responsible to take appropriate measures to ensure occupational health and safety for all persons in the plant as well as the safety and comfort of surrounding communities directly affected by operational activities.

Negative impacts

- Deteriorating quality of air due to gaseous and dust emissions. ;
- Solid waste generation;
- Occupational health and Safety in relation to work environment;
- Direct impact on localized soil e.g. soil contamination during operations;
- Generation of sewage;
- Oil effluent Impact on ground water;
- Noise pollution due to use of machinery during operations;

Positive impacts

- Employment opportunities for people ;
- Revenue for Government through payment of taxes;;
- Improved social interaction;
- Fulfilling the need for processed cooking oil in Zambia;
- Multiplier effects in related service and goods sectors;
- Empowerment of small scale soya beans growers

Environmental Management and Monitoring

The study has proposed an Environmental Management and Monitoring Plan (EMP) to address the management of the identified negative impacts associated with the plant. The plan consists the following:-

- Implementing the Impacts Mitigation Plan;
- Monitoring the implementation of the EMP; and
- Institutional Framework for Monitoring, Reporting and Supervision of EMP.

Environmental monitoring and enforcement are stated along with the output from such monitoring activities. Monitoring responsibilities are specified for the responsible authorities (PGL).

Key parameters to monitor during operation of the project will include:

- Sewage/ effluent quality;
- Emissions from boilers ;
- Coal ash from boilers section;
- Hexane leaks;
- Dust from the feeders/storage section;
- Solid waste storage, collection and disposal;
- Emergency Preparedness (e.g fire preparedness and maintenance of fire equipment).
- Worker safety.

Conclusion

The Cooking oil plant will undoubtedly bring economic development. This undertaking is within an already established area and most of the environmental impacts during the operational phase of the project will be positive and the following are among the notable ones: -

- Provide direct employment opportunities for the skilled, semi-skilled and casual workers ;
- Empowerment to small scale soya beans growers (out grower schemes)
- Contributing to supply of affordable high quality processed cooking oil.

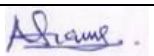
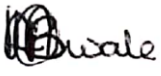
Declaration of Authenticity

Parrogate Ginneries Limited (PGL) certifies and declares that the information presented in this Environmental Impact Statement (EIS) is both factual and accurate. This EIS conforms to the requirements of the Environmental Impact Assessment Regulations, SI 28 of 1997 with regard to the development of Environmental Management Plans.

For and on behalf of the **Parrogate Ginneries Limited, Zambia**.

……

Mr. Rohit Kumar
General Manager Administration
Parrogate Ginneries Limited

EIA Study Project Team					
No.	**Name**	**Qualification**	**Position**	**Role**	Signature
1	Patson Zulu	• Bachelor of Science (Chemistry), University of Zambia. • **Postgraduate certificates** in general and hazardous waste management, Environmental Management and Conservation, Cleaner Industrial Production and Technology Assessment, Legal Prosecution, Anti-corruption practices, Management systems etc	Team Leader	Coordination and supervision of EIA activities and EIS report writing.	
2	Abiud Banda	• Masters of Science in Geo-Information Science and Earth Observation, University of Zambia, Zambia, 2017-2019 • Bachelor of Engineering (Environmental), Copperbelt University, 2015 • Environmental Impact Assessment Procedures, ZEMA,	Environmental Engineer – Reporting Water Resources Specialist and Air Quality Expert	Critical analysis of project components in relation to existing environmental setting; report writing Assessment of water resources and quality and Air quality assessment / air dispersion modelling	
3	Alice Muyanga	• BSc (Wood Science and Technology - Forest Ecology), Copperbelt University, 2016	Ecologist	Assessment of ecological impacts.	
4	Siame Ndanji	• Bachelor of Mineral Science (Geology), University of Zambia, 2017	Geology Expert	Assessment of the geology of the proposed site	
5	Bwalya Mwale	• Bachelor of Engineering (Environmental), Copperbelt University, 2018	Solid waste Management	Analysis of best options for solid waste at the farm Assessment of waste water, and sewage management	
6	James Bwalya	• BEng(Civil Engineering), Copperbelt University, 2017	Civil Engineer	• Interpretation of building plans • Proper siting of the project	
7	Ernest Mwape	• MSc (Agriculture Economics); • BA (Economics/Statistics)	Social and economic Expert	• Socio-economic surveys • Social impact assessment • Environmental and Social Sustainability	

NON TECHNICAL SUMMARY

NON TECHNICAL SUMMARY

Parrogate Ginneries Limited bought the ZAMANITA Cooking Oil plant located on Mumbwa Road on stand No. 5001/5960 Chinika industrial area in Lusaka District from Cargill Zambia Limited in 2019.The existing plant has about six process operation sections namely; seed preparation/crushing, extraction, oil refinery, cake shed, plastic plant and filling room.

The plant is operational and involves procurement of the soya bean seed which is cut, heated and squeezed to make vegetable cooking oil. Although there have been changes in ownership of the plant, no EIA was prepared for the entire plant. The new owners (Parrogate Ginneries Limited) of the plant would like to normalize, regularize and ensure environmental sustainability of operations of the plant through preparation of this document.

The total cost of investment is estimated at **US$10, 000,000.00** with its implementation expected to commence upon acquisition of necessary permits from ZEMA and other authorizing agencies. The project is expected to have a lifespan that will last as long as possible. However, plant of that nature is expected to last over **40 years.**

The positive impacts of the project will include employment opportunities due to operation of the plant, improved aesthetics of the area, contribute to government revenue, improve social interaction and fulfilling the need for affordable high quality processed cooking oil in Zambia

The main issues arising during operations include gaseous and dust emissions., noise pollution etc The owners of the plant shall be responsible for providing adequate sanitation for workers and ensuring proper measures for the management of solid and liquid waste products such as garbage and building rubble. Operational raw materials shall be sourced, stored and used according to appropriate procedures. The owners are responsible to take appropriate measures to ensure occupational health and safety for all persons in the plant as well as the safety and comfort of surrounding communities directly affected by plant activities.

The Cooking Oil Processing Plant will undoubtedly bring economic development. This undertaking is within an already established area and most of the environmental impacts during the operational phase of the project will be positive and the following are among the notable ones: -

- Provide direct employment opportunities for the skilled, semi-skilled and casual workers during the operation phase;
- Empowerment to the small scale soya beans growers (out grower schemes)
- Contributing to supply of affordable high quality processed cooking oil.

1

INTRODUCTION

1) INTRODUCTION

1.1 Proposed Background

This document is the Environmental Impact Statement Report for Parrogate Ginneries Limited (PGL), a group of companies with branches in Malawi, Zambia and Zimbabwe .PGL intends to regularize, normalize and continue operating the cooking oil plant by solvent extraction on Stand No. 5001/5960 on Mumbwa road, Chinika industrial area in Lusaka City. PGL has since contracted **ESEC LTD** to conduct the environmental impact study.

PGL owns the Cooking oil processing plant located on Mumbwa road in Lusaka. This Plant was initially established in early 1960s. For a long time it operated under the name Refined Oil Products (RoP) Ltd. Then Cargill Zambia Limited (Trading as Zamanita) took over the operation of the plant in 2006 until towards the end of the year 2018 when they announced the closure of operations at this factory. Recently (in 2019) Parrogate Ginneries Limited bought the plant from Cargill Zambia Limited. The existing facility has about six process operation sections namely; seed preparation/crushing, extraction, oil refinery, cake shed, plastic plant and filling room. The project is operational and involves procurement of the soya bean seed which is cut, heated and squeezed to make vegetable cooking oil. Although there have been changes in ownership of the plant, no EIA was prepared for the entire plant. The new owners (Parrogate Ginneries Limited) of the plant would like to normalize, regularize and ensure environmental sustainability of operations of the plant through preparation of the EIA and therein, an Environmental Management Plan (EMP) as per the Zambian legal requirements.

In accordance with the Zambian Environmental Laws, the cooking processing facility falls under the Second Schedule; regulation 7 (2) of the Environmental Impact Assessment regulations, statutory instrument No. 28 of 1997 and listed under the category of **Processing and Manufacturing Industry: (g) "Food processing plants - 400 tonnes or more output a year".** The facility has potential adverse environmental impacts that are generally site-specific, and could be readily addressed through mitigation measures. This EIS report, has therefore been prepared in accordance with section 29 of the Environmental Management Act No. 12 of 2011 that requires the presentation of the findings of the EIA study and identifies both positive and negative impacts of the project together with recommendations to mitigate potential negative impacts and enhance the benefits.

1.2 Project Justification/Rationale

As one of requirements for all the ADB-financed infrastructure undertakings, Plants need to have Relevant Environmental Permits or Compliance Certificates like Environmental Impact Assessment and approval from the Local Regulatory Agencies (in this case ZEMA and others). The role of the environmental assessment for this facility is to provide environmental guidelines and plans for monitoring the environment during the manufacturing of soya cooking oil, plastic containers and other auxiliary operations of the plant. The study also aims to develop monitoring procedures as management actions during the operation of the plant.

The Cooking Oil Processing Plant has exchanged owners since its inception and by the time of purchase by PGL, an EIA had not been done by the previous owner. Therefore PGL would like to comply with existing international and local environmental regulations as it is their mandate to bring all the activities on the Plant in line with the Environmental Management Act so that all activities are implemented in sustainable manner. This is what has led to the preparation of the Environmental Impacts Assessment (EIA) report. The key purpose of the this Environmental Impact Statement (EIS) is to assess the environmental and social impacts of the existing Plant project by PGL, and to provide interested and affected parties (I&APs) with the findings of the EIA.

1.3 Project Description

Parrogate Ginneries Limited (PGL) intends to regularize, normalize and continue operating the Cooking Oil Processing Plant by Solvent Extraction on **Stands No. 5001 and 5960** on Mumbwa Road Chinika Industrial Area, Lusaka. The existing facility has about six main process operation sections namely; **seed preparation/crushing, extraction, oil refinery, cake shed, plastic plant and filling room**. The project is operational and involves procurement of the soya bean seed which

is cut, heated and squeezed to make vegetable cooking oil. The plant uses solvent extraction as main method using hexane as a solvent.

There are nine (9) unit operations involved in preparation of soya beans for solvent extraction and these are itemized below (see Figure 1-1);

- Receiving and storing,
- Cleaning
- Drying
- Tempering
- Cracking
- Dehulling
- Conditioning
- Flaking
- Expanding.

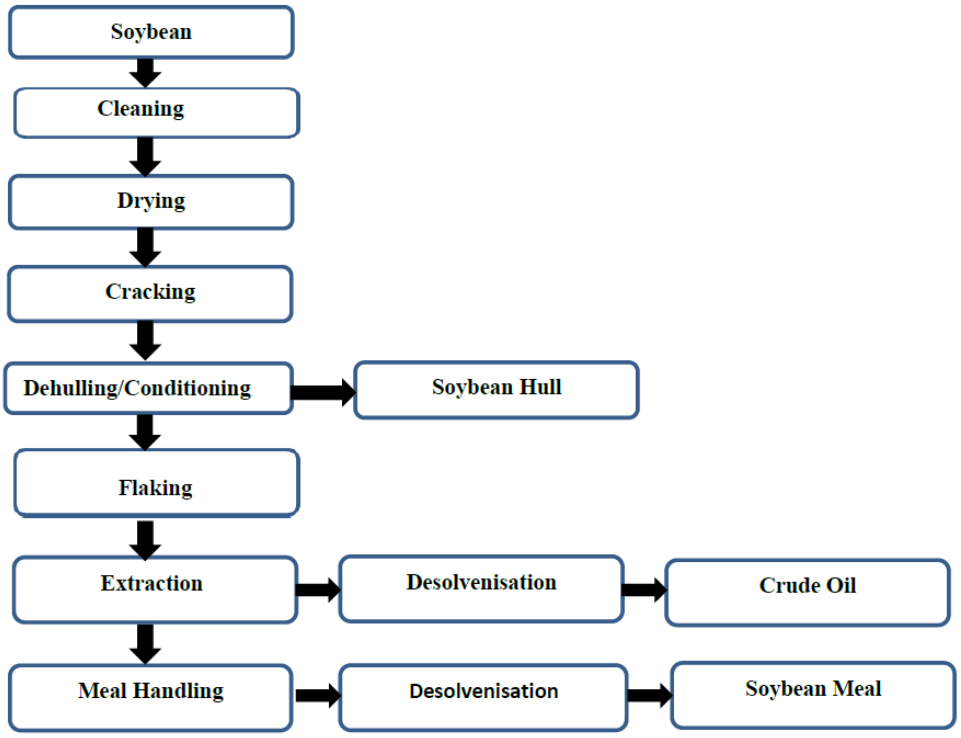


Figure 1-1: Production process flow of oil solvent extraction
[Source: Cheng, Ming-Hsun, (2017). https://lib.dr.iastate.edu/etd/15277]

1.4 Proposed Project Location

The site for the Cooking Oil Processing Plant which covers an area of **6.1ha** is located on Stand No. 5001, Mumbwa Road Lusaka. The site is located on Mumbwa road, about 1km from Lumumba/Mumbwa road junction. The neighbors are Engen Filling Station in the south direction (155m from the project site), Manal Investments is the western direction (100m from the project site), in the northern direction there is FRA and Zambeef (50 and 120m away from the site) and in the east there is Master meat (400m from the plant site).

The existing facility has about six process operation sections namely; seed preparation/crushing, extraction, oil refinery, cake shed, plastic plant and filling room. The following are the coordinates of the plant:

Table 1-1: Plant site coordinates

	PLANT SITE COORDINATES		
Beacon No.	**Description**	**Longitudes**	**Latitudes**
A	Corner East	28°16'13.66"E	15°24'54.94"S
B	Corner South East	28°16'14.82"E	15°24'58.91"S
C	Gate – South	28°16'9.81"E	15°24'59.69"S
D	Corner South West	28°16'0.68"E	15°24'58.75"S
E	Corner North West	28°15'59.71"E	15°24'52.91"S

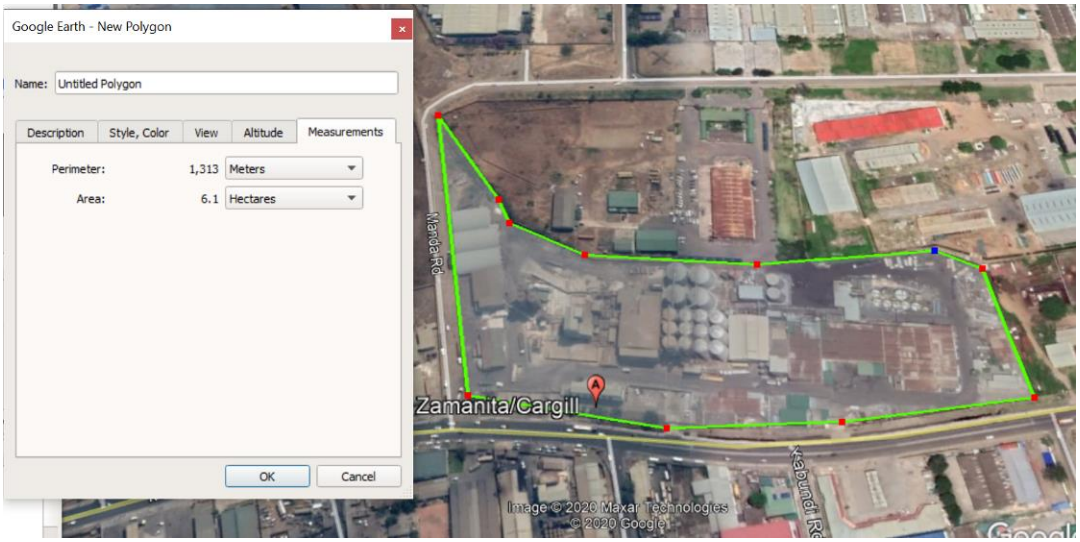


Figure 1-2: Total area of the PGL Cooking Oil Processing Plant

1.5 Material Requirements

The plant requires the following raw materials; Oil seed (Soya beans), Water, Electricity and Diesel in operation phase. The Plant has two boreholes, one is at Manal Investments and the other at the Plant and water is pumped and goes through the Reverse Osmosis system to treat it before it is used. Energy in form of power is supplied by ZESCO Limited for the entire plant and also two existing Generator Sets which are on standby to be used during any emergencies. The other source of energy for the plant is coal peas which are sourced from Maamba Collieries and Wange Coal Mines.

1.6 Estimated Cost and Start Date

The total cost of construction works is estimated at **US$10, 000,000.00** with its implementation expected to commence upon acquisition of necessary permits from ZEMA and other authorizing agencies. The plant is expected to have a lifespan that will last as long as possible within the period of the lease remains relevant to the area. However, processing plants of that nature are expected to last over 40 years as long as the market remains available for the product.

1.7 Project Objectives

The objective of the project is to continue operating the Cooking Oil Processing Plant by Solvent Extraction on Stand No. 5001/5960 off Mumbwa Road Chinika Industrial Area, Lusaka.

Other objectives and benefits of the plant are as follows: -

- To contribute to reduction of public demand for cooking oil in Lusaka and the nation as a whole.
- Contribute to national Growth Domestic Product (GDP) by enhancing infrastructural development in Zambia;
- Provide employment opportunities for skilled, semi-skilled and casual workers through direct and indirect job opportunities.
- Contribute revenue to the Government and the Local Authority through payment of corporate taxes, rates and personal levy; and
- Contribute to reduction of poverty levels in Lusaka District through people employment.

1.8 Legal and Administrative Framework

The document has been prepared in line with the requirements of the Zambian Environmental Management Act, 2011 and its subsidiary legislation, the Environmental Impact Assessment Regulations, 1997 (Statutory Instrument No.28 of 1997). It also refers to the **Factory Act, Local Government Act, of 2019, the Urban and Regional Planning Act, 2015**, the Water Resource Management Act, 201102, the Public Roads Act, 2002 and other applicable legislations and regulations. The administrative framework within which the proposed project will be implemented will include Zambia Environmental Management Agency (ZEMA), the Lusaka City Council, Ministry of Housing and Infrastructure Development, Water Resource Management Authority (WARMA) and other regulatory and government agencies.

In accordance with the Zambian Environmental Laws, the proposed project falls under the Second Schedule; regulation 7 (1) of the Environmental Impact Assessment regulations, statutory instrument No. 28 of 1997 and listed under the category of **Processing and Manufacturing Industry: (g) "Food processing plants - 400 tonnes or more output a year".**. This ESIA, has therefore been prepared in accordance with section 29 of the Environmental Management Act No. 12 of 2011 that requires the presentation of the findings of the EIA study and identifies both positive and negative impacts of the project together with recommendations to mitigate potential negative impacts and enhance the benefits.

1.9 Need for the Environmental Impact Assessment (EIA)

The current economic development trends worldwide have recognized the need to take environmental considerations into account. This is to ensure a sustainable management of the world's diverse but delicate and diminishing resources and is made using the processes and activities encompassed under the tool of Environmental Impact and Assessment, (EIA).

The process begins with the development of Draft Terms of References (TORs) by the Proponent in conjunction with the appointed EIA Consulting Team for the proposed development. Thereafter, a Scoping Meeting is called by the Proponents or Developer, in order to provide the public with an opportunity to participate in the environmental assessment process.
The input from the various stakeholders and potential Interested and Affected parties (IAPs) consolidates the Draft TORs which are now submitted to ZEMA. The approved TORS by ZEMA provide a basis for conducting the detailed Environmental Impact Assessment (EIA). After the assessment, an EIA report is produced and submitted to ZEMA.

1.10 ESEC LTD and EIA Terms of Reference

ESEC LTD was recruited by the Developer (PGL) to provide environmental management consultancy and advisory services. The Consultants then liaised with all the stakeholders by engaging all the interested and affected parties (IAPs) and incorporating their views and concerns into the EIA process, to develop the TORs. The firm undertook and facilitated the undertaking of specialized studies related to the assessment. This EIS is the output.

1.11 Overview on Parrogate Ginneries Limited

Parrogate Ginneries Limited is a group of companies with branches in Malawi, Zambia and

Zimbabwe. The success of Parrogate lies in its commitment to investing in the best and most qualified human resources, hard work, ambition, integrity, accountability and its practical approach to business. Parrogate has made large investments to ensure its sustained commercial footprint on African. Shareholding of PGL is as presented in Table 1-2.

Table 1-2: Name and Details of the Project Developer

Name and Details of the Project Developer	
Name of Project Developer	Parrogate Ginneries Limited
Address and contact details **Contact Person** **Designation**	**Address:** Plot No 5001, off Mumbwa Road Chinika Industrial Area , Lusaka **Mr. Rohit Kumar** General Manager - Administration Tel No.: +260 0971239642 E-mail: rohitkumar@parrogate.com.zm
Ownership	CORBEL FINANCE LIMITED – 99.96%

Table 1-3: Shareholders of the Project

Particulars of Shareholder	Nationality & NRC/Passport No	Country of Origin	Number of Shares held	Percentage Shareholding
PRADEEP GANEDIWAL	PPN. Z4207201 INDIA	INDIA	1.00	0.02
PRADUMAN KUMAR	PPN. Z4987035 INDIA	INDIA	1.00	0.02
	BUSINESS ENTITIES			
Name of Business	**Residential & Postal Addresses**		**Number of Shares held**	**Percentage Shareholding**
CORBEL FINANCE LIMITED	SACKVILLE HOUSE, AAKPELWA ST, LIVINGSTONE		4,998.00	99.96
Total			**5,000.00**	**100%**

1.12 Approach and Methodology

An environmental and socio-economic survey was conducted to ascertain environmental and socio-economic characteristics of the baseline environment and the possible impacts of the facility. Data for both the impact assessment and the baseline survey were collected using a combination of tools aimed at drawing out both qualitative and quantitative information using multiple but complementary public opinion survey. Discussions were held within the facility with various stakeholders.

1.13 Initial Scoping with public consultation

In line with the Environmental Impact Assessment Regulations of 1997, a scheduled scoping exercise for the Cooking Oil Processing Plant by Solvent Extraction project on Mumbwa Road Project, was conducted as an initial stage in the EIA study. **Due to Covid-19 Pandemic, a public opinion survey (Scoping) was held from 22 May 2020 to 5 June 2020 using the website www.parrogate.com**. The scoping attracted the public, especially those in Lusaka. Prior notices for consultations were given before scoping survey. The project description, potential environmental and socio-economic, mitigation measures and benefits were presented to stakeholders for their feedback. The public opinion survey provided an opportunity for capturing of any other relevant issues for inclusion in the ESIA document. The meeting allowed stakeholders to air their views on all possible environmental and socio economic impacts and best practical mitigation measures. Media prints, survey website and comments raised are annexed to the report.

1.14 Desktop study

In order to gain a clear perspective on the environmental and social implications of the proposed project, detailed desktop studies were conducted on reports concentrating on the available data and documents related to the environmental studies. Literature review will include but not limited to:

- Review of the existing environmental information and legislation;
- Review of the Environmental Management Act and its subsidiary legislation and other relevant Acts and international conventions.

1.15 Baseline Studies and Data Collection

To describe the existing environment appropriate standard methodologies were used. These included undertaking inventory of physical and biological environments and reviewing of relevant literature. Information on names of geographical features were checked from the maps and confirmed. The inventory of the existing physical and biological environment such as vegetation in the vicinity of the facility focused on quality, density, and distribution. The mapping of the area was undertaken to map out the surroundings of the project areas in order to determine the location of the facility in relation to any existing installations that are affected by the facility. In doing so, the existing environment was categorized into physical and biological environment. After data collection and analysis, preliminary description of bio-physical and socioeconomic environment within and around study area was done.

The EIA involved: -

- **Desk study** and review of the available background information about the project proponent, the project area and its nature., the environmental and legislation information, literature review concerning the project site, collected secondary data, analysed survey plans, interviews with owners who provided valuable information associated to the project;

- **Several field trips** and surveys were conducted by the study team at the site and surroundings to gather information on the existing environment including topography, geology and soils, fauna and flora, population and settlement, economic activities and existing physical infrastructure relevant to the environmental study. Collected primary data and carried out ground truthing on the information provided to the consultant and triangulated important information pointed out during literature review in order to have an in-depth understanding of the current status of the station and its surrounding environment;

- **Evaluating the objective of the project** against the current environmental status and project conceptualization; Identifying all potential social-economic, positive and negative impacts that may arise as a result of regularizing, normalizing and continuous operation of the cooking oil plant and their impacts on the biophysical environment, their magnitude and significance;

- **Prescribing the mitigation measures** to all the identified potential negative impacts; outlining a sustainable Environmental Management Plan (EMP) for the project.

2

POLICY, LEGAL, AND INSTITUIONAL FRAMEWORK

2) LEGISLATIVE AND ADMINISTRATIVE FRAMEWORK

This section outlines the legal and administrative framework within which the project will be implemented. It outlines the relevant national legislations and international agreements.

2.1 Environmental Policy/Plans/strategies

2.1.1 National Policy on Environment (NPE), 2009

It is the principal policy that governs environmental management in Zambia to safeguard the environment and sustainable use of natural resources. The Policy expects to achieve increase economic growth that is not detrimental to environment and natural resources. The specific objectives are:

- Promote the sound protection and management of Zambia's environment and natural resources in their entirety, balancing the needs for social and economic development and environmental integrity to the maximum extent possible, while keeping adverse activities to minimum;
- Manage the environment by linking together the activities, interests and perspectives of all groups, including the people, non-governmental organizations (NGOs) and government at both the central and decentralized local levels;
- Accelerate environmentally and economically sustainable growth to improve the health, sustainable livelihoods, income and living conditions of the poor with greater equity and self-reliance;
- Ensure broadly based environmental awareness and commitment to enforce environmental laws and to the promotion of environmental accountability;
- Regulate and enforce environmental laws and build individual and institutional capacity to sustain the environment;
- Promote the development of sustainable industrial and commercial processes having full regard for environmental integrity.

Relevance/Compliance: Parrogate Ginneries Limited intends to regularize, normalize and continue operating the cooking oil plant in an environmentally and socially sound manner and operate in line with the country's set regulations environmental protection, which is a focal point of NPE.

2.1.2 National Conservation Strategy (NCS), 1985

The National Conservation Strategy has been the main policy document on the Environment and Natural Resources in Zambia. The objectives of the NCS are as follows:

- To ensure the sustainable use of Zambia's renewable natural resources;
- To maintain the country's biological diversity;
- To maintain essential ecological processes and life-support systems.

The NCS had triggered the enactment of Environmental Protection and Pollution Control Act (EPPCA), a regulatory instrument that cuts across sectors and creation of Environmental Council of Zambia (ECZ) to regulate environmental matters and deal with related issues in 1991. It establishes policies and devises plans and fully integrates conservation into Zambia's social and economic development. It also aims to analyse trends and current issues to better anticipate problems and needs.

Relevance/Compliance: PGL will ensure sustainable use of resources as well as make certain that the facility is environmentally friendly. PGL will ensure that effluents discharged into the LWSC ponds should comply with ZEMA standards and that they do not cause pollution in the receiving environment.

2.1.3 National Environmental Action Plan (NEAP), 1994

The National Environmental Action Plan (NEAP) is a comprehensive plan focusing on the identification of environmental issues, analysis of its causes and recommending adequate mitigation measures. The overall objective of NEAP is to integrate environmental concerns into the social & economic development planning process of the country. The three (3) founding principles of NEAP are as follows:

- The right of the citizens to a clean and healthy environment;
- Local community and private sector participation in natural resources management; and
- Obligatory Environmental Impact Assessments (EIAs) of major development projects in all sectors.

Relevance/Compliance: PGL will follow the requirements of the Plan and therefore, develop centre to arrest ground and surface water contamination in the priority areas of the Lusaka city.

2.1.4 National HIV and AIDS Strategic Framework (NASF), 2017 – 2021

The National HIV-AIDS Strategic Framework (NASF) 2017-2021, provides an overall strategy for the planning, coordination and implementation of the multi-sectoral national response based on available evidences. The principal goal is to reposition prevention of new HIV infections as the focus of the national multi-sectoral HIV and AIDS response. A great emphasis is laid on scaling up HIV combination prevention services that enable individuals to maintain their HIV negative status as well as improve access to quality treatment and care services. NASF was developed through highly participatory and consultative process and reflects aspirations of the Zambians in their efforts to fight HIV and AIDS epidemic. The framework is designed to support decentralised implementation with meaningful involvement of communities, people living with HIV, Civil Society Organisations (CSOs) and marginalized populations, so as not to leave anyone behind in the response.

Relevance/Compliance: PGL will establish adequate mechanism for HIV/AIDS awareness in the project area through consultations amongst affected communities.

2.2 National legislative framework

2.2.1 Environmental Management Act (EMA), 2011

The Zambian Environmental Management Act (EMA), 2011 is the superior Act on matters relating to environmental protection and management. Its superiority is outlined in Section 3 of the Act. The Act sets out a framework for Environmental Impact Assessments (EIA's) as well as renaming the Environmental Council of Zambia (ECZ) as the Zambia Environmental Management Agency (ZEMA), a regulatory Agency mandated to do all such things as are necessary to ensure the sustainable management of natural resources and the protection of the environment, and the prevention and control of pollution.

The Act outlines principles governing environmental management and provides for, among other things, Environmental Impact Assessment and regulations relating to environmental assessments. The Act has also spelt out offences relating to failure to prepare and submit an EIA report for projects that require such reports. Projects that require preparation of EIA reports must be approved by ZEMA prior to implementation. Section 29 of the Act specifically states that “a person shall not undertake any project that may have an effect on the environment without the written approval of the Agency, and except in accordance with any conditions imposed in that approval”.

The Environmental Impact Assessment) Regulations, 1997 (Statutory Instrument No. 28 of 1997) specifies the requirements for an EIA and it also set out in its Second Schedule projects for which EIAs are applicable. It provides specific guidelines for conducting environmental impact assessments. The regulations require project developers undertaking projects that may have significant effect on the environment to conduct environmental impact assessment prior to obtaining written approval from ZEMA on implementation of the project. Regulation 3 of the Statutory

Instrument specifically states that “A developer shall not implement a project for which a project brief or an environmental impact statement is required under these Regulations, unless the project brief or an environmental impact assessment has been concluded in accordance with these Regulations”.

The Environmental Management (Environmental Impact Assessment) Regulations, 1997 (Statutory Instrument No. 28 of 1997) specifies the requirements for an EIA and it also sets out in its Second Schedule projects for which EIAs are applicable. It provides specific guidelines for conducting environmental impact assessments and for evaluation of environmental impact statements. The regulations require project developers undertaking projects that may have significant effect on the environment to conduct environmental impact assessment prior to obtaining written approval from ZEMA on implementation of the project. Regulation 3 of the Instrument specifically states that “A developer shall not implement a project for which a project brief or an environmental impact statement is required under these Regulations, unless the project brief or an environmental impact assessment has been concluded in accordance with these Regulations.

Compliance: The cooking oil processing plant will be operated in accordance with the provisions of the Act and applicable environmental regulations.

A. Environmental Management Act no 12, 2011 (Environmental Impact Assessment) Regulations, SI No. 28 of 1997.

These Regulations provide the main framework under which Environmental Impact Assessments (EIA) are conducted under the supervision of ZEMA that considers and decides to approve or reject projects.

Relevance: - the cooking oil processing plant has social-economic and environmental impacts, hence the relevance of the EIA.

Compliance: The facility will implement the approvals obtained in accordance to these regulations. The existing cooking oil processing plant will be required to submit an EIS to the ZEMA, and approval from the ZEMA will be required to be implemented in the facility.

B. Statutory Instrument No. 112 of 2013; Part II on Air and Water pollution (Licensing) Regulations.

These Regulations provide for licensing of gaseous emissions to the environment and also provides for statutory discharge limits for respective parameters. The Regulations also provides for issuance of permits, limits, air quality guidelines and classification of effluent discharge to air or water.

Relevance: The facility may produce air pollutants including smoke from the vehicles, dust and plant odors during operation activities.

Compliance: The facility will ensure that only modern equipment with none or fewer emissions are released into the atmosphere. The workers shall further be provided with PPE attire including air masks

C. Environmental Management (Licensing) Regulations, Statutory No.112 of 2013 part III- solid non-hazardous waste

This regulation provides for the licensing of solid non-hazardous waste transportation and operating/owning of non-hazardous disposal sites.

Relevance*:* these regulations are relevant in that the operations of the facility as it somehow generate solid waste whose transportation and disposal requires constant monitoring.

Compliance: All solid waste generated during operation and decommissioning of the cooking oil processing plant will be governed and handled with the provision of this regulation. Thus it will be ensured that all the solid waste is properly stored before disposal to the designated disposal site at the Chunga landfill.

D. Environmental Management (Licensing) Regulations, Statutory No.112 of 2013 Part II- liquid waste discharge

This regulation provides for the licensing of liquid waste discharge limits for respective parameters. Operational stage of the facility may cause contamination of storm water by hydrocarbons; therefore measures have to be put in place to comply with the provisions of this regulation.

Relevance*:* these regulations are relevant in that the plant facilities (canteens, toilets, bathrooms) as they have potential to leak, spill into the environment causing pollution, especially foul smells.

Compliance: The effluents will be monitored to ensure that the foul smell from the effluents is adequately reduced. A proper sewer system is in place. The effluent is channeled to the Lusaka Water and Sewerage Company sewer system.

E. Environmental Management (Licensing) Regulations, Statutory No.112 of 2013 Part IV Hazardous waste management.

The regulation provides for licensing of solid/liquid hazardous waste management from generation through to disposal and owning of hazardous waste disposal sites. The processing facility will involve the generation of hazardous waste in form of sludge and should be handled in accordance with this regulation.

Relevance: These regulations are relevant in that the operations of the facility will somehow generate hazardous waste whose transportation and disposal requires constant monitoring.

Compliance: All the hazardous waste will be contained because the area will be made of concrete. Any machine oil will be adequately stored in the drums and sold to the recycling companies.

2.3 Other Related Legal Framework

As required in the preparation of the full environmental impact assessment, in addition to consultation of the Environmental Management Act No. 12 of 2011, consideration of provisions or requirements in the other relevant pieces of legislation is vital to this project. Some of these are listed below:-

2.3.1 Standards Act No.4 of 2017

This provides for standards of quality control for certain commodities and continues the existence of the Zambia Bureau of Standards by re-defining its powers and functions; provide for standardization and quality assurance of products and services through the setting of national standards and provision of conformity assessment services for products and services; to repeal the Standards Act, 1994; and to provide for matters connected with or incidental to the foregoing.

Relevance: The facility has installation of tanks, electrical components and other ancillary facilities that are subject for standardization.

Compliance: The developer (PGL) will install the components according to the Zambia bureau of standards Specification. Before any material and equipment are taken to the site it shall be ensured that all the inspections and authorizations are obtained from the Zambia Bureau of Standards.

2.3.2 Metrology Act No. 6 of 2017

This is an Act to continue the existence of Zambia Weights and Measures Agency, rename it as the Zambia Metrology Agency and re-define its functions; establish the Board of the Agency and provide for its functions; provide for the designation, keeping and maintenance of national measurement standards; provide for the use of measurement units of the International System of Units and other

units; provide for consumer protection, health, safety and environmental management through legal metrology measures; repeal the Weights and Measures Act, 1994; and provide for matters connected with or incidental, to the foregoing.

Relevance: The facility will involve the use of measurement units of the International System of Units and other units especially during any construction on the plant.

Compliance: The developer (PGL) will install the tanks, electrical components and other ancillary facilities according to the Zambia Metrology Agency's Weights and Measures.

2.3.3 National Heritage Conservation Act, 1989

The National Heritage and Conservation Act (NHCA) established the National Heritage and Conservation Commission (NHCC) which is responsible for the conservation of ancient, cultural and natural heritage, relics and objects of aesthetic, historical, pre historical, archeological or scientific interest by preservation, restoration, rehabilitation and reconstruction. The national heritage and conservation commission is responsible for identification and conservation of sites of cultural and historical interest. The commission is also responsible for enforcement of the national heritage Act.

Relevance: The facility being in an area which might have some historical background not known to us requires compliance to this Act.

Compliance: The area is void of any archeological history, in a case where a strange object having cultural significance is found, the developer will ensure that the matter is made known to the National Heritage and Conservation Commission.

2.3.4 Land Act, 1995

The Lands Department in the Ministry of Lands, Natural Resources and Environmental Protection is the government agency that enforces the provisions of the Land Act. The Act provides for holding of land into categories that include state, local authority and traditional land.

Relevance: The land in question is under state's jurisdiction and as such is governed by the Act.

Compliance: The land in question belongs to PGL. The property is registered in the name of the owner of the land.

2.3.5 Local Government Act No.4 2019

This Act provides for an integrated local government system; give effect to the decentralization of functions, responsibilities and local services at all levels of local government; ensure democratic participation in, and control of, decision making by the people at the local level; revise the function of local authorities; provide for the review of tariffs, charges and fees within area of the local authority; repeal and replace the Local Government Act, 1991.

Relevance: The facility being in the Lusaka City Council area, it will require local licensing e.g. fire certificates**.**
Compliance: All the required certificates will be furthered at the Lusaka City Council.

2.3.6 Factories Act, No. 2 of 1966

Enacted in 1967, the Act regulates the conditions of employment in factories and other places of work as regard to the safety, health and welfare of persons employed therein. The Act also provides for the examination and inspection of certain plant and machinery in order to ensure safety.

Relevance: The PGL Soya Oil processing plant will house factory equipment and will be operational for 24hrs every day.

Compliance: The developer will ensure that the machinery being used for construction and maintenance are in good working order to avoid any accidents

2.3.7 Public Health Act, 1995

This Act provides for prevention and suppression of public health hazards. It regulates all matters and activities that are connected to outbreak of diseases. Provisions of the Act are implemented by Councils through licensing and inspections.

Relevance: The facility's activities may affect the health of the workers at the site and the general public, hence the need to adhere to this act.

Compliance: Activities to do with good sanitation, health and safety and general cleanliness will be enhanced throughout the operations of the plant. This will be enhanced by implementing adequate mitigation measures including routine medical check-ups for all the workers on site during all the facility's operational phases.

2.3.8 Water Resources Management Act, 2011

The Act provides for establishment of the Water Resources Management Authority and defines its functions and powers; the management, development, conservation, protection and preservation of the water resource and its ecosystems; the equitable, reasonable and sustainable utilization of the water resource; issues rights to draw or take water for domestic and noncommercial purposes, and ensures that the poor and vulnerable members of the society have an adequate and sustainable source of water free from any charges; create an enabling environment for adaptation to climate change; provide for the constitution, functions and composition of catchment councils, sub-catchment councils and water users associations; provide for international and regional cooperation in an equitable and sustainable utilization of, shared water resources; provide for the domestication and implementation of the basic principles and rules of international law relating to the environment and shared water resources as specified in the treaties, conventions and agreements to which Zambia is a State Party; repeal and replace the Water Act, 1949; and provide for matters connected with, or incidental to, the foregoing.

Relevance: Water abstraction from rivers and underground requires permit from WARMA. Surface run-off and seepage from the proposed pipeline should not contribute to pollution of water resources that may render its use by other stakeholders unsustainable. This legislation is relevant to the project to ensure that measures to prevent pollution to human health and to any water supply bodies are taken into account through provisions of tight leakage control systems.

Compliance: Several permits were obtained from WARMA like water permits.

2.3.9 Employment Code Act, No. 3 of 2019

An Act to regulate the employment of persons; prohibit discrimination at an undertaking; constitute the Skills and Labour Advisory Committees and provide for their functions; provide for the engagement of persons on contracts of employment and provide for the form and enforcement of the contracts of employment; provide for employment entitlements and other benefits; provide for the protection of wages of employees; provide for the registration of employment agencies; regulate the employment of children and young persons; provide for the welfare of employees at an undertaking; provide for employment policies, procedures and codes in an undertaking; repeal and replace the Employment Act,1965, the Employment (Special Provisions) Act,1966, the Employment of Young Persons and Children Act, 1933 and the Minimum Wages and Conditions of Employment Act, 1982; and provide for matters connected with, or incidental to, the foregoing.

Cited Section: Introduction and Title.

Relevance: For the proposed development, this will cover such matters as contracts of work. The proposed project will employ a number of people.

Compliance: The developer will ensure that the employees' conditions of service are humane and that all people that get employed will be employed on the basis of merit and skills and not race,

gender or tribe.

2.3.10 Public Roads Act, 2002 (amended in 2006)

The Act provides for establishment of the Road Transport and Safety Agency and its functions; a system of road safety and traffic management; licensing of drivers and motor vehicles; registration of motor vehicles and trailers; compulsory third party insurance of motor vehicles; licensing and control of public service vehicles; promotion of road safety; regulation of road transport between Zambia and other countries with which Zambia has concluded cross-border road transport agreements.

Relevance: All the stages of the facility might lead to disturbance to the normal flow of traffic in the Mumbwa road near the facility area. Hence the need for PGL and the Contractor to adhere to this Act.

Compliance: The proponent shall ensure that all the transportation vehicles are registered and being driven by licensed drivers who shall promote road safety.

2.3.11 National Council for Construction Act of 2003

An Act provides, among other things, for the promotion and development of the construction industry in Zambia, registration of contractors, affiliation to the Council of professional bodies or organizations whose members are engaged in activities related to the construction industry. It also provides for the regulation of the construction industry.

Relevance*:* The Act will be relevant if there be any alteration activities the contractor on site shall be required to be registered with the NCC and also all the works are supposed to be done with great compliance to the best construction practices. Hence the relevance of this Act.

Compliance: The Company shall engage only licensed contractors and ensured that the NCC certificates are all valid.

2.3.12 Electricity Act No. 11 of 2019

The Act seeks to regulate the generation, transmission, distribution and supply of electricity so as to enhance the security and reliability of the supply of electricity; provide for the sale and purchase of electricity within and outside the Republic; facilitate the achievement of the efficient, effective, sustainable development and operation of electricity infrastructure; provide roles and responsibilities of various participants in the electricity sector; provide for a multi-year tariff framework; promote transparency in the identification and allocation of risks, costs and revenues within and between participants in the electricity sector; ensure the protection and safety of consumers of electricity and the public; repeal and replace the electricity Act, 1995;and provide for matters connected with, or incidental to, the foregoing. g. The act states that any person, who, without legal right, cuts, injures or interferes with any apparatus for generating, transmitting or distributing or supply electricity, or malicious extinguishes or damages any lamp or other electric apparatus provided for the convenience of the public, shall be guilty of any offence.

Relevance/Compliance: Facility components and operations at the site utilize power from ZESCO and some pass through or intersect a ZESCO power line, hence the Developer shall carry out the work in accordance with this Act.

2.3.13 Wildlife Act of 2015

The act was enacted in 2015 repealing and replacing former Zambia Wildlife Act No. 12 of 1998, and provides for the conservation and management of the ecosystems to preserve them from impacts of the anthropogenic activities. It also provides for the establishment, control and management of national parks and the conservation and enhancement of wildlife ecosystems, biodiversity, and objects of aesthetics importance, pre-historical, geological, archaeological and scientific interest in national parks. It further provides for the promotion of opportunities for the equitable and sustainable use of special qualities of natural parks. It also provides for the establishment, control and

management of Games Management Areas (GMA's), sustainable use of wildlife and effective management of GMA's while envisioning the enhancement of benefits of these areas to local communities in the management of GMA's. This Act makes further provision for wildlife impact assessments where any person who has reasonable grounds to believe that any proposed or existing activity may have an adverse effect on some wildlife species or community in the national park, GMA's or Open area.

Relevance: The area is void of vegetation and hence no need to comply with the Act.

Compliance: Nonetheless, Indiscriminate cutting of trees within the facility site will be discouraged. Where trees are cut, revegetation programme will be implemented to offset the losses.

2.3.14 Road Traffic Act, 2002

The Act provides for establishment of the Road Transport and Safety Agency and its functions; a system of road safety and traffic management; licensing of drivers and motor vehicles; registration of motor vehicles and trailers; compulsory third party insurance of motor vehicles; licensing and control of public service vehicles; promotion of road safety; regulation of road transport between Zambia and other countries with which Zambia has concluded cross-border road transport agreements.

Relevance: All the stages of the facility might lead to disturbance to the normal flow of traffic on Mumbwa road near the Plant area. Hence the need for PGL and the Contractor to adhere to this Act.

Compliance: The proponent shall ensure that all the transportation vehicles are registered and being driven by licensed drivers who shall promote road safety.

2.3.15 Occupational Health and Safety Act, 2010

This Act provides for the establishment of the Occupational Health and Safety Institute and for its functions. It provides for the establishment of health and safety committees at workplaces and for the health, safety and welfare of persons at work. It further provides for, among other provisions, the protection of persons, other than persons at work, against risks to health or safety arising from, or in connection with, the activities of persons at work.

Relevance: The facility works will have occupational health and safety risks such as exposing workers on site to high levels of dust, lifting heavy equipment, trip and slide hazards etc.

Compliance: The Company will ensure that all the necessary safety signs are displayed around the site, within the site and safety attires are worn always by the employees. Safety awareness talks every morning by the chief safety officer will also be conducted.

2.4 International Convention and Agreements

This subsection summarizes some of the international conventions and agreements to which the Zambian Government is a party and which are applicable to the project. The agreements and protocols impose obligations on Zambia to address issues or topics included in these documents.

2.4.1 Convention on Biological Diversity (ratified in 1993)

This convention requires Parties to it to prepare national biodiversity action plans. Zambia has already in place a National Biodiversity Action Plan whose objectives include, ensuring the conservation of a full range of Zambia's natural ecosystems through a network of protected areas, development and implementation of strategies for conservation of biodiversity, sustainable use and management of biological resources.

Biological resources of significant conservation value that will be identified during Project implementation will be conserved and protected.

Relevance: the area earmarked for the facility might have had indigenous trees.

Compliance: PGL will endeavor to preserve the tree and incorporate them into the landscape of the proposed project.

2.4.2 Convention on Wetlands of International Importance (1975)

The Convention aims at promoting conservation and sustainable use of wetlands and their resources for the benefit of the present and future generations.

Relevance/Compliance: The Project development and implementation would need to be undertaken in a way that should not comprise the ecological character of the nearby water bodies.

2.4.3 Convention Concerning the Protection of World Heritage (1972)

The Convention aims at ensuring the identification, protection, conservation, presentation and transmission to future generations of the cultural and natural heritage.

Relevance/Compliance: Cultural and natural heritage sites that may be identified during the operations of the facility will be protected and conserved in accordance with the provisions of the Convention to which Zambia is party to.

2.4.4 Protection of the World Cultural and Heritage (1972)

This convention was ratified by Zambia in 1982. It provides for the protection of cultural and heritage sites.

Relevance: The facility being in an area which might have some historical background not known to the Developer requires compliance to this Act

Compliance: if any such items are found, they will be handed over to the National Heritage and Conservation Commission.

2.4.5 Ramsar Convention: -

The general objective of the Ramsar Convention is to curtail the loss of wetlands and to promote wise use of all wetlands. The convention addresses one of the most important issues in Southern Africa, namely the conservation of water supplies and use of the natural and the human environments in an intergenerational equitable manner.

Relevance: - The facility may bring about surface and underground water depletion and pollution and therefore the convention will be adhered to.

Compliance: The effluent prone areas will be made of concrete to ensure that all the spillages are contained before contaminating underground water.

2.4.6 African Convention on the Conservation of Nature and Natural Resources (Algiers, 1968), (Maputo, 2003):-

The objective of the convention is to encourage individual and joint actions for the conservation, utilization and development of soil, water, flora and fauna for the present and future welfare of mankind. This must be done from an economic, nutritional, scientific, educational, cultural and aesthetic point of view.

Relevance to the Project: -Soil protection, water protection and protection of flora and fauna shall be a requirement considering environmental aspects of the project. Most of these requirements are already covered under the customizing legal structures already described. However, it is necessary to recognize that these requirements are also provided for at international level hence the relationship.

Compliance: - provisions of this convention together with the customizing regulations are critical to the project.

2.4.7 Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES):-

The objective of this agreement is to ensure that international trade of wild flora and fauna does not endanger their existence. The convention is customized through the Zambia Wild Life Act No. 12 of 1998 and the implementing body is the Department of National parks and Wildlife.

Relevance to the Project: -The facility area has potential for existence of small animals and birds. If protection measures are not strictly enforced, there is likelihood that employees may start exploiting these resources.

Compliance: - Provisions of this Convention together with the customizing regulations are critical to the project.

2.4.8 Basel Convention on the Control of Trans-boundary Movement of Hazardous Wastes and their Disposal: -

The objective is to control import and export of hazardous wastes. It also aims at ensuring that any trans-boundary movement and disposal of hazardous waste, when allowed, is strictly controlled and takes place in an environmentally sound and responsible manner.

Relevance: - hazardous wastes may be generated and disposed of.

Compliance: Maximum control measures shall be put in place to ensure that their transportation and disposal is done in accordance with provisions of this Convention.

2.4.9 Equator Principles Adopted for the Project

For the purpose of complying with international best practices in environmental management as a voluntary initiative, PGL has adopted three Equator Principles that shall be observed throughout the EIA process including the Scoping Stage. These principles shall also be sustained throughout the project lifecycle. The adopted principles are listed below.

a) **Principle 5 (Consultation and Disclosure):-** Environmental management by effective consultation and disclosure is now being recognized as the most effective way of ensuring compliance. PGL will always consult with affected communities in a culturally and structured manner. To attain this, PGL will promote free, fair and informed participation by all stakeholders.
b) **Principle 6 (Grievance Mechanism):-** PGL shall develop and implement a transparent and systematic grievance mechanism and major guiding principles shall be implemented during the EIA Process. This shall be done to develop a good first and sustainable impression with the community.
c) **Principle 9 (Independent Monitoring and Reporting):-** PGL shall facilitate an effective independent monitoring and reporting of project activities that shall interact with the environment. This principle shall be observed starting from the EIA process stage.

2.4.10 United Nations Framework Convention on Climate Change

This was signed by Zambia in 1992. The main objective is to achieve stabilization of greenhouse gas concentrations in the atmosphere. Zambia recognizes that the largest source of one of the main greenhouse gases, carbon dioxide, is from burning wood fuel and the use of coal and oil.

Relevance: - Evidence of climate change is now common knowledge. The PGL project may

contribute to climate change due to increase in the emissions from the machinery and gas emissions from boilers throughout the project lifespan.

Compliance: there will be no major gas emissions at the processing plant due to the latest machines which are installed.

2.5 Institutional Framework

A number of institutions will have a regulatory and monitoring role directly or indirectly under their respective pieces of legislation. However, the following will be the key institutions whose requirements will need to be complied with:

- **Ministry of Water Development, Sanitation and Environmental Protection (MWDSEP)**

This is a newly formed department, after the abolishment of Ministry of Local Government and Housing. It is in charge of water policy, water supply and sanitation, water resources management and development in the country.

- **Ministry of Health (MoH)**

The Ministry of Health (MoH) has the supervisory responsibility for sanitation and hygiene promotion. The Environmental Health Section of MoH under the Directorate of Public Health and Research is the section most relevant to drainage which is an integral part of sanitation and hygiene promotion.

- **Lusaka City Council (LCC)**

Lusaka City Council (LCC) is the governing local authority for the City of Lusaka. The Local Authority derives its authority from several Zambian laws, but primarily, Section 61 of the Local Government Act enlisting 63 functions of local authorities. LCC's responsibilities include the following, but are not limited to:

- The establishment and maintenance of sanitation and drainage systems to facilitate the removal of refuse and effluent,
- Prohibit and control the use of land and erection of buildings in the interest of public health, safely and orderly development of the Council area, and
- Approval to formalize unplanned settlements.

In the strategic plan, core pillars for the Council include: strengthening institutional governance, enhancing institutional capacity, infrastructure development (especially the central business district), effective management of solid waste and environmental conservation, maintenance of health standards through health programmes, enhancement of revenue base and efficient utilization of finance and enhancement of community participation in civic matter within the City of Lusaka

- **Water Resources Management Authority (WARMA)**

WARMA was set up by the Zambian Government, following the water sector reforms process that led to the enactment of the Water Resources Management Act of 2011. WARMA is an authority whose main function is "to promote and adopt a dynamic, gender-sensitive, integrated, interactive, participatory and multi-sectoral approach to water resources management and development that includes human, land, environmental and socio-economic considerations, especially poverty reduction and the elimination of water borne diseases, including malaria". it is also responsible for managing and regulating the use of Zambia's water resources in an integrated, participatory and sustainable manner based on human, land, environmental and socio-economic considerations.

- **Zambia Environmental Management Agency (ZEMA)**

Zambia Environmental Management Agency (ZEMA) is a statutory body established in 1992,

under Environmental Protection and Pollution Control Act, 1990. It was earlier known as Environmental Council of Zambia. Its mandate is to protect environment and pollution control to provide health and welfare of persons, as well as the environment. Part VI of the above-mentioned Act assigns ZEMA certain roles and responsibilities which are as follows:

- Formulating and providing standards on classification and analysis of wastes and advising on standard disposal methods and means;
- Publicizing the correct means of storage, collection and disposal of any class of wastes; and
- Maintaining statistical data on nature, quantity and volume of waste generated and on-sites where waste disposal is taking place or has taken place.

3

PROJECT DESCRIPTION

3. PROJECT DESCRIPTION

3.1 History of the Facility

Parrogate is a group of companies with branches in Malawi, Zambia and Zimbabwe. They own the Cooking oil processing plant located on Mumbwa road in Lusaka. The proponent took over ownership of the plant in 2019 and it was re-launched and commissioned early 2020 by His Excellence Dr. Edgar Chagwa Lungu. This Plant was initially established in early 1960s. For a long time it operated under the name Refined Oil Products (RoP) Ltd. Then Cargill Zambia Limited (Trading as Zamanita) took over the operation of the plant in 2006 until towards the end of the year 2018 when they announced the closure of operations at this factory. Recently (in 2019) Parrogate Ginneries Limited bought the plant from Cargill Zambia Limited. The existing facility has about six process operation sections namely; seed preparation/crushing, extraction, oil refinery, cake shed, plastic plant and filling room. The project is operational and involves procurement of the soya bean seed which is cut, heated and squeezed to make vegetable cooking oil. Although there have been changes in ownership of the plant, no EIA was prepared for the entire plant. The new owners (Parrogate Ginneries Limited) of the plant would like to normalize, regularize and ensure environmental sustainability of operations of the plant through preparation of the EIA and therein, an Environmental Management Plan (EMP) as per the Zambian legal requirements.

3.2 Key Stakeholders

The major stakeholders identified are:

- Cooking Oil processing Plant staff – the proposed site
- Local communities – these include neighbouring facilities and settlements such as Food Reserve Agency (FRA), Zambeef, Kanyama, Garden House and other surrounding areas for public consultations and raising concerns on this project.
- Lusaka City Council – mandated to monitor all the projects in the District.
- Zambia Environmental Management Agency – Lusaka reviewing the project and ultimate approval of this Project.
- Lusaka Water and Sewerage Company District

3.3 Justification of the Project

Project Motivation

The Cooking Oil Processing Plant has exchanged owners since its inception. Although there have been changes in ownership of the Plant no EIA or EMP was prepared for the entire Plant. The new owners (Parrogate Ginneries Limited) of the Plant would like to normalize, regularize and ensure environmental sustainability of operations of this plant through preparation of the EIA and EMP as per Zambian legal requirements.

Rationale and Justification

As one of requirements for all the ADB-financed infrastructure undertakings, Plants need to have Relevant Environmental Permits or Compliance Certificates like Environmental Impact Assessment and approval from the Local Regulatory Agencies (in this case ZEMA and others). The role of the environmental assessment for this facility is to provide environmental guidelines and plans for monitoring the environment during the manufacturing of soya cooking oil, plastic containers and other auxiliary operations of the plant. The study also aims to develop monitoring procedures as management actions during the operation of the plant.

Moreover, when PGL purchased the Plant, an EIA had not been done by the previous owner. However, the current owner would like to comply with existing international and local environmental regulations. It is PGL‘s mandate to bring all the activities on the Plant in line with the Environmental

Management Act so that all activities are implemented in sustainable manner. This is what has led to the preparation of the Environmental Impacts Assessment (EIA) report. The key purpose of the soon to be prepared Environmental Impact Statement (EIS) is to assess the environmental and social impacts of the existing Plant project by PGL, and to provide interested and affected parties (I&APs) an opportunity to comment on the findings of the EIA.

3.4 Description of the plant area

The site for the Cooking Oil Processing Plant which covers an area of **6.1ha** is located on Stand No. 5001/5960, Mumbwa Road Lusaka. The site is located on Mumbwa road, about 1km from Lumumba/Mumbwa road junction. The neighbors are Engen Filling Station in the south direction (155m from the project site), Manal Investments is the western direction (100m from the project site), in the northern direction there is FRA and Zambeef (50 and 120m away from the site) and in the east there is Master meat (400m from the plant site.

3.4.2 Plant Component Capacities

Within the project site there are two areas, one for office blocks and the other for the soya/plastic plant areas. Other infrastructures at the site are: Warehouses, fuel depots, waste area, extraction, refinery and packaging plants, two bore holes (water tanks) Zesco transformer (315kv), concrete slabs, and concrete roads. The following are the components capacities:

FOR SEED STORAGE

1. GIC Sheet silo , Conical bottom - 6 X 1241 MT - 7446 MT (No. 1 to 6) - in operation
2. GIC Sheet silo , Flat bottom - 6 X 1241 MT - 7446 MT (No. 7 to 12) - Not in operation
3. GIC Sheet silo , Flat bottom - 4 X 2244 MT - 8976 MT (No. 13 to 16) - in operation

TOTAL CAPACITY 23686 MT

FOR OIL STORAGE

A) AT TANK FARM

1. Crude Soya , MS Tank , (1 x 205, 1 x 210, 1 x 245) - 660 MT
2. Crude Palm , MS Tank (1 X 550 MT) - 550 MT
3. Refined Soya , MS Tank (1 X 65, 2 X 295 MT) - 655 MT
4. Refined Palm , MS Tank (1 X 550 MT) - 550 MT
5. Soap Stock , MS Tank (1 X 315 MT) - 315 MT

B) AT FILLING SECTION

1. Refined soya, SS Tank (1 X 50 MT) - 50 MT
2. Refined Soya, MS Tank (1 X 40 MT) - 40 MT
4. Refined Palm , SS Tank (1 X 50 MT) - 50 MT
5. Refined Palm , MS Tank (1 X 40 MT) - 40 MT
6. Refined Cotton , SS Tank (1 X 50 MT) - 50 MT
7. Refined Cotton , MS Tank (1 X 25 MT) - 25 MT

C) WARE HOUSE

1. Meal Warehouse - 01 no. – Size - 22 Mtrs X 32 Mtrs
2. Meal warehouse - 0 1 No. – Size - 40 mtrs X 35 Mtrs
3. Meal warehouse - 01 no. – Size - 20 mtrs X 30 Mtrs
4. Oil dispatch ware house - 01 no - size - 15 Mtrs x 30 Mtrs
5. Chemical ware house - 01 no. – Size - 15 Mtrs X 25 Mtrs
6. Plastic warehouse - 01 no. - Size - 15 Mtrs X 20 Mtrs
7. Store - 1 - 01 no. -Size - 15 Mtrs X 50 Mtrs
8. Store – 2 - 01 No. –Size - 15 Mtrs X 25 Mtrs
9. Store – 3 - 01 No. –Size - 15 Mtrs X 30 Mtrs

The main components of the facility are Preparation/crushing, Extraction, Refinery, cake shed, plastic plant and filling room.

There are nine (9) unit operations involved in preparation of soya beans for solvent extraction and these are itemized below;

- Receiving and storing,
- Cleaning
- Drying
- Tempering
- Cracking
- Dehulling
- Conditioning
- Flaking
- Expanding

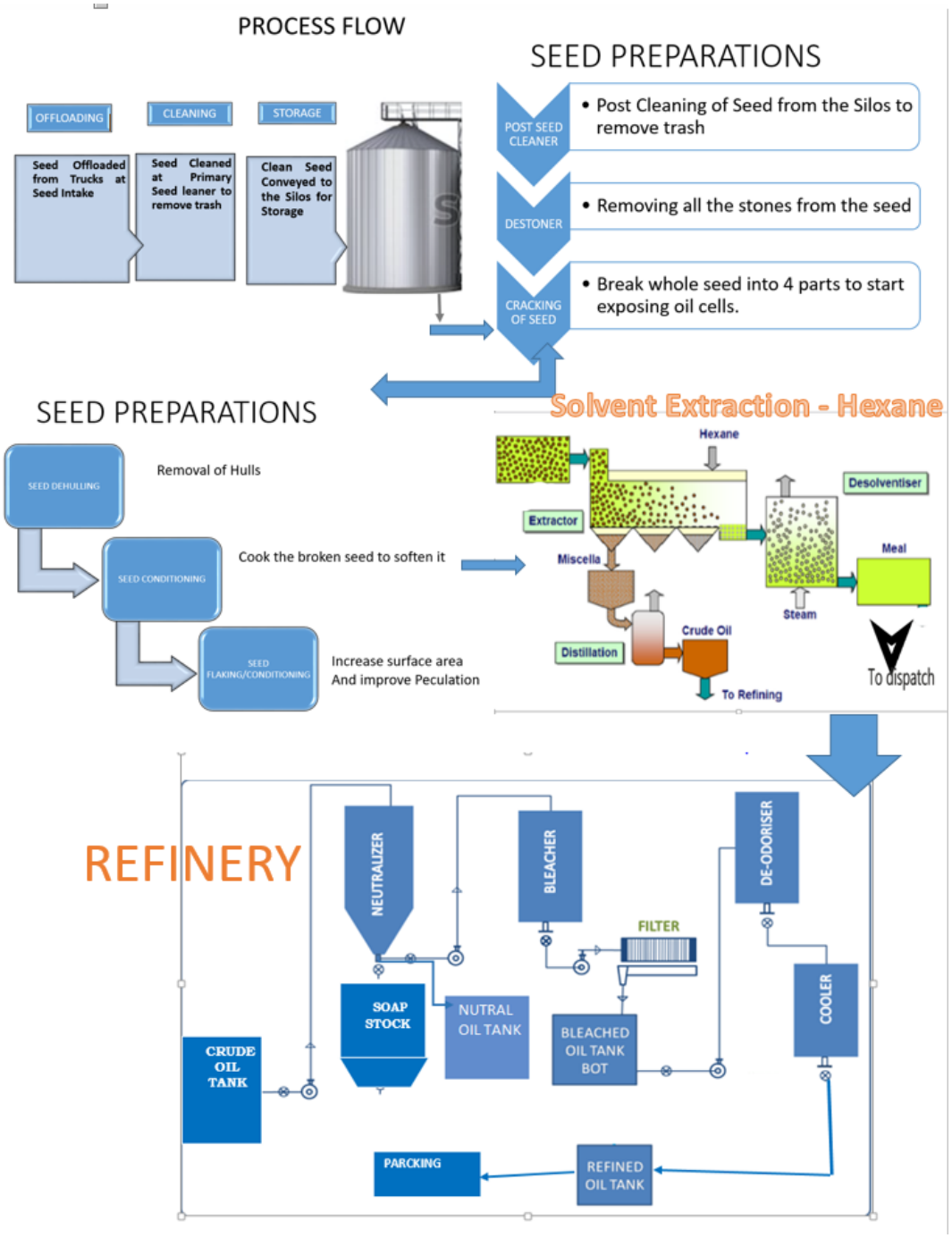


Figure 3-1: Cooking oil plant process flow

- **Receiving and storing raw soybeans**

When the soya beans arrive at the plant using private trucks or rail, samples are taken for moisture content, foreign matter, and damaged seeds. The beans are weighed and carried to silos for storage in readiness for processing.

- **Cleaning or "scalping."**

The soya beans are removed from storage and cleaned. Cleaning involves removal of foreign particles by screening and loose hulls by aspiration.

- **Drying**

The beans are dried to reduce the moisture content to 10% (percent) by weight.

- **Tempering**

After drying, the beans are tempered for 2 to 3 days to allow the moisture to equilibrate and the hulls to loosen. Soybeans are generally cleaned again after drying using magnets, screens, and aspirators.

- **Cracking**

During the process of cracking, beans are passed through a series of corrugated rolls that are generally about 10 inches in diameter and 42 inches long. The purpose of cracking is to break the soybeans into pieces suitable to dehulling and flaking. Usually each bean is broken into four to six pieces. Cracking should produce a minimum of fines.

- **Dehulling**

The purpose of dehulling is to produce high protein meal for animal feed or flour for human consumption. Soybeans are not dehulled for oil extraction. Dehulling decreases the volume that passes through the extractor, thus increasing throughput. Beans are dehulled by screening and aspiration. The removed hulls may be combined with hulls from the earlier cleaning steps and used in animal feed.

- **Conditioning**

Cracked soybeans, with or without hulls, are then transported to conditioners. Conditioners are vertical stack cookers or rotary horizontal cookers where the soybeans are heated and moistened to make them pliable enough to ensure proper flaking.

- **Flaking**

Conditioned soybeans are fed through large, smooth-surfaced rollers and emerge as flakes ranging in thickness from 0.2 mm to 0.5 mm.

- **Expanding**

The expanders mix flaked soybeans with water and steam and press them into pellets called “collets.” Collets are denser and more porous than flakes. They allow more oil to be extracted from the soybeans and increase the throughput of the extractor. Collets also allow the solvent to drain more freely, decreasing the energy needed for desolventizing.

- **Boiler Operations**

The plant is run using two coal-fired boilers. Boiler 1 has a capacity of 15 Tons and Boiler 2 is 20 Tons. The coal peas come from Maamba Collieries and Wange coal Mines who are the major suppliers of coal for the plant. The plant usage capacity of coal monthly is 460 Tons per month. The water product from the Boiler is Coal ash and soot. Coal is disposed of by being used in road constructions and Making blocks. Monthly stack emissions are conducted to ensure that the emissions are within ZEMA guidelines and returns are then sent to ZEMA monthly.

- **Water Treatment Plant**

The plant gets its operation water from a borehole. This water goes through the water treatment process called reverse osmosis where all the impurities are removed before the water can be used in the processing unit plant operations and the boilers.

- The Raw water from the borehole is normally about 7.2 pH
- Total hardness of the water from the raw water is about 109 ppm
- Total Dissolved Solid (TDS) of the water from the borehole is about 10246 ppm
- This raw water then goes through reverse osmosis in the plant for water treatment and below is the normal outcome of the water.
- RO water comes to 6.62 pH
- Total Hardness comes to 2 ppm
- TDS drops from 340 ppm

This now is the water which is required for plant operations.

- **Sold Water Management**

The plant generates an average of 20 tons of solid waste materials. These include the following:

- Plastic waste from Plastic Plant.
- Paper waste from Offices.
- Trash materials from the screens.

These materials are disposed of at Chunga dump site for Lusaka City Council, LCC.
A solid waste Management company has been engaged to ensure constant removal of solids from the plant once every week.

3.4.2 Manufacturing Process and Flow of Material

The Soya bean oil shall be extracted from the seed using a Solvent Extraction Method. This is a process of diffusion of solvent into the oil bearing cells of the raw material that results into a solution of oil in the Solvent Hexane.

Pre – Cleaning Objectives and Process

The Soya bean seed is received at the platform through two seed unloading hoppers, before being conveyed by a conveyor to a pre – cleaning section. Soya bean refinery is mainly aimed at extracting seed oil and concentrating the contents of protein. Owing to the morphology of the seed structure, removal the soybean hull is a necessity for most processes. Notwithstanding this, oil extraction is the first step of soybean applications.

Oil is as a microscopic content, reserved in spherosomes (oleosomes), has a structure comprising of a triglycerol matrix core enclosed by a monolayer of phospholipids, and are embedded with oleosin-protein. These three components are weight- wise proportionately about 94%, 2% and 4% by respectively. Pressure, heat, organic solvents, and enzymes are in most cases used for extracting oil from oil bodies.

Using a Bucket Elevator, the soya bean seed coming from unloading section is conveyed to a Rotary Screen Cleaner. Here in the Rotary Screen Cleaner, dust particles are removed and dust collected through Cyclone airlock valve. The clean soya bean seed then conveyed to the storage Silo's Feeding elevator.

De-stoning – Cracking - Dehulling

The seed from the Silo is conveyed using a Conveyor Belt and Bucket Elevator to the De-stoner where the stones or heavy impurity particles are extracted allowing only separated Soya bean seeds to go to a Magnetic Separator where metallic particles in particular Iron from grinding steel are removed from the seed. The Soya bean seed is thereafter channeled into the Intermediate Balance Silo. From the Silo/s the seed is continuously poured into Crackers where it will be broken in four – six parts and then it goes to Dehuller. It is in the Dehuller where the outer shell of soya bean seed is removed.

- Then seeds are transported into the Cooker through the Bucket Elevator or Bulk Flow Conveyor, where the cracked seed is cooked at a temperature range of 75 – 90^0C by providing continuously flowing water steam.

- The cooked seed goes to the Flacker, through the Conveyor where the flakes are dried and cooled in continuous flow.

- The cooled flakes are further channeled to an extraction section through a conveyor. This is an efficient extraction which results into every oil-bearing cell of the material to come in contact with the solvent. The solvent penetrates better into the oil-bearing seed cells where the material is smaller in size. Nevertheless, if the material is too fine, it restricts the

percolation of the solvent into the mass. It is for this reason that an optimum size is absolutely important for efficient extraction. To achieve this, soya bean seed is passed through **expanders after Cracking**, Cooking and Flaking.

The Solvent Extraction process includes bean cleaning, drying, cracking, dehulling, flaking, solvent extraction, and meal handling as illustrated in Fig. 3-2.

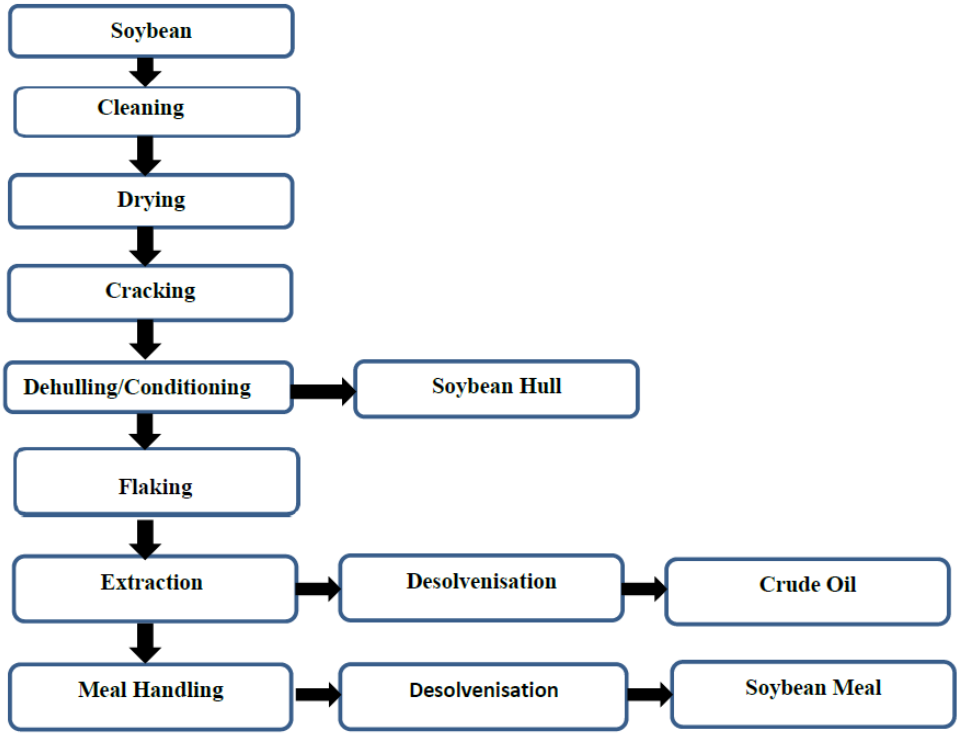


Figure 3-2: Production process flow of oil solvent extraction
[Source: Cheng, Ming-Hsun, (2017). https://lib.dr.iastate.edu/etd/15277]

Soya bean hulls

Soya bean hulls are a by-product of the extraction of oil from soya bean seeds after it has entered the oil mill, where soya beans are screened to rid it of broken and damaged beans as well as foreign material. The beans are then cracked as presented above, and their hulls, which mainly consist of the outer coats, are removed (see figure above). Hulls are fibrous materials which are not suitable for human consumption, but are very valuable for ruminants. **Soya bean hulls** are usually reintroduced in the final oil meal production for purposes of reducing its protein content and resulting in **soya bean meal** types which have a maximum protein plus fat guarantee of 44 to 48%. Nevertheless, this end use decreases when the demand for high protein soya bean meal increases. Soya bean hulls are thus considered available and very valuable **feeds for on-farm feeding of cattle**.

Solvent Extraction

The prepared material is received in a receptacle Extraction Chamber) in the extraction plant which is made up of a number of solvent sprayers that are used to spray the solvent over the entire bed. The length and breadth of the bed is designed in such a way that there is enough time for ideal

contact penetration of solvent into the material.

The extraction of oil is done using hexane as a solvent in a solvent extraction plant. The cake from preparatory section come to the Extractor via Redler conveyor. Then via feed hopper, it is transferred onto the extractor conveyor belt. The operating temperature at the extractor ranges at 45-50^{o}C. Fresh hexane from the solvent-water separator comes to the extractor and sprayed along the conveyor using circulation pumps. Oil from the cake is extracted from hexane and the deoiled cake is taken to the Desolventiser/Toaster for further removal of hexane vapors. In the Toaster, hexane vapors is separated by using superheated steam and which then tunneled to the Dust catcher. The remaining cake is tunneled to the DOC unit via Redler conveyor where it is dried by the Humidifier, where it is bag packed and sold out. The extracted oil plus hexane stream (Miscella) from extractor after certain cycle of spraying and recirculation is transferred to the Hydro cyclone via pump. After the removal of dust particles from miscella, it is transferred to Miscella Tanks.

From miscella tank, it is taken to the Economizer where heat exchange take place between miscella and hexane vapors coming from Dust catcher. As a result, some hexane from miscella is vaporized and condensed in a Condenser. Liquid miscella is then transferred to the Miscella Evaporator. The vapor stream from dust catcher is cooled up to 35-40^{o}C in economizer and transferred into the Flasher. Where hexane vapors is separated and condensed in the DT condenser and the remaining liquid hexane is transferred to the solvent-water separator. In Miscella Evaporator, the miscella is heated from 55-60^{o}C to 80^{o}C by using high pressure steam. Then, it is transferred to the Flasher where some hexane is vaporized and condensed in a condenser. Liquid miscella is transferred in to the Secondary Miscella Evaporator where it is heated from 80^{o}C to 90-95^{o}C by using high pressure steam. Then it is transferred to the Stripper where some hexane is vaporized and condensed in a Distillation condenser. Liquid miscella is channellled to the Intermediate Heater where it is heated from 90-95^{o}C to 105-110^{o}C by using low pressure steam. Then it is transferred to Final Oil Stripper where remaining hexane from oil is vaporized and condensed in a Distillation condenser. Oil is pumped to Oil Cooler by a pump. It is cooled up to 60^{o}C and transferred to Final Oil Day Tank. This oil is then pumped to Main Oil Tank and followed by Tanker loading facility.

The condensed hexane from Condenser and Distillation Condenser is transferred to the Vacuum Breaker and then tunneled further into the solvent-water separator where hexane and water is separated. Hexane is pumped to Extractor by a pump and water is taken to the Water Heater where it is heated up to 90^{o}C by superheated steam and circulated to Dust Catcher. Also, waste water from water heater is taken to ETP.

Disolventisation

The extracted material has a tendency of retaining the solvent with it, and this solvent has to be recovered. The retention varies from 20% to 36% weight of the material extracted. The basic principle involved in desolventisation is direct and indirect heating of the material with steam to a temperature well above boiling point of the solvent and thus ensuring no solvent is left over with the material. The vapor of the solvent is sent to the scrubber, where the solvent is washed to the trace vapor level. The de-oiled and desolventised meal thus obtained is then transported to bagging section by conveyor. A cooling arrangement is provided to ensure proper cooling of the material for easy bagging and at hold moisture of 10-12%.

Distillation

The mixture of oil and solvent obtained from the extractor is known as Miscella which normally contains 12 to 18% oil. Distillation is performed in three stages under vacuum to ensure that no oxygen is present when the oil is heated to a high temperature. Firstly, evaporation takes place in the Economizer and concentrates in the first and second flasher, leaving practically only oil behind. This oil is further treated with open steam to ensure that no solvent finds its way into the oil. The solvent vapor thus produced passes through oil vapor separator to remove any oil particles strapped

with the solvent vapor and this is then passed on to the condenser for condensation.

3.5 Relevant policy, legislative and planning framework

This document has been prepared in line with the requirements of the Zambian Environmental Management Act, 2011 and its subsidiary legislation, the Environmental Impact Assessment Regulations, 1997 (Statutory Instrument No.28 of 1997). It also refers to the Local Government Act, of 2019, the Urban and Regional Planning Act, 2015, the Water Resource Management Act, 201102, the Public Roads Act, 2002 and other applicable legislations and regulations. The administrative framework within which the proposed project will be implemented will include Zambia Environmental Management Agency (ZEMA), the Lusaka City Council, Ministry of Housing and Infrastructure Development, Water Resource Management Authority (WARMA) and other regulatory and government agencies.

Project implementation will also conform to international conventions and internationally recognized standards such as Equator Principles (EP). The EP are based on and implemented in accordance with World Bank Group's International Finance Corporation (IFC) Performance Standards and the IFC Environmental Health and Safety (EHS) Guidelines.

This project will be implemented within the confinement of these guidelines and the following:

- The Environmental Management Act NO. 12 OF 2011
  - Statutory Instrument No. 112 of 2013; Part II on Air and Water pollution (Licensing) Regulations
  - Environmental Management (Licensing) Regulations, Statutory No.112 of 2013 part III
  - Environmental Management (Licensing) Regulations, Statutory No.112 of 2013 Part II
  - Environmental Management (Licensing) Regulations, Statutory No.112 of 2013 Part IV
- The Factory Act 1966
- Urban and Regional Planning Act, 2015 PART III section 17
- The occupation health and safety act of 2010 PART IV Section 16
- Public Health Act Cap 295 of 1978 Part V Section 31
- The Local Government Act No. 2 of 2019 Introductory Part
- The Fisheries Act No. 22 of 2011
- The Water Resources Management act No. 21 of 2011 Section 6
- The National HIV/AIDS/STI/TB Act of 2002 Section 4
- The National Heritage and Conservation Act (Cap.173 of 1989) Section 8
- The Employment Code Act No. 3 2019 Introductory Part
- Workers Compensation Act No. 10 of 1999 Section 6
- The Road Traffic Act Cap 464 Section 196
- The Lands Act (Cap. 184 of 1995) Section 8
- The Forest Act No.4 of 2015 (The Forests Community Forest Management Regulations, SI No. 11 OF 2018.

3.6 Identification of associated projects

The Cooking Oil Processing Plant is near other similar Plants such **Essential Commodities** just 30m away and Kalomo Grain Marketing Limited (Supreme Oil Zambia) in Manda Hill, Mount Meru Millers Zambia Limited (30km away from PGL Plant) and other small scale oil processing companies dotted around Lusaka. Therefore there could be possibilities of these facilities competing for the same customers for the final product. This will be assessed and documented in the EIS.

3.7 Project Products and by- products

The main products in the production cycle will be **soybean oil, soybean cake and soy hulls**. **Coal ash** as a waste product of coal i.e. a by-product will be used in the boiler. This coal will also be expected to be supplied as an aggregate in the brick making industry as well as a harder on gravel roads. In summary, the following are the products of the crush plant.

- Soya meal
- Soya oil

Below are the by-products from the crush plant (bean sifter)

- Trash
- Sticks
- dust

By-products and Wastes

Other wastes from the production line include:

- **Non-hazardous Solid waste:** include material such as scrap timber and various off cuts and refuse such as discarded packaging (e.g. soya bags), garbage and domestic waste from workers canteen etc.
- **Hazardous waste:** hazardous waste results from operation activities; this comprise mainly used oil / lubricants.
- **Runoff:** Storm water from the site
- **Dust:** Dust generated on site due to movement of vehicles.
- **Exhaust emissions:** from operation of vehicles on site.
- **Gas Emissions:** gas emitted from the production line.

Table 3-1 Sources of solid waste and disposal during operation

Waste	Source	Disposal
Glass	Broken panes during maintenance works	Disposal – Municipal dumpsite if broken.
Ferrous	Off cuts during maintenance works	Recycled – taken to a licensed scrap dealers.
Packaging	Empty cement bags, fittings, plastics, paper and cardboard	Disposal – Municipal dumpsite Recycling companies like Flex waste.
Plant material	Maintenance works	Reused – Composted Disposal – Municipal dumpsite
Domestic waste	Cleaning	Reused – Reuse and composting Disposal – Municipal dumpsite

3.8 Resources for project implementation

Resources required for successful implementation and operation of the project include the total financial cost of construction works estimated at **US$10, 000,000.00**. Skilled and unskilled human resource shall be local and Zambia at large.

3.9 Brief history of the project including the options considered

Parrogate is a group of companies with branches in Malawi, Zambia and Zimbabwe. The own the Cooking oil processing plant located on Mumbwa road in Lusaka. This Plant was initially established in early 1960s. For a long time it operated under the name Refined Oil Products (RoP) Ltd. Then Cargill Zambia Limited (Trading as Zamanita) took over the operation of the plant. Recently Parrogate Ginneries Limited bought the plant from Cargill Zambia Limited. The existing facility has about six process operation sections namely; seed preparation/crushing, extraction, oil refinery, cake shed, plastic plant and filling room. The project is operational and involves procurement of the soya bean seed which is cut, heated and squeezed to make vegetable cooking oil. Although there have been changes in ownership of the plant, no EIA was prepared for the entire plant. The new owners (Parrogate Ginneries Limited) of the plant would like to normalize, regularize and ensure environmental sustainability of operations of the plant through preparation of the EIA and therein, an Environmental Management Plan (EMP) as per the Zambian legal requirements.

3.10 Project Location

The plant site is located on Mumbwa road, within Parrogate Ginneries Limited premises, situated in Lusaka district. Lusaka district is the provincial headquarters of Lusaka province and capital city of the country, Zambia. Parrogate Ginneries Limited is located at plot number 5001/5960, heavy industrial area, Lusaka, Zambia. The facility lies at 28°16.6' 79" E, 15° 24'56.97" S, and some 1.4km from the City Centre and 1km from Lumumba/Mumbwa road junction. The neighbors are Engen Filling Station in the south direction (155m from the project site), Manal Investments is the western direction (100m from the project site), in the northern direction there is FRA and Zambeef (50 and 120m away from the site) and in the east there is Master meat (400m from the plant site).

The nearest developments to the site include;

- Food Reserve Agency (FRA), about 120m north;
- ZAMBEEF, about 50m north east of the plant
- Mumbwa Road lies, about 20m south;
- Manal Investments, about 100m west of the plant;
- Engen Filling Station, about 155m south east;
- Kanyama Compound lies about 1.5km south west of the Plant;
- Master Meat, about 400m east of the Plant;

Table 3-2 Parrogate Ginneries Limited Site Coordinates

PARROGATE GINNERIES LIMITED SITE COORDINATES			
Beacon No.	**Description**	**Longitudes**	**Latitudes**
A	Corner East	28°16'13.66"E	15°24'54.94"S
B	Corner South East	28°16'14.82"E	15°24'58.91"S
C	Gate – South	28°16'9.81"E	15°24'59.69"S
D	Corner South West	28°16'0.68"E	15°24'58.75"S
E	Corner North West	28°15'59.71"E	15°24'52.91"S

Figure 3-3: Location Map of the Cooking Oil Processing Plant

Figure 3-4: Location Map of the Cooking Oil Processing facility

3.11 Size of Project Area

The Cooking Oil Processing Plant covers an area of **6.1ha** in extent.

3.12 Nature of the Project

The proposed project shall involve the extraction of oil from soya bean. The facility focuses on the Manufacture of vegetables oils and lies within the confines of value addition of extracting oil from soya bean for market and human consumption. The main products in the processing cycle will be soya bean oil, soya bean cake and soya hulls whilst by-products will be coal ash as a waste product of coal that will be used in the boiler. This coal will also be expected to be supplied as an aggregate in the brick making industry and as well as a hardener on gravel roads. Facilities/infrastructure at the site includes;

- Main solvent extraction plant (with components such as water scrubber, chimney etc.),
- Security cabin
- Toilets, soak away/septic tank
- Laboratory
- Administration office
- soya receiving shed
- preparation section
- packaging section
- boiler shed
- Silo component

Table 3-3: Components of the Cooking Oil Processing Plant

COMPONENTS OF THE COOKING OIL PROCESSING PLANT			
COMPONENT	**Major Facilities**	**QTY**	**Total capacity**
Seed Storage	GIC Sheet silo , Conical bottom	6	7446 MT
	GIC Sheet silo , Flat bottom	6	7446 MT
	GIC Sheet silo , Flat bottom	4	8976 MT
Oil Storage			
a) Tank Farm	Crude Soya , MS Tank	1	660MT
	Crude Palm , MS Tank	1	550MT
	Refined Soya , MS Tank	1	655MT
	Refined Palm , MS Tank	1	550MT
	Soap Stock , MS Tank	1	315MT
b) Filling Section	Refined soya , SS Tank	1	50MT
	Refined Soya , MS Tank	1	40MT
	Offices Refined Palm , SS Tank	1	50MT
	Refined Palm , MS Tank	1	40MT
	Refined Cotton , SS Tank	1	50MT
	Refined Cotton , MS Tank	1	25MT
c) Ware House	Meal Ware house - 01 No		22 Mtrs X 32 Mtrs
	Meal ware house - 0 1 No		40 mtrs X 35 Mtrs

	Meal warehouse - 01 no		20 mtrs X 30 Mtrs
	Oil dispatch ware house		15 Mtrs x 30 Mtrs
	Chemical ware house		15 Mtrs X 25 Mtrs
	Plastic ware house		15 Mtrs X 20 Mtrs
	Store - 1		15 Mtrs X 50 Mtrs
	Store - 2		15 Mtrs X 25 Mtrs
	Store - 3		15 Mtrs X 30 Mtrs

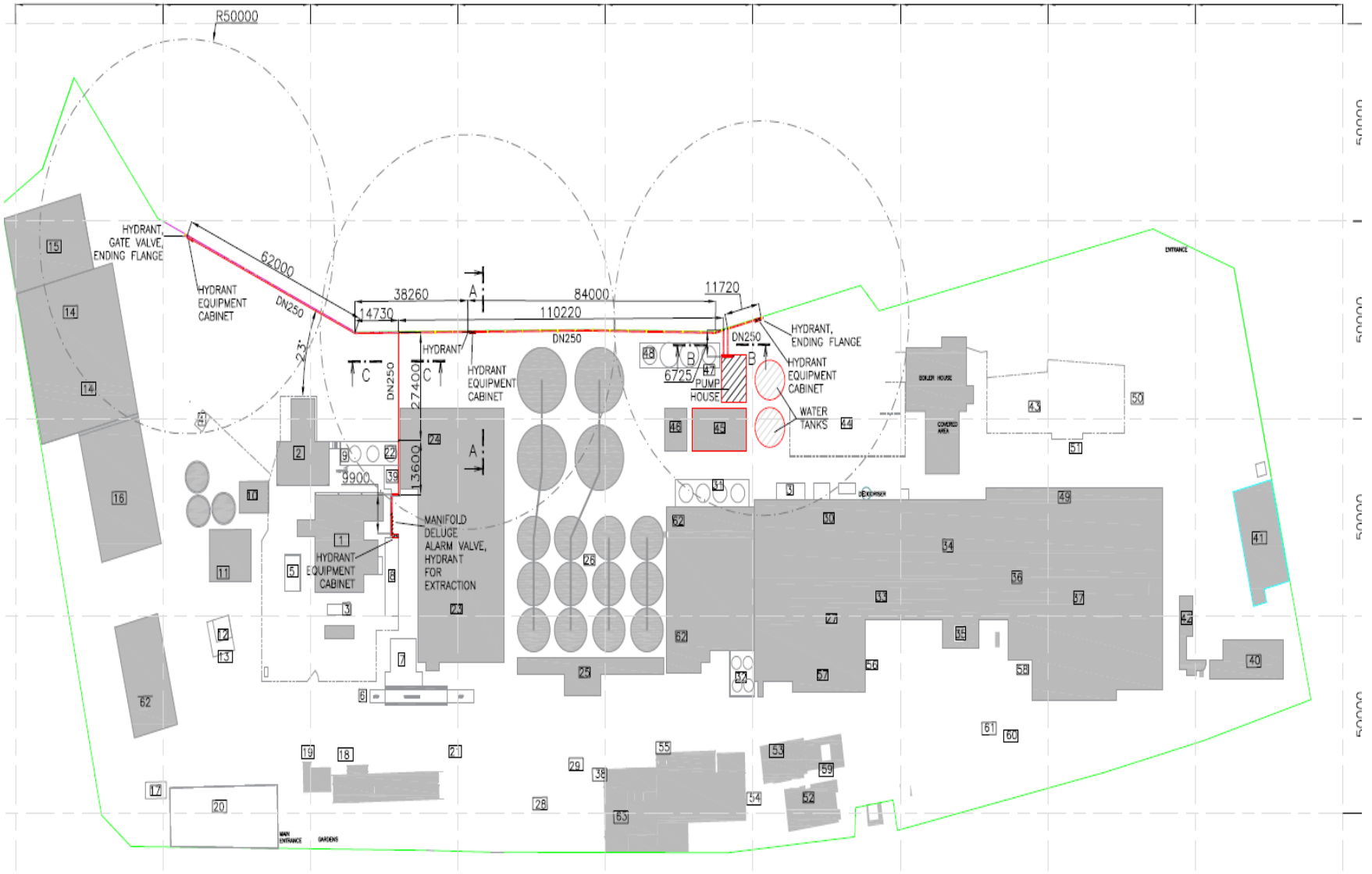


Figure 3-5: Cooking Oil Processing Plant Layout

3.12.1 Raw Materials

Soya, Hexane and water are the major raw materials for the project. Coal will also be used during the production cycle. During maintenance phase, steel roofing sheet and normal concrete, cement and blocks will be used with wall finishes done using paint.

As the facility is operational, maintenance of structures and common areas will include routine cleaning of plant, office corridors and public toilets, maintenance of physical structure (e.g. roof / walls of the plants), security lighting and fire equipment. The car park and internal roads will be cleaned routinely and monitored on a day to day basis for damage to the road surface. Any repairs necessary shall be carried out by the Proponent

The majority of the materials will be procured locally. Where local suppliers are not available or where local products are found to be of inferior quality and specification, the developer will import from neighboring countries.

3.14 Drainages

Drainage from paved areas will designed to carry and discharge storm water into the existing municipal storm water drains of the site.

3.15 Security

The existing area is bounded by a wall fence. There is a delivery entrance and the main entrance to the site. The day to day security responsibilities are out sourced to a qualified and respected Security company and a security mandate already drawn up.

3.16 Landscaping

Various areas of landscaping will be incorporated into the design of the existing area. Boundaries, both internally and externally will be landscaped to create a visual buffer. Areas around the parking lots will also be landscaped to create a visually pleasing environment.

3.17 Project Main Activities

The project will be developed in three (3) phases - preparatory works; construction of all supporting infrastructure such as: site clearance, external and internal access roads, exterior security fence around the site, drainage and sewage reticulation; and Operational phase.

The following are among the expected activities that will be undertaken for the proposed extension: -

3.17.1 Site Preparation phase

The project is operational and involves procurement of the seed soya bean which is cut, heat and squeezed to make vegetable cooking oil. Although there have been changes in ownership of the Plant no EIA or EMP was prepared the entire Plant. The new owners (Parrogate Ginneries Limited) of the Plant would like to normalize, regularize and ensure environmental sustainability of operations of this plant through preparation of the EIA and EMP as per the Zambian legal requirements

During this phase, the Consultant carried out the following activities. These included:

- Assemble EIA Team

- Prepare Terms of Reference (TORs) and Scoping Meeting on website (as no gathering is currently allowed in the middle of this pandemic – COVID 19)
- Conduct field visits for specialized studies
- Prepare Specialized study reports
- Conduct Disclosure Meeting on website due to public gathering restrictions because of COVID 19
- Prepare draft EIS Report;
- Prepare final EIS for submission to ZEMA
- Facilitate Public Hearing (If any).

3.17.2 Construction phase

Since the Plant is operational, there will be no construction activities at the project site except:

- Rehabilitation works on certain buildings and plant areas
- Repainting of old buildings
- Areas prepared for parking will be surfaced with tarmac;
- Areas surrounding buildings and parking areas will be landscaped.

3.17.3 Operation phase

Since the company is operational (manufacturing of cooking oil), the activities under this phase will comprise of the following:

- Acquiring of the necessary raw materials (soya seed).
- Screening of the soya seed.
- Crushing of the soya seed.
- Conveying the soya flakes to the extraction plant.

Acquiring of the necessary raw materials (soya seed)
Oil seed currently only include soya seed and it's acquired from local farmers from Eastern and Southern Province including Lusaka. Most of these bring their soya seed at the plant and once the seed is accepted, it's weighed at the weighbridge and bought.

Cleaning and grinding

- The incoming soya beans seeds are passed over magnets to remove any trace metal before being stripped of all extraneous material.
- The stripped soya beans seed are then ground into coarse meal to provide more surface area for oil extraction. The hammer mills crush the material to the proper sizes consistently.
- The meal is heated to facilitate extraction of oil.
- The heated meal is rolled into flakes and processed by solvent extraction to attain maximum yield.
- The flakes are conveyed to the extraction plant through a conveyor belt.

3.17.4 Decommissioning phase

This phase shall include the following;

- Repairing all the structures to a suitable state for alternative uses.
- Conducting re-vegetation activities where possible around the entire project area.
- General clean-up of the site.

4

ANALYSIS OF ALTERNATIVES

PROJECT ALTERNATIVES

A variety of alternatives, such as the following, exist for the design and management of the project.

The characteristics of the identified sites are briefly outlined below.

4.1 Project Need

The Cooking Oil Processing Plant has exchanged owners since its inception. Although there have been changes in ownership of the Plant no EIA or EMP was prepared for the entire Plant. The new owners (Parrogate Ginneries Limited) of the Plant would like to normalize, regularize and ensure environmental sustainability of operations of this plant through preparation of the EIA and EMP as per the Zambian legal requirements.

4.2 Site Alternative

The alternative of constructing the plant at another site was compared to the plant at their premises. The first option was not feasible as the project was already operational and the project activities were interrelated. The second option was preferred. No other sites were considered as the development project site is already under PGL ownership.

4.3 Raw materials

Since the project is already in full operation, the material alternatives include the vegetable oil types. The plant has been processing soya seed since its inception. Other raw material could include, sun flower, groundnuts, cotton seed and palm seed. The soya seed was preferred due to its availability in the bulk and constant supply.

4.4 Water Supply Alternative

The project site is located in an area serviced by Lusaka Water and Sewerage Company water and sewer mains which renders easy connection to the proposed project. A decentralized sewage management and disposal system may not provide a better option than the existing connection to sewer main considering the presence of other businesses in the immediate adjacent properties. The nature of the development calls for a back-up water supply source and as such two boreholes fully equipped will storage tanks are already integrated into the development.

The use of bore hole for water supply was analysed against connecting to a local water supply utility company and buying of disposable water bottles for domestic use. The use of a borehole was preferred for the project operations and domestic use as an alternative which seemed to be cheaper and appropriate.

4.5 Energy sources

The principal source of electricity during operational phase of the project is hydro-power energy to be sourced from a nearby ZESCO main which is found within reach of the project site. The ZESCO main was picked as a major source of power as it provides the clean and less costly power alternative which is also environmentally friendly. The use of a generator was also analysed against but since its costly operating Gensets, the two Gensets at the site are only run during power outage.

4.6 Alternative Design

Since the Plant is already in full operation with a good production rate, the option of continuing using the existing design and machinery was preferred against the installation of new machinery.

4.7 Waste Management Alternatives

The option of using the waste bin was analysed against using a skip bin. The first option meant that the company needed to buy many waste bins, which have a limited holding capacity. The second option was opted as the skip bin has a huge carrying capacity. The proponent has engaged a solid waste collectors as it is at the operational phase to ensure waste management at the facility is well maintained. All non-organic waste will be collected and disposed of using a reputable company and taken to the Chunga landfill.

4.8 Sewerage management alternatives

The use of septic tank was analysed against connecting to existing sewer line. The first option meant constructing a septic tank, which are not environmentally reliable. The second option was opted as it meant connecting to the existing Lusaka Water and Sewerage Company main trunk line, which passes through the premises (Plant)

4.9 The “No Action” or “No Project alternative”

The alternative of not implementing the Project was rejected because the project under review was operational. Other reasons were;

- Current demand for cooking oil and soya cake both local and international is very high and thereby stopping the plant operations would negatively affect the animal farming industry and the national economy as a whole.
- Loss of business for local suppliers,
- Loss of direct employment and training opportunities for approximately the company and contractual staff. (e.g. those working to upgrade the plant).
- Loss of indirect employment and training opportunities for contractors and suppliers of goods and services..

5

DESCRIPTION OF THE BASELINE ENVIRONMENT

5. DESCRIPTION OF THE BASELINE ENVIRONMENT

This section describes briefly the environmental and social conditions of the facility's area. It gives highlights on climate, rainfall, wind, hydrology, geology, air quality, soils, land use / land tenure, flora and fauna, archaeology and cultural heritage, traffic volume, noise and socio-economics.

The bio-physical data of the proposed project area was gathered by both literature review and field visits to the site. Climatic data was collected from a weather website (www.weatherbase.com.) Data on air quality, flora, fauna and existing physical developments and infrastructure were collected on-site during field visits. The hydrology, geology and topography of the area were established by both field visits and literature review.

Ecologically, the cooking oil processing plant site was divided into four strata in four directions i.e. North, West, East and South for easier management purposes. The strata was arrived at, depending on the administrative boundaries, the size in terms of coverage and the physicals barriers. In each strata, one transect of 100m was established. Thereafter, with each 100m transect, four plots of 20m apart from the other were established.

A Garmin Quest, Global Positioning System (GPS) Navigation instrument, was used by the study team to capture and record some of the geographical data at the site. GPS coordinates were collected, recorded on the instrument and later exported to a web-based Google earth App for analysis.

5.1 Climate

5.1.1 Temperature

Mean monthly temperatures range between about 15^{o}C in the cold season to about 28.9^{o}C in the hot season when humidity is comparatively high. Minimum temperatures as low as 9.6^{o}C have been recorded for July, the coldest month of the year (the occurrence of frost is not expected), while temperatures of 30^{o}C and over are not uncommon for October, which is the hottest month.

5.1.2 Relative Humidity

Relative humidity increases in December and highest in February at 80.7% and drops to 49% in October.

5.1.3 Sunshine

At the peak of summer (i.e.; October), the sun is expected to shine for an average of 10 hours per day. This represents the average number of hours in the daytime that the sun is visible and not obscured by cloud e.g. the average number of hours the sun is actually out and shining. In winter (i.e.; June and July) the sun shines for an average of 8 hours per day. Sunshine is more event during the dry season than during the wet season. Sunshine hours decrease from December to March and then start to increase in April and May

The district is in Region I of the Agro-ecological zone and it enjoys a subtropical climate due to its high altitude above sea level (1,100 and 1,400 metres above sea level). The figure below shows the Zambia Agro-Ecological Zones of Zambia.

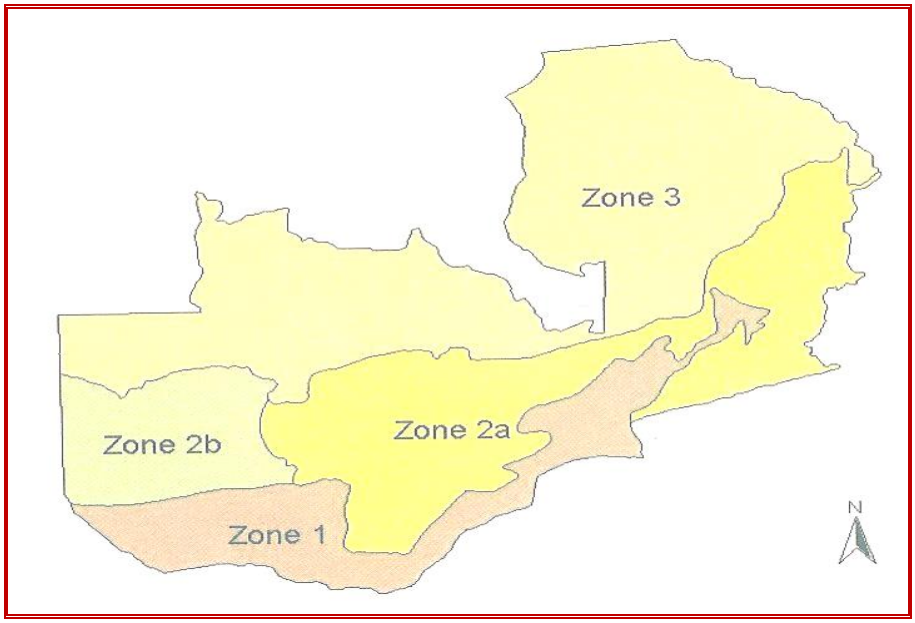


Figure 5-1: Agro-Ecological Zones of Zambia

5.1.4 Rainfall

The rains generally start in the middle of October and continue through up to the beginning of April. Rainfall reaches its peak around January after which it diminishes slightly up to the beginning of April when usually it ceases entirely. The typical average rainfall in the Lusaka area is 850mm (min: 527mm and max 1,318mm over a 30-year period), with the majority of precipitation occurring during the months of November to March (90% of annual rainfall).

5.1.5 Wind

The study area experiences prevailing easterly winds during the dry season with fresh winds experienced in the months of July and August. The rains experience light variable winds predominantly northerlies and north - easterlies in January and February. Mean wind speed ranges from 4.0 km/hr. to 9.0 km/hr.

5.2 Geology

The geology of Zambia comprises of various rocks and layers dating from over 1,000 million years ago. These rock formations consist of igneous, sedimentary and metamorphic rocks. The age of the Katanga Super Group ranges from late Precambrian to cambriam (100 to 500 million years old). The Katanga Super Group comprises shales, sandstone, dolomites, localized, limestone and conglomerates (Figure 5b). The Lusaka Dolomite is believed to be laying over the Cheta Formation (of earlier Katangan age) and generally consists of flaggy muscovite and biotite metasiltstones and quartzite.

The carbonate rock/dolomite and schist are mainly distributed in Lusaka City. In Lusaka City, the flat areas consist of carbonate rocks and the slope areas consist of schist rocks. Alluvial deposit is distributed around the Lusaka International Airport area.

Karst exists in the carbonate rock area with some variation. The western area of the Lusaka Plateau dolomite has few cracks and melted roundly. On the other hand, south-eastern areas of the Lusaka Plateau dolomite which has many cracks and melted sharply. In most areas,

karst is covered by surface soil. In a few places where it is connected to an underground channel, surface soil has flowed into the ground causing sinkhole.

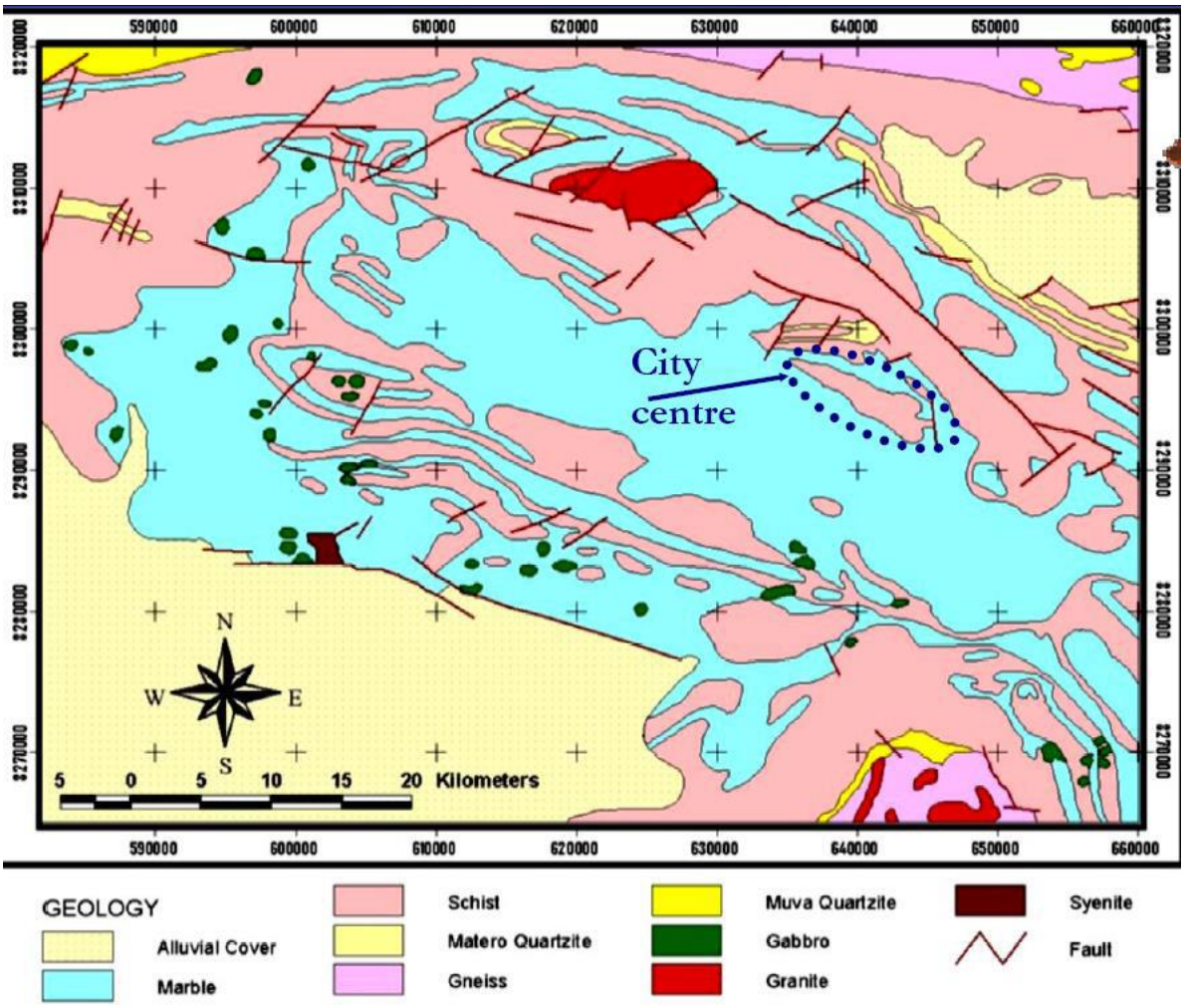


Figure 5-2: Geology of Lusaka (Source: Nkhuwa DCW et al, 2007)

The geology of the Project area is underlain by Quartz Muscovite Biotite **Schist**, which belongs to Chunga Formation. The Quartz-Muscovite Schist is poorly exposed. It is light brown and fine to medium grained in texture. The unit is strongly weathered composed of Quartz muscovite and biotite. The structural geology of the plot consists of foliations and joints which consists of strongly folded meta-sedimentary rocks of an ancient basement complex overlain by limestone and dolomitic rocks of the Cheta formation, of which is composed of one main lithostragraphic unit; Quarts-muscovite schist with minor quartzite which belong to the cheta formation. The quarts' muscovite schist is fine grained and with very little exposure. The foliations have a strong schistosity which is often corrugated forming a sequence of the Katanga system. This is typical of the Lusaka area. Schist with small outcroppings is mainly located in the East sector of the plot. The topography and soils of the site correspond closely to the underlying geology.

5.3 Soils

Distribution to Simpson et al (1963), the geology underlying the project area is characterized by an extensive band of calcareous rocks of Katangan age constituting the Lusaka Dolomite. The Lusaka Dolomite lies unconformably over the Cheta Formation (of earlier Katangan age) and generally consisting of flaggy muscovite and biotite metasiltstones and quartzite (Smith, 1963).

The geological map of the area places the project site over the boundary of the carbonate sequence of the Lusaka Dolomite.

The Met sediments of the lower Katangan succession have in places been intruded by gabbroic and doleritic basic rocks but are not exposed on the surface in the project area.

The soils are essentially sandy loams. Pisolitic ferricrete or laterite mixed with reddish brown to rust coloured sandy loams to clay loams; the soils are permeable and well drained and reflect possibly the gemstone geology beneath. The soils fall under the Ibex Soil Series5, which represents agriculturally productive soils with high inherent fertility. This arises from a relatively high organic matter content which forms a pool of nutrients. The mineralogy of the soils, which have developed over the basic rocks such as gemstone and dolomite, also supports the high inherent fertility.

The existing available data will be used to benchmark future rehabilitation activities during decommissioning and closure

5.4 Topography

The site is situated on the flat land with some protruding Lusaka dolomites which is a predominant feature. Lusaka District is about 1270m above mean sea level. The terrain features shallow valleys and mild hills, with a very gentle north-east slope dipping towards Southern extension of the project site; however the site appears almost flat to the human eye.

5.5 Air Quality and Noise

Air/Dust

The main sources of emissions that can reduce local air quality within the project area include release of air pollutants from boilers, dust, movement of utility vehicles along the Mumbwa access road and the gravel road on the western section of the Plant. Hexane gas being used as a solvent can also leak and become source of pollution. Coal ash from the boiler if not taken care of could also be a source of dust.

A review of air pollution data and ambient air quality monitoring within the site were undertaken as part of the environmental and social impact assessment of the facility to identify potential impacts of dust and air emissions on human health and functions of the ecosystems services within and around projects site as defined by the study area.

The emission concentration levels of Sulphur dioxide (SO_2), Carbon Dioxide (CO_2), Nitrogen Oxide Compounds (NO_x) were within the emission limit set by ZEMA except for Carbon Monoxide (CO). However, the reports indicated that the combustion efficiency displayed by the flue gas analyzer machine shows that the boiler was exerting complete combustion of the coal used during production.

Noise

There is noise at the project site since the plant is in operation. The main source of noise are boilers, crusher plant, refinery, movement of utility vehicles and heavy duty equipment such as loaders and forklifts, trucks bringing soya beans and loading cooking oil and other products and

by products. The workers and local communities near the plant could be considered to be sensitive receptors although this could not be proved as the plant was shut down for maintenance during assessment.

Noise disturbance as a result of the plant operations were assessed. Sensitive receptors within the study area were identified and the potential impacts assessed. Noise survey was undertaken to generate primary baseline data, which was be supplemented with secondary data if available.

5.6 Hydrogeology

The topography of the area affects its hydrogeology. It affects the depth of decomposition of older rocks. The older rock surfaces are more deeply weathered than the younger surfaces. On old mature surfaces the streams are small and flow slowly. Due to the prevalent limestone rock in the upper Chalimbana area (north-west of study area), much of the water percolates downwards, causing development of an extensive underground drainage system.

The study area lies in the region of the Lusaka watershed separating major drainage basins, namely those of the Kafue River to the southwest, the Chongwe River to the east and the Ngwerere River to the north. As described, surface drainage features are absent on the site.

The site is with a regional slope to the north-East; a natural drainage depression becomes apparent about 500m-700m to the North West of the site which becomes more incised and pronounced as it progresses west.

Surface water sources are limited around the project with no streams or rivers in the vicinity of the site. However, the ground water sources are available especially during the rainy season when the water table rises.

The Lusaka aquifers cover an area of 2,832 km^2 which includes:

i. Lusaka Dolomite Formation 580 km^2
ii. Other carbonate rocks 1,039 km^2
iii. Schist and psammites 935 km^2
iv. Quartzite 34 km^2
v. Alluvium 244 km^2

The aquifer systems are separated by a major catchment divide whereby the western and southern portions form part of Lower Kafue River sub-catchments while the northeastern and eastern portions are located belong to the Chongwe river system.

5.7 Hydrology

Surface Water

The study area lies in the region of the Lusaka watershed separating major drainage basins, namely those of the Kafue River to the southwest, the Chongwe River to the east and the Ngwerere River to the north. As described, surface drainage features are absent on the site.
The site is with a regional slope to the north-East; a natural drainage depression becomes apparent about 500m-700m to the North West of the site which becomes more incised and pronounced as it progresses west.

Surface water sources are limited around the project with no streams or rivers in the vicinity of the site. However, the ground water sources are available especially during the rainy season when the water table rises.

The potential impact of the operations of the Cooking Oil Processing Plant with regard to surface water pollution was assessed though previous assessments conducted and the results indicated that the average effluent quality on Temperature, pH, COD, BOD, Total suspended Solids and chlorine levels were within ZEMAs allowable limits and certified satisfactory except for Settleable solids which recorded 3ml/L and were above the allowable limits by ZEMA (1.0 ml/L) thus certified un-satisfactory.

Groundwater

The quality of groundwater in Lusaka and surrounding areas varies depending on factors such as landuse, location of on-site sanitation facilities and underlying geologic formation. The groundwater vulnerability map of Lusaka shows that the project site lies in an area that is classified as moderate in terms of vulnerability to pollution. This implies that the area has less fractured aquifers and extensive soil cover (Baumle et al 2012).

An assessment of groundwater chemistry in Lusaka by Baumle (2009), shows that groundwater quality is largely unaltered by urban pollution sources. The project site lies in Lusaka watershed separating major drainage basins, namely those of the Kafue River to the southwest, the Chongwe River to the east and the Ngwerere River to the north. As described, surface drainage features are absent on the site. However, there are isolated areas which are highly vulnerable to pollution due to thin soil cover and highly fractured and karstic groundwater bodies (Baumle et al 2012). These areas are mainly located south-west of Lusaka's Central Business District.

Baseline testing for water quality of the project site where not conducted as the plant was closed for maintenance but recent reports of the results collected and is given in the **appendix M.**

Water and Sewage

The project area is serviced by the Sewerage line by LWSC. The Developer uses various water-saving devices to conserve water. The sole aim is to minimize and contain wastewater as no waste water is discharged into the environment.

5.8 Land Use / Land Tenure

The site is largely developed. A number of complementary businesses and developments have come up in the area which include:

- Food Reserve Agency (FRA), about 120m north;
- ZAMBEEF, about 50m north east of the proposed site.
- Mumbwa Road lies, about 20m south;
- Manal Investments, about 100m west of the proposed site;
- Engen Filling Station, about 155m south east;
- Kanyama Compound lies about 1.5km south west of the Plant;
- Master Meat, about 400m east of the Plant.
- A good road network surrounds the area

The nearest human settlement besides the Kanyama is Garden area to the west about 1.5km away.

The road network in the area is generally good with the Mumbwa road being the main trunk road servicing the area towards the central business area.

Current land use activities within the study area was mapped during the socio- economic survey to be undertaken as part of the EIA study.

5.9 Flora and Fauna

5.9.1 Flora Assessment

The plant site is a brown area and located in an area officially designated as an industrial development zone thus there is little to no evident flora. The vegetation at the site is characterized by grass cover and few scattered indigenous tress.

The site has small shrubs which include *Diospyprus Mespiliformis* (African Ebony – locally known as mucenja) while grass or weed life include *Urochloa mosambicense, hyperrhenia and Biden pilosa.*

5.9.2 Fauna assessment

No animals were observed on the plant site or around the area as the biodiversity has been cleared due to human interference rendering it into a sterile environment regarding fauna. With the described flora, the site provides a habitat and hosts foraging birds such as *Passer domesticus* (house sparrows). African bird claws and insects such as (*Formica Rufa*), termites(Isoptera) and grasshoppers (*Caelifera*) and lesser mammals such as *field Mice* (*Mus musculus*).

5.10 Archaeology and Cultural Heritage

There are no known archaeological or cultural heritage sites at the plant site and the surrounding environment.

5.11 Traffic volume

Currently private vehicles, buses and minibuses use Mumbwa road for public transport. As the Plant is already in operation, there is no possibility of increase in traffic volumes on the Mumbwa road.

5.12 Socio-economic conditions

5.12.1 Population of Lusaka District

According to the 2010 Census of Population and Housing Preliminary Report by the Central Statistical Office (CSO), Lusaka District had a population of 1,747,152 (CSO, 2012). Between the 2000-2010 intercensal periods, Lusaka District had the growth rate of 4.9%, the highest in the country, with population density of 4,853.2 people per square kilometre (CSO, 2012).

5.12.2 Development surrounding project site

The land in the study area is used for industrial development. The project site is in Heavy industrial areas of Lusaka District. The built environment are FRA, Zambeef, Polythene products, Master meat, Kembe meats, Engen Filling Station, Trade kings, City Market, Lusaka Water and Sewerage Company.
Within the site there are two areas, one for office blocks and the other for the soya/plastic plant areas. Other infrastructures at the site are: Warehouses, fuel depots, waste area, extraction, refinery and packaging plants, and two bore holes (water tanks) Zesco transformer (315kv),

concrete slabs, and concrete roads.
A community police post is situated on the corner of the Mumbwa Road. Amenities in the area vary, for example occupants either have their own borehole or access water from the municipal mains. The households that have access to electricity are on pre-paid supply

5.12.3 Economic Activities

With regard to economic activity, Lusaka can be described as having a cosmopolitan economic environment. Residents of Lusaka City engage in a wide array of economic activities, these include: quarrying (from small scale to large scale), trade (formal and informal), insurance, banking, transportation, manufacturing, packaging, recycling, agriculture, aquaculture to mention a few.
Most of the people surrounding the plant area are in manufacturing business i.e. Manal manufacturers, Trade Kings, Polythene products. Other economic activities include trading business (especially meat, maize, vegetables and tomato). The major source of income is employment offered by various companies as the site is located in the heavy industrial area.

5.12.4 Education

Due to the ever-growing nature of Lusaka urban, there are numerous private and government school all around the city. According the CSO (2012), Lusaka Province has the second highest school attendance rate (5 years and older) at 36.9%. The Province has the highest literacy rates for adult population (15 years and older) at 93.5% (CSO, 2012). Lusaka District is home to the country's largest learning institution, the University of Zambia. There are other higher learning institutions including Evelyn Hone College, National Institute for Public Administration (NIPA), Natural Resources Development College (NRDC) and a number of private colleges and universities

5.12.5 Health Facilities

Lusaka District is home to the country's largest referral hospital, the University Teaching Hospital. In 2013, there were over 190 private and public health facilities in Lusaka District (Ministry of Health, 2013). There is at least one health care facility every 5km in Lusaka. Most townships affected by the proposed project have a health facility, either a government or private health facility. Residents in all the project areas take an average 16 minutes to drive and 35 minutes to walk to the nearest health facilities.

5.12.6 Energy

The plant gets its source of energy from Zesco and has two gensets to supplement power needs of the plant.
Lusaka City generally has seen an increase in the number of developments coming up from 2009 to date. This increase in both population and economic activities has resulted in the growth of the energy sector. The demand for power and other energy products in the district has resulted in a number filling stations coming up and also the demand for charcoal has also increased. The plant has its own share in the aforementioned demand for energy.

5.12.7 Transport and communication

The plant site is well serviced by tarred road (Mumbwa), which leads to the facility. Mumbwa road connects the plant area to Lusaka District Town Centre, the other parts of the district and the rest of the country. The site can be accessed using public transport (mini-buses/taxis).

The environs of the study area are well covered and served by the local radio and television network and local print media. The local newspapers are sold in shops within the area. The surrounding area is also well covered by both land phone (telephone - ZAMTEL) and mobile cell networks (Airtel, MTN and Zamtel).

5.12.8 Water Supply and Sanitation

Lusaka Water and Sewerage Company (LWSC) Limited is the utility company in charge of providing water and sanitation services in Lusaka Province. The company operates under the legal framework as outlined by The Water Supply and Sanitation Act No. 28 of 1997. The company has been licensed by the National Water Supply and Sanitation Council (NWASCO) as the Regulator, to provide water supply and sanitation services in the City of Lusaka.
The plant uses water from a bore located at Manal Investments Ltd. plant effluent is discharged into the Lusaka Water and Sewerage Company sewer line.

5.12.9 Potential Resettlement and Compensation

The plant is already in full operation and the social assessment indicates that there will be no resettlement or compensation issues associated with the operation of the plant.

6

POTENTIAL ENVIRONMENTAL IMPACTS AND THEIR MITIGATION MEASURES

6. POTENTIAL ENVIRONMENTAL IMPACTS AND THEIR MITIGATION MEASURES

Environmental impacts are any changes in the physical, natural or cultural environment arising from undertaking a development project. These environmental impacts are investigated to identify and assess their significance, which is basis for informing decision-making by the regulatory authorities and other stakeholders.

A number of environmental issues were identified during the scoping process and the ESIA study. The purpose of this section is to predict and make an assessment of the impacts on the environment that may potentially arise as a result of the operations of the plant. Impacts that could occur are grouped and discussed below under the headings of the various environmental components or receptors that are likely to be affected by the implementation of the project.

An assessment of the general significance of these impacts based on significance and likelihood is made on the basis of information gathered during the scoping process, the environmental baseline study of the plant area which included several plant visits by respective experts, as well as a desk study of relevant existing documents and information pertaining to the study and information describing the nature and design of the proposed project. The possible environmental impacts related to the project are discussed in this section: -

The key environmental issues of concern have been referred to in this chapter and the mitigation measures are incorporated in the environmental management and monitoring section of this report.

6.1 Positive Impacts (Socio – economic impacts)

6.1.1 Employment Opportunities

The facility provides between 300-350 direct employment opportunities. The plant has skilled personnel and crafts people as well as un-skilled labour and offers many employment opportunities. Furthermore, indirect opportunities for employment are stimulated in the other sectors related to operations, such as manufacturers and suppliers of local raw materials and finished products and providers of services. Maintenance phases will also create indirect employment opportunities for locals especially for semi-skilled labour such as brick layers, steel fixers, carpenters, supervisors and sub-contractors.

6.1.2 Improved Aesthetics of the area

The plant contributes to the development of the industrial area by providing impressive scenery and contributes to a positive aesthetic outlook of the surrounding built environment.

6.1.3 Increased Public revenue

The facility pays revenue and taxes thus increase revenue and taxes for both the central and local authorities. This includes scrutiny fees for the local planning authorities (LCC) and other indirect taxes resulting from the construction project such as VAT on materials and services, PAYE as well as revenue to pension funds such as NAPSA.

6.1.4 Multiplier Effect

The developer enhances local participation throughout the various phases of its operation by focusing on local suppliers, employees and consumers and intends to maximize the multiplier

effect on the Zambian economy.

6.2 Negative Impacts (Preparation/Construction/Operation Phases)

This particular project is expected to have some negative environmental impacts and these are:

6.2.1 Direct impact on localized land and soil (Operation)

Destabilized soils could result in soil erosion due to storm water runoff during periods of heavy rainfall which could have an effect in the long run.

All earthworks for maintenance will be carried out during the dry season and the permanent storm water, road and site drainage system will be in place before the onset of the following rains.

Hydrocarbon/Oil Leaks and Spills

Oil/grease spills are noted to be prevalent during operations on the site; dealing with petroleum products. Such products contain detrimental elements to the environment since they contain traces of heavy metals such as; mercury, lead and sulphur among others. It is wise to control and observe the little that could occur especially during maintenance of the involved machinery.

6.2.1.1 Impacts on biological existing environment (fauna and flora)

The site is already a cleared site with an already existing operational plant. In comparison to surrounding areas, impacts on utilization of natural resources within the project area will be mitigated through good plant practices and replanting of exotic plants within the plant.

Impact on Biodiversity

Construction Phase

The site is already a cleared site with an already existing operational plant thus little to no global significance has been identified and no impact on biodiversity.

Mitigation measures

Good practices that protect biodiversity.

Impact on Fauna

Operations at the plant have little to no impact on fauna.

Mitigation measures

PGL commits to notify the National Park and Wildlife Department should any fauna be noticed on the plant.

Introduction of Alien species

All workers are sensitized not to carry or introduce alien species (plants or otherwise) into the plant area which contaminate water bodies, so as to avoid alien species invasion in the area. Inspections should also be done to ensure that no seeds or plant remnants of these invasive species are carried on equipment being transferred from other areas to the project site.

The developer will monitor the trees that are replanted on site ensuring that no alien species are planted on site

6.2.1.2 Impacts on risk of fire

There are some operations that may pose a risk to fire occurrences at the plant. These

occurrences may arise during the operation phase since there will be extensive use of electricity in the facility. High risk of fire is also expected due to the flammability of the products (petrol, diesel, Hexane) handled at the site. It should therefore be ensured that all operations during operational phases are in tandem with the Fire Risk Reduction Rules.

6.2.1.3 Impacts of the facility will have on the business within the vicinity of the proposed project site

Local businesses around the area will have easy access to the commodity (such as restaurants and other industrial companies) but provide competition to other industries producing the same commodity.

6.2.2 Impact on Noise (Operation)

Preparation and Construction Phases

Since the plant is already operational there is some noise from operating machinery; however, considering that the area is navigated by busy main roads, additional noise from construction traffic around the area could be enhanced.

Operation Phase

Potential sources of noise at operation stage will include:

- **Noise from increased traffic**

The increased volume of traffic to the area will result in an increased background noise level, especially during peak times. However, given that the site is located next to existing busily trafficked roads, it is not considered that the impact of noise from the additional traffic will be significant.

Faulty operation equipment will not be allowed to operate on the site to ensure quiet operation. Earmuffs shall be provided to personnel working in or near noise environments.

Public liaison through the management will be an integral part of PGL management in order to avoid potential conflict with surrounding developments and neighboring residential areas as regards the activities of the development. Prior notice will be given in good time of impending activities that may potentially cause disturbance to surrounding residential areas

6.2.3 Impact on Air quality (Operation)

- **Dust releases and nuisance**

Bare surface areas with loosened topsoil combined with the operation of machinery such as trucks, folk lifts will increase dust raised from the site. Dust will be raised during the off-loading of materials (soya seeds) delivered to the site; the preparation of the foundations will require the importation of raw materials.

Coal-fired Boilers at the Plant are a source of air pollution; particulate matter, Oxides of nitrogen, Sulphur and carbon are mostly emitted. Hexane if leaked could also pose adverse effects at the plant.

- **Exhaust nuisance**

The operation of machinery will result in an increase in the levels of air pollution within the site due to exhaust fumes although the impact of this will be localized and is considered moderate to small. Given that the site is already active, the surplus impact of exhaust fumes from

operational vehicles will generally be very small. Levels of such exhaust pollution will depend highly on the maintenance and condition of the equipment and vehicles at and coming to the site. The proponent shall ensure all vehicles are properly serviced to avoid unnecessary fumes during construction works.

6.2.4 Solid Waste generation (Operation)

Solid waste is expected to be generated at all stages. Waste that will be produced on the site includes building rubble, iron cuttings as well as worker's domestic garbage mainly biodegradables such as food stuff and non-biodegradables (such as plastics).

The following Solid Waste Management protocols will be followed:

- Proper housekeeping will ensure that all parts of the site are at all times clean and tidy. Bins will be provided throughout the development for the deposition of litter.
- Designated covered areas will be provided for the storage of normal solid waste arising within the project area.
- An approved waste removal company will be contracted by the developer to collect un-recyclable solid waste for disposal at an approved refuse dumping site in accordance with Section 63 of the EMA No. 12 of 2011.
- All hazardous wastes, material soiled with hazardous wastes and empty containers of hazardous materials shall not be disposed of on site. All such waste shall be stored on site in an approved manner, and be removed at regular intervals to offsite waste disposal facilities designed to handle such hazardous waste as required by law (Hazardous Waste Management Regulations SI No. 112 of 2013 Regulations 18 - 30).

6.2.5 Generation of sewage (Operation)

The main source of sewage is from offices and production units. The following measures are ensured;

- All sewage will be directed/connected to the LWSC system;
- Proper sanitary system will be put in place
- effluent from the plant will be discharged directly to the existing trunk main

6.2.6 Impact on ground water – abstraction related (Operation)

It is not considered likely that the water requirements of the plant will result in over abstraction of ground water that could result in reduced availability to other users or have detrimental effects to the aquifer.

Borehole abstraction will be monitored for the facility. Only required amounts shall be drawn and storage tanks are mounted to ensure conservation of water. The reticulation system will be automated to only draw water when reservoirs go below a preset minimum level.

6.2.7 Impact on Traffic and Road Safety (Operation)

The major roads around the plant are Mumbwa road as the site is located on Mumbwa road. Currently private vehicles, buses and minibuses uses Mumbwa road for public transport. As the Plant is already in operation, there is no possibility of increase in traffic volumes on the Mumbwa road.

6.2.8 Occupational Health and Safety (Operation)

- **Safety risks**

Operations at the plant involve potentially risk levels to the occupational health and safety of workers and personnel. The nuisance of dust and the movement of vehicles around the site may impact on the health of workers. Potential risks include working at heights with scaffolding platforms, welding, cutting, and on site handling of machinery.

Other risks may include explosions, fire, hazardous situations arising from process designs etc.

Strict adherence to safety measures and procedures will minimize (or eliminate) risks of accidents occurring and ensure healthy and safe conditions for all persons working on the site. Adherence to engineering regulations and standards would eliminate structural failure.

Safety arrangements shall include:

- All Fire Fighting equipment such as fire extinguishers and hydrants will be checked and serviced regularly to ensure that they are always in full working order.
- Personnel shall be trained in fire procedures and assembly points. Fire drills will be conducted based on the Emergency Response Plan.
- Personal Protective Clothing (PPE) shall be issued and used as required by the various classes of the workforce e.g. gloves and aprons for cleaning and housekeeping, gloves, aprons and/or overalls, respirator and face shield for spraying chemicals, etc.

- **Health risk**

The dust raised during various plant activities and exposed worksites can pose a nuisance to workers or adjacent communities. Impacts are potentially significant if unmitigated and can lead to either chest or eye irritations.

The developer shall comply with the Zambian Construction Health and Safety Standards. These include provisions of:

- Factories Act. Cap. 441,
- Workers Compensation Act

In addition, the developer shall ensure that all employees, subcontractors, suppliers and visitors are made aware of and comply with safety rules and measures that will apply on site, and is responsible for conducting the necessary trainings of personnel. The developer shall take reconnaissance of safety regulations in order to avoid unsafe/disruptive actions on site.

6.2.9 Impacts on Archaeological/Historical/Cultural sites (Preparation)

The plant site does not contain known historical, pre historical or archaeological or scientific interest.

Any such features that may be discovered that were not apparent on surface investigation will be reported by the Developer and applicable procedures will be followed.

6.3 The Evaluation of the Impacts Significance

The assessment of the issues has been conducted according to a synthesis of criteria required by the integrated environmental management procedure defined as follows:

6.3.1 Nature of the Impact

This is an appraisal of the type of effect the plant activities would have on the affected environmental component. Its description includes what is being affected and in what way. This includes both the positive and negative.

- **Direct Impact -** These are impacts that are typical, inevitable and predictable. They are caused directly during implementation of project activities.

- **Indirect Impact -** These are reasonably foreseeable and probable impacts that are caused by facility direct and indirect effects. The impacts may occur at some future time after direct effects and will be located within the boundaries of the systems affected by the plant.

6.3.2 Duration

The lifetime of the impact is measured in the context of the life-time of the proposed development.

- **Short term -** the impact will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase.
- **Medium term-** the impact will last for the period of the construction phase, thereafter it will be entirely negated.
- **Long term -**the impact will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter.
- **Permanent -**the only class of impact which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.

6.3.3 Intensity

A description of whether or not the intensity (magnitude) of the impact would be high, medium, low or negligible (no impact). An attempt will be made to quantify the impacts on components of the affected environment will be described as follows: Is the impact destructive, or benign? Does it destroy the impacted environment, alter its functioning, or slightly alter it? These are rated as follows:

- **Low -** where the impact will not have significant influence on the environment, and this will not be required to be significantly accommodated in the project design or implementation; the impact alters the affected environment in such a way that natural processes of functions are not affected in any significant way.
- **Moderate -** where it could have an adverse influence on the environment which would require modification of the project design or alternative implementation schedules; the affected environment is altered, however, function and process continue, albeit in a modified way.
- **High -** where it could have significant influence on the environment but cannot be mitigated or be accommodated by the project environment by introducing alternative mitigation measures such as realignment at a particular stretch or adoption of different design measures.

6.3.4 Probability

This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:

- **Unlikely** - the probability of the impact occurring is very low, due to the circumstances, design or experience.
- **Possible -** the impact could possibly happen, and mitigation planning should be undertaken.

- **Probable -** it is most likely that the impact will occur at some or other stage of the development. Plans must be drawn up before the undertaking of the activity.
- **Improbable -** it is not likely that the impact will occur at some or other stage of the development.
- **Certain/Definite -** the impact will take place regardless of any prevention plans, and only mitigatory actions or contingency plans can be relied on to contain the effect.

6.3.5 Severity

This describes whether the severity (harshness / gravity) of the impact would be high, medium, low or negligible (no impact). The severity of the impact will be qualitatively determined on the components of the environment to be affected by taking into consideration the following questions. Is the impact harsh, serious or dangerous? Does it degrade the impacted environment, alter its functioning, or slightly modify its natural state? These are rated as follows:-

- **Low** applies where the impact is very little and will not have significant influence on the environment. This will not be required to be significantly accommodated in the project design or implementation and the impact changes the affected environment in such a way that natural processes of functions are not affected in any significant way;
- **Moderate**, applies where the impact could have an adverse influence on the environment and would require some modification of the project design or alternative implementation schedules. In this regard, the affected environment is altered while the function and process continue, albeit in a modified way; and
- **High,** applies where the impact could have significant influence on the environment but cannot be mitigated or be accommodated by the project environment by introducing alternative mitigation measures such as realignment at a particular stretch or adoption of different design measures. In this regard, the function or process of the environment is disturbed to the extent where it temporarily or permanently ceases.

6.3.6 Sensitivity

The sensitivity of the element being impacted would be regarded as being high, medium, low or negligible (no impact). An effort will be made to determine the qualitative sensitivity of the element of the environmental components being impacted upon due to the proposed development. Is the reaction of the environmental component due to the impact acceptable or not? Does it destroy the impacted environmental component, alter its functioning, or slightly alter it?

- **Low**, where the sensitivity of the element being impacted will not have significant influence on the environmental component, and this will not be required to be significantly accommodated in the project design or implementation. The impact to the affected environment will be in such a way that natural processes of functions are not affected in any significant way;
- **Moderate,** where the sensitivity of the element being impacted could have an adverse influence on the environmental component, which would require modification of the project design or alternative implementation schedules. The affected environment is altered while the function and process continue and the albeit in a modified way; and
- **High,** where the sensitivity of the element being impacted could have significant influence on the environmental component but cannot be mitigated or be

accommodated by the project environment by introducing alternative mitigation measures such as realignment at a particular stretch or adoption of different design measures. The function or process of the environment is disturbed to the extent where it temporarily or permanently ceases.

6.3.7 Determination of Significance

Significance is an indication of the importance of the impact in terms of physical extent, intensity and time scale, and therefore indicates the level of mitigation required. Usually the community is involved in provision of information and determination on the characteristics of the impacts and the significance is determined based on this information.

The classes are rated as follows:-

- **Negligible**, the impact is not substantial and does not require any mitigatory action, Low, the impact is of little importance, but may require limited mitigation,
- **Moderate**, the impact is of importance and therefore considered to have mitigation. Mitigation is required to reduce the negative impacts to acceptable levels or positive impacts maximised,
- **High**, the impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential. Positive impacts should be enhanced as a priority.

From the baseline information assembled in the previous chapter coupled with the information gained during the consultation stage, the expected environmental impacts can be categorised into positive and negative impacts.

In addition, it is important to consider the duration of the impact and at what phase of the project it occurs, i.e. impacts during site preparation phase or impacts over the life of the project (operational phase) and whether the impacts are direct (i.e. removal of vegetation) or indirect (increased sexual diseases as a result of the improved wages).

The evaluation of impacts using these criteria is presented in Table 6 on the next page:

6.3.8 Significance Ranking Matrix

Table 6-1 Significance

CONSEQUENCE (Magnitude Geographic Extent Duration of impact)															
LIKELIHOOD (Frequency of activity Frequency of impact Sensitivity)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45
	4	8	12	16	20	24	28	32	36	40	44	48	52	56	60
	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75
	6	12	18	24	30	36	42	48	54	60	66	72	78	84	90

	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105
	8	16	24	32	40	48	56	64	72	80	88	96	104	112	120
	9	18	27	36	45	54	63	72	81	90	99	108	117	126	135
	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Table 6-2: *Positive/Negative Mitigation ratings*

Significance Rating	Value	Negative Impact Management Recommendation	Positive Impact Management Recommendation
Very High	126-150	Propose mitigation measures	Improve current management
High	101-125	Propose mitigation measures	Improve current management
Medium-High	76-100	Propose mitigation measures	Improve current management
Low-Medium	51-75	Maintain current management	Propose mitigation measures
Low	26-50	Maintain current management	Propose mitigation measures
Very low	1-25	Maintain current management	Propose mitigation measures

Table 6-3: Impacts on the Bio-Physical Environment (Operational Phase)

Impacts on Air Quality	
Deterioration in air quality due to increased traffic exhaust emissions, odour from solid waste and fugitive dust	
Magnitude of impact	4
Geographic extent	3
Duration of impact	2
Frequency of activity	4
Frequency of impact	4
Sensitivity of element	2
Result	**Medium-High (-88)**
Comment/ Mitigation	
• All discharges to air from kitchens will be screened through kitchen hoods, filters and extraction fans to ensure compliance with local building regulations. • Proper house cleaning and management of solid waste will ensure the risk of odour due to the accumulation of refuse is minimal. • All walkways and driveways will be paved, while other areas will be landscaped and planted with flowers or grass and hence no dust release is envisaged	

Deterioration in air quality due to increased traffic exhaust emissions, odour from solid waste and fugitive dust	
Magnitude of impact	1
Geographic extent	2
Duration of impact	1
Frequency of activity	1
Frequency of impact	2
Sensitivity of element	1
Result	**Very Low (-12)**

Impacts of Noise on the Environment	
Magnitude of impact	2
Geographic extent	2
Duration of impact	3
Frequency of activity	3
Frequency of impact	4
Sensitivity of element	2
Result	**Low -Medium (-75)**
Comment/ Mitigation	
The site is located along Mumbwa road from which noise levels equivalent to what may result from additional traffic to be attracted by the new conference facility are already experienced, and hence expected to have a corresponding effect	
Noise pollution from plant operation and traffic movement	
Magnitude of impact	2
Geographic extent	1
Duration of impact	1
Frequency of activity	1
Frequency of impact	3
Sensitivity of element	1
Result	**Low (-20)**

Table 6-4: Evaluation of Impacts

Phase	Description of Impact	Type of Impact	Spatial Extent	Frequency	Duration	Intensity	Severity	Probability	Sensitivity	Determination of Significance
Improved Aesthetics of the area										
Site Operational	Enhanced aesthetics of the project area by improving the landscaping and general cleanness of the site.	Indirect/ Direct	Site	More than twice	Long term	Moderate	Moderate	Probable	Moderate	High
Boosting supplying sector										
Site Operational	Positive boost to the local and national economy through its multiplier effect	Indirect/ Direct	Site	More than twice	Long term	Moderate	Moderate	Probable	Moderate	High
Employment and enhance services										
Site Operational	Employ people during all the phases of the project.	Indirect/ Direct	Site	More than twice	Long term	Moderate	Moderate	Probable	Moderate	High
Improved local Economy										
Site Operational	Impacts on the local economy due to alternative income generating activities, increased employment levels, influx of people to the area, land use changes, increased purchasing power.	Indirect/ Direct	Site	More than twice	Long term	Moderate	Moderate	Probable	Moderate	High

Impacts on Water Quality										
Site operation	Storm water and other run offs	Indirect	Local	More than twice	Long term	Moderate	Moderate	Probable	Moderate	Moderate
Impacts on Air Quality										
Site operation	Temporary air pollution due to dust generated by excavation, vehicle traffic and transportation of construction materials and fumes from vehicles	Direct	Local	More than twice	Short term	Moderate	Moderate	Possible	Moderate	Moderate
Operational	Localized Gaseous fumes due to operations.	Indirect	Site	More than twice	Long term	Moderate	Moderate	Possible	Moderate	Moderate

Impacts on Noise										
Operational	Noise from increased traffic.	Indirect	Site	More than twice	Long term	Low	Moderate	Possible	Moderate	Moderate
Impacts of Traffic and road safety										
Operational	Increased noise levels.	Indirect	Site	More than twice	Long term	Moderate	Low	Possible	Low	Low

Impacts of occupation health and safety										
Operational	Workers could be in danger of accidents from machinery such as excavators etc	Direct	Site	More than twice	Medium	High	Moderate	Possible	Moderate	Moderate

Table 6-5: ***Summary of Potential Impacts and their Mitigation Measures***

No.	Environmental Impact	Source of Impact	Potential Impact	Proposed Mitigation Measures
1.	**Impact on soil**	• During site Preparation and construction	• Altering the topography of the area. • Destabilized soils could result in soil erosion due to storm water runoff during periods of heavy rainfall which could have an effect in the long run.	• The plant is already operational and as such no clearing of land shall take place. However, in case of future expansions, all earthworks for site preparation and levelling and preparation of the platform will be carried out during the dry season and the permanent storm water, road and site drainage system will be in place before the onset of the following rains
2. .	**Air quality deterioration due Dust**	• During site Preparation and construction	• Dust from site preparation and construction works phase and from vehicle movements around the site; • Dust from removal of top soil and excavation of trenches for tanks; • Dust from the cement and aggregate during construction; • Worker exposure to dust	• Watering the site at regular intervals during the site preparation and construction phases of project implementation; • Respirators shall be used to protect employees;
3.	**Solid Waste generation**	• During all the stages of the project	• Degradation of soil and general environment	• Institute solid waste management by having designated bins and engaging a company for collection; • Having designated points for the disposal of waste; • Separation of biodegradable from non–biodegradable waste. Waste will be separated into the four categories hence reducing the environmental load by minimizing actual waste being Biodegradable; Plastics; Glass and bottles; and Cans and metal. • Minimizing solid waste through effective and efficient operations on site of the service station Operations during and after the construction phase of project implementation;

				• Waste will be kept to minimum levels by efficient and effective operations on site; • A system will be put in place to ensure that there is proper storage of the waste so that even in the event of potential delay in collection, the waste is properly contained; • Vehicles carrying waste should be covered as they transport the waste to designated dumping sites; • Mixing of stones and cement will be done at one point of the site to be identified by the qualified surveyors and constructors in order to avoid contaminating the whole area.
4.	**Generation of sewage.**	• From site offices	• Contaminating surface water and underground water	• All sewage will be directed/connected to the LWSC system; • Proper sanitary system will be put in place • Sewage from the development will be discharged directly to the existing trunk main
5.	**Safety and Risk of Workers**	• Accidents during Site preparation; Construction; and • Injury / loss of life from accidents	• Loss of life	• Ensure that all workers are briefed on potential hazards and necessary safety precautions; • Implementation of emergency procedure on site; • Use of clearly labelled signage during and after the project construction phase; • Proper control and directing of on and offloading traffic during construction phase;
6.	**Traffic and Parking**	During operation stage of the project	• Increased traffic loads.	• There is enough room for a good car park.
7.	**Noise Pollution as a result of vehicular**	• Construction and Operational stages	• Disturbing surrounding community	• Works will be done in an enclosed or barricaded area as per construction rules;

	movements to and fro during construction and operational activities;			• Ensuring proper regulation of working hours. • Regular servicing of vehicles
8.	**Health and safety of workers**	• Construction phase	• Chronic illnesses leading to Loss of life	• Implement a safety and health policies designed to identify, evaluate, monitor and control health hazards and provide safety training; • Put in place a health scheme for the employees; • Ensure that employees are regularly trained and drilled to fire fighting and safety techniques; • Provide adequate ablution facilities for all employees and change rooms facilities; and • Provide hygienically prepared meals for all employees.

7

APPROACH AND METHODOLOGY

7. DESCRIPTION OF METHODS USED IN DATA COLLECTION

7.1 Introduction

This section refers to various study tools that are adopted for each element of EIA study like literature review, understanding prevalent environment of the study area, data collection and data analysis approach, transect and socio-economic study, and Geographic Information Systems (GIS) mapping using drone-imagery.

7.2 Methodology

For the preparation of detailed EIA, ESEC LTD team collected the necessary information through field assessments, government authorities, and carried out public consultations.. The team developed communication links with appropriate personnel of the Parrogate Ginneries Limited (PGL) and other relevant key entities with the objective of progress of proposed assignment in a timely manner.

The scope of the study is to describe the project and evaluate all the possible positive and negative environmental impacts in order to propose the mitigation measures necessary to reduce the effect of the identified negative impacts. Data has been collected from different sources which is then analyzed and synthesized to understand prevalent environment, identify impacts and thereby propose adequate management plans.

7.3 Data Collection

Literature review that was partially carried out during Scoping Report preparation has been continued for the EIA study. The prime objective is to:

- Review of existing studies, environmental legislation, environmental and social surveys, and technical documents relevant to sewerage connection;
- Collect any data required to meet requisites of the approving authorities, e.g. ZEMA and World Bank.
- The team collected required information from different government departments, academic institutions (universities), public agencies, research institution, authorised websites, etc. The collected information (policy documents, published books, journals, and census data) has been reviewed by the team for better understanding of project area, environment, sensitiveness, and socio-economic structures.

The baseline data was collected in order to describe the existing environment. Data collection included an inventory of biophysical environment, conducting interviews with stakeholders and reviewing of relevant literature. Information on names of geographical features were checked from maps and confirmed by interviewing key local informants who were conversant with the area and specific details.

The inventory of the existing physical and biological environment on the facility focused on quality, quantity, density, and distribution. The mapping of the existing surrounding industries was undertaken to map out the surroundings of the plant area in order to determine the location of the proposed development in relation to any existing critical installations and developments that would be affected by the project. In doing so, the existing environment was categorized into physical, social and biological environments. Specialized studies were conducted to assess possible impacts on air, soil and water. Existing Baseline Data: Review of relevant published data, including previous EIAs and Environmental monitoring data. Sources of baseline data and all key documents, which have been used for this EIA, are listed

in the appendices.

Biophysical Environment: Vegetation has been cleared due to human interference as the area is a designated industrial area thus rendering the area into a sterile environment. As for species identification the following were considered: Leaf composition, leaf type, leaf variation and plasticity, branch shape and stems. The Species diversity, Abundance, Population and Evenness of the trees within the area was not conducted as the plant is within an already existing industrial area which is already cleared of plants and no trees will be cut.

Fauna and avifauna at the plant site area were sighted by taking field walks around the site and surrounding areas. Little or no birds were identified on sight and reference was made through desk study literature.

Baseline Surveys: Where baseline data was considered to be potentially insufficient (such as, out of date, lack of seasonality considerations, too narrow scope) for the current EIA process, new baseline surveys were conducted and additional primary data collected. Project baseline surveys included socio-economics.

7.4 Mapping

GIS maps are prepared to illustrate the climatic conditions; land use & land cover patterns, historical sites, geological formations, routes for laying pipelines, and other related parameters. The mapping is based on geographical coordinates collected during field surveys, consultations and while some are based on data available from satellite images and authorised websites.

7.5 Scoping Phase

ESEC LTD team visited the project site several times and interacted with various stakeholders such as PGL Staff, ZEMA and other regulatory authorities for conducting the preliminary investigations to define the scope and formulating Terms of Reference (ToR) for the detailed EIA study. The stakeholders had been identified through a detailed stakeholder identification and mind-mapping process in discussion with PGL and ZEMA during the inception phase and document review. The findings of the preliminary assessment had been recorded and documented as the Scoping Report along with the ToR, which was submitted to ZEMA by the Consultant for approval in June 2020.

7.6 Preparation of EIS

PGL through the ToR has described a list of significant tasks that needs to be undertaken by the Consultant to prepare a comprehensive and detailed EIA. The tasks are as follows:

i. Legislative and Regulatory Framework

ESEC LTD studied the relevant legislation and policies at National, Regional, and Local levels from secondary data sources. The World Bank operational policies are also studied and analysed to streamline the policies that are triggered by the operations of PGL.

ii. Environmental and Socio-Economic Baseline Study

ESEC LTD team collected and assessed information on key environmental, ecological and social parameters present within the project areas. The approach for the environmental and socio-economic baseline study is as follows:

a) Environmental Baseline Study

- **Desktop Review**

The study source for desktop review included environmental project brief, geographical, ecological and socio- economic profiles for Lusaka, data obtained from the PGL, and other available maps, related reports and documents. The data collection and review had been conducted to:

- Collect documented data on all aspect of the project.
- Assess ongoing or planned initiatives related to Housing.
- Detailed review of any existing studies, environmental legislation, environmental and social quantitative and/or qualitative surveys and studies.
- Study the ZEMA environmental laws and regulations.
- Collect any additional data that is required to meet the requirements of the approving authorities.

- Data Collection and Site Surveys

Data collection and site surveys had been initiated prior to the development of Scoping Report and continued throughout the period of EIA study. It involved interacting with various stakeholder institutions and engaging with them through consultations at institution/residential/company level of Lusaka. The prime objective of the activity is to carry out reconnaissance survey for site inspection and understanding project area for overall environmental and social assessment.

b) Socio-Economic Baseline Study

- Primary and Secondary Data

This assessment is based on primary exercises like field investigations, consultations/meetings with relevant stakeholders and secondary socio-economic data obtained from books, reports, journals and other sources such as the Lusaka City State of the Environment Outlook Report, Central Statistics Office (CSO) Census Reports, NGOs, CBOs, LWSC, Universities and other sources.

- Stakeholder Consultations and Focused Group Discussions

ESEC LTD ensured that each relevant stakeholder is involved during the study to provide a foundation for attaining and sustaining support of stakeholders, particularly the directly affected persons and local communities. Early engagement of stakeholders in any activity is critical, as community perceptions, expectations and relationships established can reduce risks and threats to the project.

The stakeholder engagement process included identification of stakeholders, in consultation with PGL and ZEMA and analysis of their objectives and interest, engagement strategies and monitoring & reporting. The project stakeholders were engaged through consultation-based methodologies, comprising of qualitative and quantitative tools to acquire the project and project areas related information and suggestions/concerns from the stakeholders by using the questionnaires designed for this project. The website was prepared in such a way that it covered each component of the project requirement such as air, water, ecological, socio-economic, land acquisitions etc. Stakeholder meetings were conducted using the open designed website.

iii. Identification of Impacts and Mitigation Measures

Based on the findings of the field investigations and consultations, ESEC LTD team identified the potential impacts of all the project specific activities related to operation and decommissioning phase and the cumulative impact assessment (CIA) in detail using qualitative or quantitative methods. Interaction matrix has been used to identify the interaction between project activities and the environmental and social sensitivities. This records the rationale for the impacts and their potential significance, mitigation measures, linked to relevant legislation and the provisions of the EMP.

Impacts are identified from environmental and socio-economic baseline as affecting the

receptors air, water, land, biodiversity, resources and community. These were further categorized into pre-construction, construction, operational and decommissioning impacts. Impact assessments were also based on criteria developed by ZEMA requirements.

iv. Analysis of Alternatives

ESEC LTD team on the basis and in coordination with PGL and PGL assessed all the alternatives options of the proposed project and provided the recommendations/suggestions for modification in the project works to eradicate and minimize the negative impacts. A comparative analysis of the alternative options in terms of technical, financial, environmental and social has been prepared with justification for the selection in the context of the local conditions. The 'Alternatives' has been analysed for the following components:

- Project Location
- Project Design
- Technology to be used
- No project scenario

v. Environmental and Social Management and Monitoring Plans

ESEC LTD developed the EMP consisting of the plans for the proper and improved implementation of mitigation measures to reduce the adverse impacts arising out of the project activities. The proposed EMP comprise mitigation and monitoring plan for Operation and Decommissioning Phases in accordance with the ToR.

ESEC LTD team also prepared the Monitoring and Evaluation (M&E) plan for the implementation arrangements and subsequently performance as well as outcome monitoring of the actions suggested in the EMP

8

ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN

8 ENVIRONMENTAL MANAGEMENT PLAN

The Environmental Management and Monitoring Plan (EMMP) provides framework for management and mitigation of the environmental and social impacts associated with the cooking oil processing plant. The EMMP is a direct consequence of the EIA for the proposed project. It also depicts how the organizational capacity and resources will be organized to implement the mitigation measures proposed in the EIA.

PGL will implement mitigation measures contained in the EMMP to ensure environmental protection. In this regard, the EMMP that is based on the Environmental Management Act No, 12 (2011), (EIA) Regulations of 1997 together with ZS specifications underscores responsibilities of the PGL in safeguarding the environment in and around the plant.

8.1 The Main Aim of the Environmental Management Plan

The aim of this Environmental Management plan for the facility is to avoid, minimize, or ameliorate effects or impacts resulting from plant activities and where possible, enhance beneficial effects. To this effect, PGL is going to initiate several Environmental Action Plans in order to address the issues arising from this development.

Meanwhile the significant positive impacts from PGL activities will be follows:

- Increased formal and informal Employment Opportunities for the locals especially the youths
- Increased market for farmers supplying raw materials and the general consumer community who will purchase cooking oil and by-products products.
- Increased Government Revenue from Taxes
- Economic Multiplier Driver
- Increased Citizens' Participation in Economic Activities

The identified significant negative impacts from the implementation of the PGL plant are:

- Generation of noise by plant equipment
- Possible ground water contamination resulting from chemical, oils and hexane usage.
- Air pollution due to Emission from processing activities e.g. use of boilers and hexane and dust during operation activities especially at the oil seed feeding point

Due to the foregoing Environmental Management Plans to enhance the positive impacts, and mitigate the negative impacts have been developed and cover the following aspects

1. Assigning responsibilities for the anticipated negative impacts for mitigation and costing
2. Identifying and assigning possible areas for amplifying the positive impacts
3. Continuing with local and institutional public consultations for mitigations that ensure Sustainable development

The developed EMMPs in section 8.2 are derived from the summarized mitigation for negative impacts in section 6.0, which outlines the mains sources of the risks discussed.

The impact mitigation plan allocates the responsibilities for implementation of the proposed mitigation measures to the various stakeholders and indicates at what stage in the project they should be performed. The Plan is presented in this chapter and it addresses the negative impacts generated by the project activities throughout the cycle and presents the associated cost estimates of mitigating the adverse impacts. The key components of the proposed impact mitigation plan are:

- Surface Water Management
- Erosion Control and Sediment Retention
- Water Quantity and Quality
- Vegetation and Flora
- Wildlife and Fauna Habitats
- Processing chemicals Management
- Hazardous Waste Management
- Noise

- Occupational Health and safety
- Land and Soil
- Air Quality
- Noise
- Landscape and Aesthetics
- Land-use and Surrounding Environment
- Socio-economic issues
- HIV/AIDS Awareness
- Work Accidents

8.2 Surface Water Management

Surface water is an important component of both ecological and human use of the land. The aim of the surface water management Program is to ensure that where practical, flows into and through the project site and the nearby streams are maintained and that water quality to these systems is maintained.

8.3 Erosion Control and Sediment Retention

The nature of the soils at the project area indicates that they are prone to erosion in a disturbed state. According, and where appropriate, all surface runoff from areas of disturbance and areas with elevated runoff coefficient will be directed by correctly designed drainage system, to sediment traps with sufficient volume and retention time to maximize settlement of suspended sediment prior to release. The drains will be designed according to the characteristics of peak flows for the predetermined design storm, and the requirement to discharge flows without causing erosion.

8.4 Effluent Discharge

There shall effluent produced from the plant process. The effluent discharge into the LWSC sewer line existing at the site. All monitoring of the effluent is done the LWSC. The other effluent will be sewer materials and other domestic/official uses which will be collected in a septic tank/Soak-away.

The groundwater system will be protected by constructing soak-away system that will not contaminate the ground water system. Thus a septic tank with a water tight lining connected to a soak-away will be constructed to allow for collection of slug that will eventually be emptied once full with the liquid matter that will float out into a soak-away system which will be sighted 60 metres away from water bodies water abstraction point in line with the requirements of the Public Health Act. It is anticipated that generally after 60 metres water would have purified in the underground formation of a combination of the geological and soil material which works as filter.

8.5 Optimum Usage Processing Chemicals

Excessive usage and spillage of processing chemicals can not only result in higher operating cost but also elevated level in surface and underground water systems.

8.6 Biomass Burning

There will be no biomass burning generated during weeding and landscape maintenance will be composited.

8.7 Noise

Noise generated from operations at the project site is not expected to impact on local communities due to the distances between the operations area and areas of habitation. However, the development's technical team will investigate any noise complaints received.

8.8 Soil Erosion

The proposed project area has a bi-directional steep slope towards the North-western and North-eastern fringes and there is no isolated steep areas development. Gullies can easily form due to water erosion. This is an ecological disadvantage for there will be gully erosion. The hazard assessment results should be used to plan the plant and associated structures properly and put up a well paved drainage system.

8.9 Sediment Ponds

Drainage system for effective conveyance of surface runoff away from disturbed areas will minimize the extent of erosion. For plant, roadside drains may play this function and will further retain direct discharge of eroded soil particles..

8.10 Sewerage effluent Sanitation Facilities

Improper sanitation facilities may lead to disease outbreak (airborne, waterborne or vector borne). Adequate sanitation facilities include:

- Toilet facilities adequate for the plant and additional workforce with septic tanks that will be maintained regularly to ensure their effectiveness.

8.11 Occupational Safety and Health

The existing safety and environmental control unit should be 'beefed up' in order to minimize work place accidents. The following can be improved upon:

- Workers shall be given proper and adequate training in machinery handling and safe working procedures.
- Personnel protective apparels such as safety boots, gloves, and respirators (especially for possible pesticide application) shall be provided in terms of suitability and adequacy.

Traffic signage at strategic locations within the access roads shall be provided, particularly farm blocks undergoing harvesting. Where haulage traffic volume is higher than any other block.

8.12 Management of Hazardous Materials

The following measures will be implemented to minimize potential environmental pollution arising from these materials:

i. **Processing chemicals** – proper storage and handling used containers will be returned to suppliers or collected for proper disposal – the developer will ensure they are never reused for domestic purposes;

ii. **Used lubricants** – will be collected for disposed of as wastes in accordance with ZEMA Regulations;

iii. **Fuel dispensing** will be carried out at existing dispensing points within the estate and by trained and experienced personnel to prevent spillage;

iv. **Containers for fuel** and fuel enhancers will be collected and properly disposed of in accordance with ZEMA Regulations.

8.13 Community Consultation and Interaction

MML shall adhere to its corporate policy of working with the local authorities and the surrounding communities to ensure that the expansion project becomes very much a part of the local community by adhering to lease agreements and other deliberations. The corporate affairs office shall constantly liaise with the community to thwart land tensions wherever necessary.

8.1 Workforce Awareness

Work force awareness and culture is an important component in minimizing environmental and cultural impacts resulting from project operations. Plant personnel will be made aware of the MML Environmental Policy. An environmental awareness induction plan will be implemented to ensure that all plant workers are aware of their environmental responsibilities.

8.1 HIV/AIDS Awareness Program

PGL HIV/AIDS Workplace Policy should be implemented throughout the organization structure. The Medical Department which is given the mandate to implement the policy should ensure that all employees and other casual workers are sensitized about the dangers of HIV/AIDS.

Table 8-0-1: PGL ENVIRONMENTAL MANAGEMENT PLAN

ASPECT	IMPACT	OBJECTIVE	*MITIGATION/ENHANCEMENT MEASURE*	FREQUENCY OF MONITORING	TIME FRAME	PERFOMANCE INDICATOR	RESPONSIBLE PERSON	COST (U$)
Site training	Positive **Enhance people's skills**	To sensitize all employees working at the plant site	*Site training session on Environmental management/safety*	Planning for periodical assessment.	During all stages of operation	Programme for education both employees and customers	PGL Safety Manager	1500/Yr
Erosion at site	Negative soil degradation	Avoid soil degradation	Rehabilitate exposed areas to minimize erosion. Ensure proper usage of loose soils.	Planning for Periodical assessment	During all stages of operation	Absence of gullies and erosional signs	PGL Safety Manager	330/month
Air Quality	Negative **air pollution**	To eliminate and reduce discomfort to workers and surrounding communities To control the movement of the heavy duty equipment	*Watering the ground to suppress any minute dust rising.* *Maintain dust levels ≤ 10mg/m^3;* *Provide protective dust masks* *to workers.* *Control gaseous emissions from* *the plant unit operations; Nox,* *Sox,etc*	Regular inspections throughout the operation Phase.	During all stages of operation	Exhaust fume emissions, unpleasant odour, dust are controlled.	PGL Safety Manager	200/month
Solid waste management	Negative land pollution	To avoid unwarranted disposal of solid waste.	• *Disposal of waste will be limited to approved solid waste disposal sites* • *Waste management protocols* • *Waste management protocols including designated storage areas for solid waste with*	Regular inspections throughout the operation Phase	During all stages of operation	Absence of solid waste.	PGL Safety Manager	500/month

			segregation for recyclable materials					
Noise Pollution due to operation activities	Negative Noise Pollution	To minimize noise disturbance to resulting from the operations of the Plant	*Noise levels will be monitored, if results are above the recommended 80db appropriate mitigation measures like provision of ear protective gears and appropriate clothing to the workers operating at the site; Use of well-maintained machinery.*	Regular inspections throughout the operation Phase	During all stages of operation	Noise levels at the nearest sensitive receiver are minimized.	PGL Safety Manager	200/month
Safety/Health risk of workers	Negative	To prevent accidents, injury or health risks to workers/public	*Periodic training and continual safety reminders to all operating staff and require periodic drills in safety and emergency procedures;* *Ensure that all workers are briefed on potential hazards and necessary safety precautions;* *Implementation of emergency procedure on site;* *Use of clearly labeled signage during and after the project operational phase;* *Proper labeling of machinery and equipment with the necessary pictorial and written instructions;* *Ensuring that the employees wear protective clothing at all times during all the phases of plant activities*	Periodical inspections throughout the operation Phase.	Throughout the plant cycle	Operational Manual on Safety, Health and Environment for construction workers is developed and available on site.	PGL Safety Manager	6000/yr

Oil and fuel leaks	Negative	To prevent contamination of soils and underground aquifers	*Oil shall be cleaned immediately any spill is noticed* *Vehicles shall be serviced in designated garage with concretized surface;* *All oils shall be properly kept in secure concretized room at the motor vehicle workshop to avoid direct spillages to underground water.*	Planning for Periodical assessment	Throughout the plant cycle	Absence of oil leaks	PGL Safety Manager	500/month
Public Health and safety	Negative	To prevent public injury or health risks to workers/public	*Sufficient warning sign posters shall be installed in all areas under maintenance and out of use. The speed limit signs and /or humps for vehicles coming into the plant to be provided. Speed humps to help reduce the speed of trucks on the access roads will be built.*	Planning for Periodical assessment	Throughout the plant cycle	Evidence of a health workforce and records.	PGL Safety Manager	500/month
Occupational Safety and Health Risk of Workers	Negative	To prevent accidents, injury or health risks to workers/public	• *Implementation safety and health policies designed to identify, evaluate, monitor and control health hazards and provide safety training;* • *There shall be a health scheme for the employees;* • *Employees shall be regularly trained and drilled to firefighting and safety techniques;* • *The firm shall ensure that all visitors are briefed on potential hazards and necessary safety precautions;* • *Implementation of emergency procedure on site;* • *Use of clearly labelled signage;* • *Proper labelling of machinery and equipment with the necessary pictorial and written instructions;* • *Ensuring that employees wear*	Planning for Periodical assessment	Throughout the plant cycle	Operational Manual on Safety, Health and Environment for construction workers is developed and available on site.	PGL Safety Manager	1000/month

			protective clothing at all times; • *Proper control and directing of traffic during peak period for deliveries.*					
Flora & Fauna due Site clearance.	Negative Loss of Flora & Fauna diversity	To minimize disturbance	• *good plant practices and replanting of exotic plants within the plant* • *Leave undisturbed areas to allow for natural vegetation to flourish for maintenance of fauna biodiversity* • *Implement a Landscaping plan for establishment of green fields*	Planning for Periodical assessment	Throughout the plant cycle	Presence of undisturbed areas within and around worksite Presence of green fields	PGL Safety Manager	1000/month
Water quality	Surface and ground Water Quality	To prevent surface and groundwater pollution	• *Proper design of drainage system for storm water control* • *Monitoring and maintenance of sewerage system* • *Monitoring effluent for quality and quantity, especially suspended solids, settled solids, BOD, COD etc*	Planning for Periodical assessment	throughout the plant life	Effluent within allowable limits Compliant quarterly Audit and Monitoring returns Well serviced monitoring equipment	PGL Safety Manager	4000/month
TOTAL								**15,730.00**

Table 8-0-2: PGL EMMP

Impact	Mitigation Measure	Objective	Actions to be taken for its implementation	Period of Implementation	Indicators	Authority Responsible	Cost of Mitigation
Impact on Land and Soil							
Soil contamination due to improper storage of chemicals, fuels and poor waste oil disposal methods.	Chemicals and Petroleum products dispensing shall be done by qualified personnel;	To regulate any chemical usage.	Regularly weekly reports on soil composition at selected sites.	From inception to operation phase	Any visible soil contamination	☐ Developer ☐ Site Engineer	Training
Exposed soil is prone to erosion by water or wind.	Limitation of earth moving to dry periods;	To avoid erosion of soil by fast flowing rainwater.	Period of construction shall be specified.	Operation Phase	Visible signs of soil erosion	☐ PGL	1,000USD
	Protection of susceptible soil surface with cover crops and grass;	To control the current of the fast flowing rainwater.	Mitigation measures provided for impacts on soil shall be part of the overall Implementation Cost.	Operation Phase	Visible signs of soil erosion	☐ PGL	1,500USD
	Protection of drainage channels by planting grass or stone pitching;	To avoid direct contact of fast flowing surface water with susceptible soils.	Stone pitching and grass planting in drainage systems shall be part of the overall Implementation Cost as means of mitigating soil	Operation Phase	Visible signs of soil erosion	☐ PGL	1,000 USD for stone pitching

			erosion.				
Exposed soil is prone to erosion by water or wind.	Installation of Sedimentation basins or planting of erodible surfaces as soon as possible.	To trap soil particles from the current of the fast flowing water.	Mitigation measures for impacts on soils shall be part of the overall Contractor conditions.	Operation Phase	Visible signs of erosion	PGL	4,000 USD
Soil compaction could result following Plant activities.	Permanent access routes to be used.	To limit the size of area prone to compaction.	Mitigation measures for impacts on soils compaction shall be part of the overall Implementation Cost.	Operation Phase	Soil Compaction	PGL	Covered in the construction
Soil erosion near drainage channels where water velocity could increase.	Soil erosion should be prevented especially near drainage channels	To control soil erosion and check for drainage channels requiring attention.	Program for regular Plant drainage maintenance shall be developed and made available.	Operation Phase	Presence of Gullies	Local authorities	5,000 USD
	Regular maintenance of drainage channels	To prevent deterioration water bodies,	Mitigation measures for impacts on soil	Operation Phase	Presence of Gullies	PGL	

	for COD, BOD, etc.	which are prone to soil erosion.	erosion shall be part of the overall Implementation Cost.			Local authorities	
Impacts on Vegetation							
Retardation of vegetation growth due to contamination from dust particles and gas emissions.	Dust control by application of water; Gravel road will be maintained.	To suppress dust generation	Mitigation Measures for impacts on vegetation shall be part of the overall Implementation Cost.	Operation Phase	Vegetation Quality	PGL	1,000 USD
	Spraying water using water bowers	To reduce the amount of dust generation.	Mitigation measures for impacts on vegetation shall be part of the overall Implementation Cost.	Operation Phase	Vegetation Quality	PGL	
Loss of vegetation due to site clearing which will lead to loss of habitat and displacement of	Planting of trees in the plant;	To avoid mechanical clearing and reduce the extent of the area without	Mitigation measures for impacts on vegetation shall be part of the overall Implementation	Operation Phase	Vegetated Area	PGL	400 USD

fauna species, especially avifauna.		vegetation.	Cost				
Impact on water quality							
Siltation of water courses due to soil erosion of nearby drains and heavy rains.	☐ Buffer zones of undisturbed areas ☐ Sediment traps in drainages gullies	To filter of the sediment particles in the fast flowing rain water with undisturbed trees and grass.	Mitigation measures provided for impacts on Water Quality shall be part of the overall Implementation Cost	Operation Phase	☐ Turbidity ☐ Sediment load	☐ PGL	Covered under mitigation for Soil Erosion
Siltation of water courses due to soil erosion of nearby drains and culverts.	Drainage systems shall have scour checks;	To reduce the current of rainwater flow.	Mitigation measures provided for impacts on Water Quality shall be part of the overall Implementation Cost	Operation Phase	☐ Turbidity ☐ Sediment load	☐ PGL	6,000 USD
	Drainage systems shall discharge into settlement basins; later re-used in the Plant	To create a water reservoir which can be used by Plant and milling	Mitigation measures provided for impacts on Water Quality shall be part of the overall Implementation	Operation Phase	☐ Turbidity ☐ Sediment load	☐ PGL	Covered above in the drainage system cost

			Cost				
	Silt traps shall be put along drainage systems;	To protect surface water pollution through filtering finest particles in water current.	Mitigation measures provided for impacts on Water Quality shall be part of the overall Implementation Cost	Operation Phase	Turbidity Sediment load	PGL	
	Spoon drains shall have scour checks. Monthly sampling and preparation of report for local authority (LWSC)	To control excessive flow and risks of erosion.	Mitigation measures provided for impacts on Water Quality shall be part of the overall Implementation Cost	Operation Phase	Turbidity Sediment load	PGL	
Water shortage for the local community due to over exploitation for plant operation. This where the use boreholes	Exploitation of water sources for approval by the local authority and with consent from the local community.	To avoid conflicts and to receive support from the local community.	Mitigation measures provided for impacts on Water Quality shall be part of the overall Implementation Cost	Operation Phase	Extent of Water Scarcity in the community	PGL	2,000 USD

will be handy							
Ground water contamination due to construction of substandard campsite pit latrines for workers.	Provision of proper functioning toilet facilities.	To filter pollutants from getting to the ground water.	Mitigation measures provided for impacts on Water Quality shall be part of the overall Implementation Cost	Operation Phase	Fecal count Ecoli Presence of Odor	PGL	700 USD
	Good hygienic standards and proper maintenance of pit latrines.	To promote cleanliness and avoid epidemics in construction camps.	Mitigation measures provided for impacts on Water Quality shall be part of the overall Tender Document	Operation Phase	Fecal count Ecoli Presence of Odor	PGL	700 USD
Sedimentation	Steep area shall be avoided;	To make use of available soils and reduce on creating more bare areas which are prone to soil erosion.	Mitigation measures provided for impacts on Water Quality shall be part of the overall Tender Document	Operation Phase	Signs of Erosion Turbidity Sediment load	PGL	700 USD

and increased turbidity in nearby surface water caused by erosion of bare areas and runoffs resulting from site grading works and drainage.	Sides of drainage channels shall be planted with grass or stone pitched;	To filter of the sediment particles in the fast flowing rain water with grass and also to avoid erosion of soil surfaces by stone pitching.	Mitigation measures provided for impacts on Water Quality shall be part of the overall Tender Document	Operation Phase	☐ Signs of Erosion ☐ Turbidity Sediment load	☐ PGL	
	Drainage systems shall have scour checks esp. from milling plant.	To reduce the current of rainwater flow.	Mitigation measures provided for impacts on Water Quality shall be part of the overall Tender Document	☐ Operational Phase	☐ Signs of erosion ☐ Turbidity ☐ Sediment load	☐ PGL	As above
Impacts on Air Quality							
Air pollution caused by Gaseous emissions, exhaust fumes and dust from trucks, graders will affect	☐ Regular sampling of boiler stack gas from chimneys ☐ Erecting tall	☐ To ensure gaseous emissions are devoid of pollutant gasses above speck.	☐ Site engineer shall keep up to date records on gaseous emissions as a result of the development.	☐ Operational	PM_{10}, NO_2, CO_2, SO_2, CO, VOCs	☐ PGL	30,000USD / month for medium to old

human, vegetation and also disturb habitats for birds and insects.	chimney □ maintenance of operation vehicles and equipment in order to reduce emission of exhaust fumes; and installation of water Scrubbers	□ To check for defects and servicing of the vehicles and equipment so that they are in good operation condition.	□ Log book on vehicle & equipment maintenance shall be kept on the plant for inspection and shall be part of the overall Tender Document				
	Periodically water down on Plant in-route roads;	To suppress dust.	Log book on dust control showing watering times shall be kept on site for inspection and shall be part of the overall Tender Document	Operation Phase	PM_{10}, NO_2, CO_2, SO_2, CO, VOCs	□ PGL	N/A
Unpleasant odours due to poorly maintained toilets and poor waste management.	Cleaning and regular maintenance of toilets to avoid unpleasant odours.	To maintain and promote a healthy environment at campsites and prevent the spread of diseases.	Public Health standards as provided under the Public Health Act Cap 295 shall be enforced shall be part of the overall Implementation	Operation Phase	Odour	□ Contractor □ MML □ Local Authority	On-going (Administrative)

			Cost				
Impacts of Noise							
Noise and vibration caused by Plant trucks, construction machinery and other operations.	Working hours limited to day light only;	To avoid sleep disturbance at night.	Enforcement of EPPCA, Cap 204 on Noise Abatement.	Operation Phase	Excessive noise levels, complaints from residents	☐ Contractor ☐ Developer ☐ ZEMA ☐ Local Authority	Cost is not applicable as the Programme is based on 9day working hours.
Noise and vibration caused by Plant trucks, construction machinery, and other operations.	Enforcement of the Factories Act, Cap 441.	To promote occupational health and safe working conditions among the construction workers.	Enforcement of the Factories Act, Cap 441.	Operation Phase	Excessive noise levels, complaints from residents	☐ Contractor ☐ Developer ☐ Ministry of Labour	3,000 USD
	Apply all ZEMA Regulation on Noise Abatement;	To monitor and control noise generation.	Enforcement of EPPC Act, Cap 204 on Noise	Operational Phase	Excessive noise levels, complaints from residents	☐ ZEMA ☐ Local	

Noise from increased traffic.			Abatement.			Authority ☐ Local Police ☐ Traffic Unit	
	Control of noise generating activities (by local by-laws).	To monitor and control noise generation.	Enforcement of EPPC Act, Cap 204 on Noise Abatement.	Operational Phase	Excessive noise levels, complaints from residents	☐ ZEMA ☐ Local Authority ☐ Local Police ☐ Traffic Unit	
Impacts on Landscape and Aesthetics							
Visual impact of the Plant works could be substantial if designs are not compatible with the surrounding environment	Development of plant and other facilities must be environmentally safe enough and compatible with the surrounding environment.	To maintain areas of scenic beauty.	Plant design shall be Environmentally safe enough and compatible with the surrounding environment.	☐ Design Phase ☐ Construction Phase	Visual analysis	☐ Design Engineers ☐ Developer	Covered in landscaping cost

Disfigurement of the natural landscape and aesthetic view due to piles of biomass, fresh fruit bunches etc.	The solid waste and other products of the Plant shall be either re-used or burnt safely using a certified incinerator.	To maintain areas of scenic beauty	Plant designs shall be environmentally and compatible with the natural landscape of the surrounding environment.	☐ Design Phase ☐ Construction Phase	Visual View	☐ Design Engineers ☐ Developer	Covered under landscaping
Impacts on Land-use and surrounding environment							
If unskilled people are not recruited from local areas then it is likely that people who reside far away from the project area may get employed and decides to settle near the project.	☐ Local people with the necessary skills shall be employed in the Plant project ☐ Training shall be offered;	To avoid Un-planned settlements which may lead to land use change and social upheavals.	Recruitment of local people for unskilled labour shall be the priority and as part of the overall Implementation Cost.	☐ Design Phase ☐ Construction Phase	☐ Unplanned Settlements ☐ Social Order	☐ Developer ☐ Community Representative ☐ Local Authority	Mitigated through salaries
Emission of exhaust fumes to the surrounding	ZEMA Regulation on Air Pollution;	To monitor and control emission of exhaust fumes to the	Enforcement EPPC Act,	Operational Phase	PM10, NO2, CO_2, SO_2, CO,	☐ ZEMA	

environment due to increased traffic.		surrounding environment.	204 on Pollution. of Cap Air		VOCs	☐ Local Authority ☐ ZEMA Monitoring Unit	
	Adherence to engine maintenance schedules and standards to reduce air pollution.	☐ To keep the Plant viable environmentally ☐ To check for defects and repair any malfunctioning engine.	☐ Enforcement of EPPC Act, Cap 204 on Air Pollution. ☐ Development of engine maintenance schedules and making them available for inspection on site.	☐ Operational phase	PM10, NO2, CO_2, SO_2, CO, VOCs	☐ Developer ☐ Contractor ☐ ZEMA	15,000 USD
Impacts on Socio-economic Environment							

Temporary marriages, casual sex relationships and more chances of transmission of sexual diseases due to interaction of project workers with local communities.	There shall be provision of education both to the local community and camp workers on STDs and HIV/AIDS using aids such as video shows, pamphlets, talks, etc.	To sensitize the construction workers and local communities about the dangers of STDs and HIV/AIDS and to protect themselves.	Mitigation measures for impacts of STDs and HIV/AIDS shall be part of the overall implementation Cost.	☐ Construction Phase ☐ Operational Phase	☐ Divorce cases ☐ STI/STD disease prevalence rates	☐ Developer ☐ Community Based Organizations ☐ Local Authority	On-going Cost
Increased vehicular traffic and accidents in black spot areas.	Provision of adequate warning road signs in black spot areas and speed retarders and/or mechanisms at village crossing sites.	To prevent fatal accidents especially that the increase in the vehicular traffic will be huge.	Mitigation Measures for impacts on socioeconomic shall be part of the overall Implementation Cost.	☐ Operational Phase	Availability of warning signs	• Developer • Local	400 USD
Impacts of Increased Road Traffic							
Excessive dust from soya see vehicles could affect the	Through watering of dust roads.	To avoid respiratory and visibility problems and	Mitigation Measures for impacts of traffic shall be part of	Operation Phase	PM10	☐ Contractor	Water bowser US$50/hr

natural environment.		the gathering of dust on protected areas and property.	the overall Implementation Cost.			☐ Local Authority	
Impacts of Work Accidents							
Advanced planning of safety equipment requirements	Development of safety procedures and operational manual.	To ensure that Workers undertaking Plant tasks know exactly what is to be done.	Mitigation Measures for impacts of work accidents shall be in Tender Document.	Operational Phase	Availability of safety Tool kits	☐ Contractor ☐ Local Authority	2000 USD Yearly
Lack of enforcement of safety and health regulations could impact negatively on Plant workers.	Enforcement of Public health and safety regulations.	To safe guard the health and safety of workers.	Mitigation Measures for this impact shall be in the Tender Document.	Operational Phase	Potential site hazards	☐ Developer ☐ Contractor ☐ Local Authority	On-going Cost
Socio-economic impact of the project on surrounding areas							
Interaction of construction and Plant	There shall be provision of education both to	To prevent the transmission of	Mitigation Measures for impacts of	Operational Phase	STI/STD Disease	☐ Contractor	On-going Awareness Program with

workers with the nearby communities may lead to transmission of sexually transmitted diseases.	the local community and workers on STDs and HIV/AIDS using aids such as video shows, pamphlets, talks, etc.	sexually transmitted diseases between the local community and Construction workers.	construction camps shall be part of the overall Implementation Cost.		Prevalence Rates	☐ Developer ☐ Local Authority ☐ CBO on Health	staff and communities
	Local people with the necessary skills shall be employed	To ensure the local community benefit from the project.	Mitigation Measures for impacts of construction shall be part of the overall Implementation Cost.	Operational Phase	STI/STD Disease Prevalence Rates	☐ Developer ☐ Local Authority ☐ Labour Department of Ministry of Labour ☐ Community representative	2,500 USD

9

ENVIRONMENTAL MONITORING PLAN

9. ENVIRONMENTAL MONITORING PLAN

Environmental monitoring ensures that the impacts have been accurately predicted and that appropriate mitigation measures are being implemented as planned and that they have the expected effects. Identification of potential environmental impacts associated with the development of the Cooking Oil Processing Plant indicates a need to design and implement a specific environmental monitoring plan. The monitoring process begins with supervision of implementation. The bulk of the activities may take place during the implementation stage.

The environmental objectives of these activities are to ensure mitigation measures outlined in the contracts are being properly implemented, that environmental contractual measures are being respected, construction is going in accordance with the agreed design standards and that no unforeseen negative impacts are occurring as a result of project execution. The key components of the proposed environmental monitoring plan are presented under table of Monitoring Activities and Indicators. While it is appropriate to indicate that progressive construction will be practiced, this aspect of Environmental Management is not always possible as some areas only become available at the end of the project construction phase. As the construction phase progress, the monitoring plan will be reviewed and adjusted in accordance with project environmental management requirements outlined in this report.

9.1 Monitoring arrangements

To avoid deliberate creation of gaps between what actually gets implemented on the ground, the contracts must spell out the sanctions for noncompliance with mitigation measures.

ESEC LTD is to compile an activity Environmental report that will form the basis for assessment of environmental performance.

9.2 Operational Phase

PGL will be responsible for monitoring and management of all indirect impacts occurring in the project area.

Table 9-0-1: Monitoring and reporting

Impact	Mitigation measure	Monitoring and reporting method	Frequency	Responsibility
Erosion	Design and construction of drainage reticulation will arrest the flow of water.	Design plans and site diary	-	Engineering/SafetyManagesr
Erosion	Careful design of paving	Design plans	On going	Safety manager and contractors
Soil contamination	Fuel and oil containers will be stored in a bunded area. Any decanting will also take place in that area.	Site inspection	Daily	Safety/ managers
Soil contamination	Building rubble and spoil, will be collected and reused or taken to a dumpsite	Site inspections	Daily	Safety/Maintenance managers
Air pollution	A water bowser will regularly water the areas on the plant not concreted to suppress the dust	Site diary	Daily	Safety manager
Air pollution	All motorized traffic will be regularly serviced to curtail above normal fumes. Boiler emissions to be controlled	Plant and Vehicle service monitoring records	On going	Safety and Production Managers/Logistic officer
Noise pollution	Areas involving noisy machinery or activities will be fit with noise reducers and serviced for good noise performance. Equipment and plant machinery shall be well maintained and in good condition such that noise emitted is within an acceptable level	Complaints records	On going	Safety and Production Managers
Health and Safety	Traffic will be controlled to ensure public and workers' safety.	Site inspection	-	Safety manager/ Security
Health and Safety	Health and Safety standards will be maintained at all times on site.	PPE issue records Accident records	On going	Safety manager
Health and Safety	Appropriately designed entry points and signs.	Site design	-	Safety manager
Health and Safety	Personnel will be issued with and have a contractual obligation to wear appropriate Personal Protective Clothing, when required.	PPE issue records Accident records	On going	Safety manager
Health and Safety	Promotion of health awareness, particularly HIV/AIDs prevention.	Training records, publications	On going	Safety manager
Traffic	Design and construction of ingress and egress points with broader width.	Site design	-	Developer
Visual impact	The design layout of the PGL aims to minimise any negative visual impact in the area.	Site design	-	Developer

Visual impact	Selection of materials and external colour schemes will be professionally chosen.	Site design	-	Developer
Water abstraction	Water will be abstracted into holding tanks from the borehole.	Reports and water testing records	Ongoing	Safety manager
Solid waste management	A private firm will be engaged to collect domestic waste on a regular basis.	Invoices	Ongoing	Disposal contractor
Solid waste management	PGL will supply bins to areas will be designated for rubbish separation and collection.	Site Inspections	Ongoing	Safety manager
Soil Contamination	All storage facilities for fuels to be banded and concretized.	Site Inspections	-	Safety manager
Soil Contamination	Waste disposed of in designated areas	Site inspections	Daily	Safety manager
Health and Safety	Domestic waste collected and disposed of regularly	Site Inspections, Invoices	monthly	Safety manager
Health and Safety	Contractual obligation to wear PPE encouraged	Accident records, PPE issue records	Ongoing	Safety manager
Health and Safety	Fire hydrants and hoses located in high risk areas	Fire equipment inspection records	Quarterly	Safety manager
Health and Safety	Fire hydrant placement in premises and appropriate training	Training records equipment inspection records	Quarterly	Safety manager
Health and Safety	All workers required to follow Good Practices	Audit records	Annually	Management
Security	Engaging a reputable security firm.	Security reports	-	Security firm
Noise	Restriction on noisy activities on the site	Site inspections	-	Management

Table 9-0-2: Monitoring and reporting

IFC EHS Guideline	Host Country Regulatory Limit	Element to be Monitored	Method of Monitoring	Frequency of Monitoring	Indicator	Means of Verification	Authority Responsible	Cost	Sampling area/ source
Land and Soil									
		Land and Soil	Site Engineer to make inspections of sites for storage of materials, oil and fuels and ensure they have sealed surfaces.	Periodical inspections throughout the Construction Phase	Clean storage sites free from any oil or fuel spillage maintained throughout Construction Phase.	Inspection Report is available at MML	PGL Engineering Department	US$ 200	Entire plant
			Site Engineer to inspect the waste disposal sites.	Periodical inspections throughout the Construction Phase	Waste oil is being disposed of in designated sites and in the approved method.	Inspection Report is available at MML Engineering Department	PGL	N/A	
			Site Engineer to ensure used oil is being collected for recycling.	Periodical inspections throughout the Construction Phase	Containers for collection of used oil are available on site.	Used oil from serviced plant machinery has been collected in containers.	PGL	US$ 600	
			Site Engineer to inspect storage tanks and ensure they have	Once before the fuel storage tanks are put to	Bund wall design and construction plan has been	Bund walls around fuel storage tanks have been	PGL	N/A	

			bound walls around them high enough to contain any spillage.	use.	developed approved and is available.	constructed.			
			The Site Engineer to make inspections and ensure heavy construction equipment is confined	Daily inspections throughout the Construction Phase.	Absence of caterpillar trampling on plant area	Complaints from the local community on invasion of their lands by construction equipment are nonexistent.	PGL	N/A	
			The Site Engineer to undertake inspection of earthworks and ensure that slopes are graded to specifications.	Daily inspections throughout ALL Phase.	Absence of rills, gullies	Absence of erosion features.	PGL	N/A	
			Once	Each time	Presence of	Restoration	PGL	Ongoing	

			earthworks are completed, the Site Engineer should monitor the restoration measures to be implemented such as re- vegetation	earthworks are completed throughout Construction Phase	re-vegetation in erosion prone areas.	programmed for re-vegetation of exposed soils is available and is being implemented.		Cost through employed Site Engineer	
Vegetation									
		Vegetation	Site Engineer to ensure that excessive clearance of vegetation is avoided and should be confined to the	Each time clearance of vegetation is being done throughout Construction Phase	The area of vegetation cleared is minimal	Area for vegetation clearance is clearly marked and is confined to the designs.	PGL	Ongoing Cost through employed Site Engineer	Office area and open areas
Water Quality (Effluent Discharge from the plant)									

-30 mg/l -125 mg/l -50 mg/l -400b MPN/100ml n/a n/a	-5.5-9 -50 mg/l -150 mg/l -100 mg/l -5000 MPN/100 ml -150 -2 mg/l	Water Quality -pH -Biological Oxygen Demand -Chemical Oxygen Demand -Total Suspended Solid -Coliform -Color -Free Chlorine content (Cl2) -Total nitrogen content	Site Engineer to inspect and satisfy that interceptors are put in place and working well.	Periodical inspections throughout the Construction Phase.	Clean water supply maintained throughout the Construction Phase.	Absence of water pollution incidents	PGL	Ongoing Cost through employed Site Engineer	Waste water treatment plant,
			Site Engineer to inspect and satisfy that areas where hazardous liquids are stored are bunded.	Periodical inspections throughout the Construction Phase.	Clean water supply maintained throughout the Construction Phase.	Absence of water pollution incidents	PGL	Ongoing Cost through employed Site Engineer	
			Site Engineer to inspect and satisfy that water from concrete batching plants is treated.	Periodical inspections throughout the Construction Phase.	Clean water supply maintained throughout the Construction Phase.	Absence of water pollution incidents	PGL	Ongoing Cost through employed Site Engineer	

-10 mg/l	-40 mg/l								
			Site Engineer to inspect and satisfy that silt traps are put along drainage systems;	Periodical inspections throughout the Construction Phase.	Clean water supply maintained throughout the Construction Phase.	Absence of water pollution incidents	PGL	Ongoing Cost through employed Site Engineer	
			Site Engineer to inspect and satisfy that spoon drains have scour checks.	Periodical inspections throughout the Construction Phase.	Clean water supply maintained throughout the Construction Phase.	Absence of water pollution incidents	PGL	Ongoing Cost through employed Site Engineer	
			Site Engineer to inspect and satisfy that siting of pit latrines is done away from water logged areas;	Before construction of pit latrines.	Construction is done according to design specifications.	Pit latrine siting and construction report	PGL	Ongoing Cost through employed Site Engineer	
		Air Quality							

1 Year – 20 mg/m3 24 hour – 50 mg/m3		Air Quality	Site Engineer to observe the level of dust generated during operation. Watering down should be done if dust levels are unacceptable.	Regular inspections throughout the Construction Phase.	Deposition of dust on surfaces such as grasses, shrubs, trees and rooftops should decrease with watering.	Dust deposition on the immediate surroundings is controlled.	PGL	Ongoing Cost through employed Site Engineer	-Main gate -Boiler section - Outside plant 3
24 hour – 20 mg/m3 10 minute – 500 mg/m3 1 year – 40 mg/m3 1 hour – 200 mg/m3	-6 mg/m3 -5 mg/m3 -5 mg/ m3 -20 mg/m3	- Dust Particulate Matter (PM10) (Total suspended particles) -SO2 -NOx -CO	Site Engineer to check and ensure that vehicles and equipment are maintained in order to reduce emission of exhaust fumes;	Regular inspections throughout the Construction Phase.	Exhaust fume emissions are controlled.	Maintenance Log book is available on site.	PGL	Ongoing Cost through employed Site Engineer	- FD1 lv 2 - SD lv3 - Tank farm plant3 -Fan room
			Site Engineer to inspect and ensure	Regular inspections throughout	Unpleasant odours are	Clean toilet environment free from	PGL	N/A	

			that toilets are cleaned and maintained to avoid unpleasant odours.	the Construction Phase.	controlled.	unpleasant odours.			
			Site Engineer to inspect and ensure waste is carefully managed and disposed of in designated places to prevent unpleasant odours.	Regular inspections throughout the Construction Phase.	Controlled waste disposal method.	Waste is dumped in designated places.	PGL	Ongoing Cost through employed Site Engineer	
		Noise							
			Sit Engineer to monitor noise and vibrations on an adhoc basis in order to establish noise levels	Regular inspections throughout the Phase.	Noise levels at the nearest sensitive receiver are minimized.	Number of complaints of noise disturbance is controlled.	PGL	Ongoing Cost through employed Site Engineer	-Main gate

Leq (hourly), 70 dB(A)	70 dBA (6:00 – 21:00)	Ambient Noise	at the project site and the nearest sensitive receptors and should not exceed 90-decibels.						-outside Boilers - Outside plant 3 - FD1 lv 2 - SD lv3 - Tank farm plant3 -Fan room
			Site Engineer to check and ensure that working hours are limited to day light only;	Daily inspections throughout the Phase.	Sleep disturbance is minimized.	Number of complaints of sleep disturbance is minimized.	PGL	Ongoing Cost through employed Site Engineer	
		Landscape and Aesthetics							
		Landscape and Aesthetics	Site Engineer to make visual inspection of earth works to ensure that excessive excavation	Daily inspections throughout the Phase.	Landscape alterations are reduced to a minimum.	Final landscape and aesthetic view is compatible with the surrounding environment	PGL	Ongoing Cost through employed Site Engineer	

			other than those agreed upon is not carried out, particularly at borrow pit sites, temporary and approach roads and around the contractor's camp.			.			
Hazardous Wastes Waste									
	No hazardous waste disposal site in Zambia	-Lubricant -Contaminated cloth -Light tube -Battery -Ink -Waste from lab Contaminated	All hazardous waste is stored in a bunded wall locked before taken for disposal by a ZEMA licensed contractor. Burnt by external	Weekly inspections throughout the Phase.	minimized hazardous waste at the plant	quantities of waste on the storage site	PGL	Ongoing Cost through employed Site Engineer	-Production, Utility -Factory Utility -Office QA, -Waste water treatment Utility

		bags	authorize agency						

The following table illustrates the different stakeholders and their monitoring responsibilities and reporting.

Table 9-0-3: Monitoring and Reporting Responsibilities

ZEMA	Overall environmental performance of the Project	Discussions with Engineering Manager
PGL	• Monitoring the implementation of EMP	• Regular environmental progress reports to stakeholders
	• Overall environmental performance of the Project	
Safety manager-PGL	• Implementation of mitigating measures for air, water, etc.	• Regular environmental progress reports to ZEMA
	• Environmental management of worksites	
	• Develop Waste management Plan	
	• Rehabilitation of abandoned worksites	
	• Performance of equipment	
	• Accidents (trips, pollution spills, etc.)	
	• Negative social and environmental impacts	
	• Environmental performance of equipment	• Maintenance records • Accidents reports • Mitigating actions
	• Implementation of mitigating measures	
	• Occupational health and safety plan	
	• Traffic and worksite accidents report	
	• Air quality	
External Consultant	• Negative social and environmental impacts	• Complaints to Safety manager

10. DISCUSSION CONCERNING AREAS AND ISSUES WHERE INFORMATION IS INCOMPLETE

The consultant endeavoured to obtain as much information as possible when preparing the Environmental Impact Statement (EIS). However, there are no national standards on air quality, noise and vibration; moreover, lack of measuring equipment for these aspects also posed a challenge. Literature search conducted for the project area did not yield any valuable information to benchmark findings in the field.

11

DECOMMISSIONING AND CLOSURE PLAN

11. DECOMMISSIONING AND CLOSURE PLAN

11.1 Objectives

The main objectives of the decommissioning plan are to:

- Ensure the safety of site and workers in the vicinity of the plant site
- Prevent potential significant adverse effects on adjacent environs
- Return the land to conditions capable of supporting the former land use, or where this is not practical, or feasible, an alternative sustainable land use
- Promote alternative economic activities in the area that are sustainable in the future

11.2 Decommissioning and rehabilitation investigations

Prior to commencing decommissioning activities, investigations and risk assessment will be undertaken as follows:

11.2.1 Preliminary investigations

- Evaluation of general conditions and background information
- State of environment prior to establishment of the cooking oil processing plant
- Documentation of all activities during operational phase
- Documentation of any environmental incidents during operations
- Preliminary evaluation of contaminants present at the site and their likely properties and behavior
- Evaluation of available planning data and architectural map
- Results of environmental monitoring studies

11.3 Decommissioning of infrastructure

11.3.1 Buildings

The buildings which are on the site are officers, laboratories, warehouses, lavatories, guard rooms etc. Other infrastructure includes road tar and pavers. The following measures will be applied to the mentioned structures:

- Breaking and removal of walls and concrete foundation
- Removal of pillars and related concrete foundations
- Demolishing of steel and removal of its concrete foundation and pipes
- General site clean-up

Site leveling and re-profiling will be done to re-establish the natural pattern across the site, after which, the site could be utilized for other facilities or activities. All materials and equipment that cannot be reused, recycled or sold will be disposed of at an approved non-hazardous disposal site.

DECOMMISSIONING OF PLANT INFRASTRUCTURE AND ITS IMPACTS

As indicated in the foregoing and table 10.0, the area will be re-profiled to establish the natural drainage pattern. All reusable and recyclable materials and scrap of good value will be salvaged and sold off. Site leveling and re-profiling shall be done to re-establish the natural drainage pattern across the site, after which, the site shall be re-vegetated with indigenous grasses and trees. All materials and equipment that cannot be reused recycled or sold shall be disposed of at an approved non-hazardous disposal site. The following activities are anticipated to be carried out:

Site Drainage Systems

After cessation of operations, drainage channels and open surfaces will be re-profiled with the additional soil amendment material such as rock from elsewhere, previously stripped topsoil and organic matter and re-vegetated. The re-shaping and grading of a site is essential for rehabilitation to

ensure that the final landform is hydrological compatible with surrounding areas. This entails making slopes stable and less prominent.

Re-vegetation

For the purposes of re-vegetation, the proposed project will collaborate with the Forestry Department who already has a nursery of indigenous plant tree species in Lusaka. All the preparatory works will be completed before the time when the seeds are most likely to experience the conditions they need to germinate and survive such as reliable rainfall and suitable temperatures.

Monitoring

The monitoring plan and its implementation shall be spearheaded by the different government departments. These shall particularly be the Zambia Environmental Management Agency (ZEMA) LWSC, and the Lusaka City council. The current engagement with the Provincial department is creating a platform from which this backstopping can be achieved, once the thermal power plant cease and the site decommissioned.

11.4 General site rehabilitation budget

A sum of **$440,000** has been estimated in the reclamation cost for the general site breaking, levelling and reprofilling.

Table 0-1: Cost estimates of Reclamation

Issue	Action	Implementing Organisation	Responsible Organisation	Duration	Estimated Cost ($)
Process equipment	Transportation and disposing of equipment in appropriate scrap yards and waste disposal site	Scrap mental dealers to dismantle process equipment and salvage operational equipment like motors and pumps PGL management	PGL management Contractor	8 Weeks	150,000
Soil	Removal of concrete foundations and covering over with top soil.	Civil Engineering firms PGL management	PGL management Contractor	One Month	50,000
Offices and ancillary buildings like workers houses	Change of use of buildings on site to suite operational changes after decommissioning of plant	PGL management to obtain local authority approval Implementation through civil engineering firm	PGL management Contractor	Four Week	90,000
Decommissioning program/Report	Writing a decommissioning report and submit a copy to ZEMA	PGL management	PGL management Contractor	Two weeks	150,000
TOTAL					**440,000**

12

EMERGENCY PREPAREDNESS AND RESPONSE PLAN

12.EMERGENCY PREPAREDNESS PLAN

12.1 Scope

The EPP plan is necessary to protect the health, safety, and welfare employees, customers and visitors at the plant and to provide for the protection of the facility and personnel during any emergency situation.
The EPP will include, at a minimum, the following basic components:

- How to report fires and other emergencies
- Emergency evacuation procedures and routes.
- Procedures to be followed by employees (if any) who remain to conduct some critical functions before they evacuate.
- Procedures to account for all employees after emergency evacuation.
- Rescue and medical duties for those employees (if any) who are designated to perform them.
- Names and phone numbers of persons who can be contacted for further information on the emergency plan.

Through the use of regularly scheduled safety procedures, training programs, and operational procedures, management will disseminate and train selected personnel in identifying conditions that might lead to emergency conditions. Customers and visitors will be instructed, as part of their orientation, in the steps to take to prevent and report emergency situations when these conditions are found to exist.

Listed below are specific procedures that shall be addressed by management to minimize the occurrence of and impact from a fire emergency. There are no unusual fires present in the area but attention shall be paid to sudden fires. Special emphasis at the storage areas shall be placed on housekeeping and storage practices and office areas because flammable and combustible materials may be used and stored there e.g. computers and valuable files.

Management shall be committed to preventing the occurrence of fires and situations that may promote a fire.

All fire protection equipment will be inspected and results of inspection recorded. Equipment to be inspected will include fire extinguishers and any other deemed worth. All areas will be inspected to check for the following unsafe conditions: -

- Poor housekeeping procedures
- Smoking in non-designated areas (if any)
- Flammable/combustible materials not stored properly

12.2 Procedures for Fires

Fire discovered by employee

- For localized fire, put it off before it spreads;
- For storage area, clear the area of all other personnel and visitors. Instruct all personnel to evacuate the facility.
- Confine the fire
- Activate the fire alarm (if available).

First Aid

First aid kits should be fully stocked, strategically located, and properly maintained. Never give more than immediate, temporary care.

Equipment and supplies should be chosen in accordance with the recommendations of health providers and service should be rendered only as covered by written, physician-approved standard procedures. First aid attendants should be duly qualified and certified.

Emergency Response Coordinator

Responsibilities of the Emergency Response Coordinator will include the following:

- To develop the site specific Emergency Response Plan in co-ordination with the management, on-site security personnel and the local emergency services such as the Police, Fire Brigade, Hospital etc.;
- Establishing an Emergency Control Centre at the site in coordination with the local Fire, Rescue and Police Authorities and establishing emergency communications systems;
- Selecting, appointing, organizing and training of personnel of the Emergency Response Team;
- Designating evacuation paths, assemblage areas;
- Ensuring that all employees and staff members are knowledgeable of emergency alarms, actions, and evacuation procedures.
- Assuring emergency equipment is operating and readily available (emergency medical kits, flash lights, evacuation chairs, fire equipment etc.
- Ensuring that the Emergency Response Plan is kept current.

All employees are responsible for familiarizing themselves with the procedures set forth in the Emergency Response Plan. The Emergency Response Plan will provide procedures to follow during anticipated emergency situations such as.

- Fire
- Explosion in buildings
- Extended power outages / Elevator / equipment failure
- Traffic Accident Flood
- Personnel / public violent behavior or disturbances
- Robbery

Table 12-1: Emergency Response Plan

S/n	EMERGENCY SITUATION	CAUSE	PROPOSED RESPONSE	RESPONDENTS
1.	Fuel Spillage	• Undue stress on tank and product lines or aged facilities • Human error e.g. overfilling tanks • Faulty equipment	• Switch of power, • Stop all operations • Create sand bunding around spillage point • Scoop or sponge/soak out spilled product • Clean up site • Document incidence • Report to Zambia Police, ZEMA and ERB	**Key Respondent:** Emergency Respondent on Duty **Other Respondents:** Other Workers, Local Fire services
2	Fire Outbreak	• Neglect of safety procedures • Faulty electric connections • Carelessness e.g. smoking in non-smoking areas	• Sound alarm and direct people on site to assemble at Fire Assembly point for safety • Conduct roll Call • Fight the fire using appropriate tools (fire extinguisher, sand, water) • Inform Zambia Police and Lusaka City Council • Isolate area with barrier tape • Clean up site • Document incidence • Report to Zambia Police, ZEMA and ERB	**Key Respondent:** Emergency Respondent on Duty **Other Respondents:** Manager, Other Staff Local Fire services, Zambia Police
3	Staff Injury	• Failure to adhere to safety • procedures • Unskilled labour • Faulty equipment • Sheer accident	• For minor injuries apply appropriate First Aid • For major injuries take to hospital • Document incidence	**Key Respondent:** First Aid Attendant on Duty **Other Respondents:** Station Manager, Hospital Staff, Zambia Police
4	Wastewater spillage from sewer facilities or oil interceptor due	Setting a limit for cleaning and monitoring to ensure levels are maintained below	• Clean up of contaminated sites • Inform ZEMA, LWSC, if large area affected or potential wash down to surface or ground water resources has occurred • Contain the spill using appropriate bunding material such as soil • Check and address causative factor e.g. unblock clogged system • Document incidence	**Key Respondent:** Station Manager **Other Respondents:** Other staff

13

CONCLUSION

13.CONCLUSION

Having assessed the project activities in terms of the technology and project design (site layout) against the exiting physical, biological and socio-economic environment through desk research, field observation and indeed stakeholder engagement, it has been established that the plant area will not be impacted negatively by the facility. Thus, it will not impact negatively on the three major components of the environment.

This undertaking is within an already established area and most of the environmental impacts during the operational phase of the project will be positive and the following are among the notable ones: -

- Improvement of the Zambia's financial standing;
- Provide direct employment opportunities for the skilled, semi-skilled and casual workers during the three phases;
- Boost local economy;
- Contribute to enhancing the nation's economy through paying taxes

It is clear from this study that a plant of this nature will have both environmental and socio-economic impacts on the surroundings, most of which are positive. Currently, with the recent increase in demand of the commodity in Lusaka, the needs for better environmental have also increased. This project will help meet this increase in demand.

The main negative impacts that will result from a project of this nature is:

- Generation of waste potentially becoming a pollutant
- Traffic and Safety

However, following the analysis of the risks, adequate mitigation measures will be implemented and closely monitored, rendering these impacts insignificant.

It is proposed that the development as described in this report meets the requirements for approval on the basis that:

- Health and safety regulations will be implemented according to National Standards throughout the project.
- Waste generated will be disposed of safely and within the regulations set by ZEMA and the Lusaka City Council.
- Design of the site and subsequent development activities will consider Environmental preservation as the primary objective.
- Traffic Control and other safety improvements will be done in liaison with RTSA, RDA and LCC

14. Declaration of Authenticity

Rohit Kumar

I, …… the undersigned, certifies and declares that the information presented in this Environmental Impact Statement (EIS) is both factual and accurate and represents the proposed project. This EIS conforms to the requirements of the Environmental Impact Assessment Regulations, SI 28 of 1997 with regard to the development of Environmental and Social Management Plans.

We further declare that the concerns raised by stakeholders at the time of carrying the consultations have been taken into account in preparing this EIS Report.

We acknowledge that the proposed project will be implemented in accordance with the applicable Zambian legal and administrative framework.

For and on behalf of **Parrogate Ginneries Limited, Zambia**.

……..……

Mr. Rohit Kumar
General Manager Administration
Parrogate Ginneries Limited

15. REFERENCES

Government of the Republic of Zambia; S. I. No.28 of 1997, the Environmental Impact Assessment Regulations.

Bramer, H. 1973 Soil Profile Descriptions Analytical data and an account of Soil Genesis and Classification Soil Survey Report II, Soil Survey Unit, Department of Agriculture, Chilanga, Zambia.

Chidumayo E.E (1987) species structure in Zambia miombo woodland. Journal of tropical ecology 3: 109-118

Fanshawe D.B (1971): The vegetation of Zambia. First resources bulletin No. 7 Republic of Zambia.

ECZ – 2000 State of the Environment in Zambia, Lusaka, Zambia.

ECZ – 1997 : Statutory Instrument No.28 of 1997. The Environmental Impact Assessment Regulation, Chisamba, Zambia

GRZ 1990: Environmental Protection and Pollution Control Act, Lusaka, Zambia

GRZ 1985: The National Conservation Strategy for Zambia. U.K.

GRZ 1965: The Republic of Zambia Soil Map Compiled from the Information Supplied by the Soils Section, Research Branch, Department of Agriculture, Lusaka, Zambia

Earthwise.(2016). Hydrogeology of Zambia. Available at: http://earthwise.bgs.ac.uk/index.php/Hydrogeology_of_Zambia#Geology. (Accessed 11 January 2020).

Google Maps. (2017). Location of the Project site in Woodlands. Available at: https://www.google.com/maps/@- 15.4451708,28.3466681,373m/data=!3m1!1e3. (Accessed 12 January 2020).

GRZ (1986). Soil Map of Zambia, classification of Map units according to FAO/UNESCO soil Map of the World Legend. GRZ, Lusaka, Zambia.

IUCN. (1996). 1996 IUCN Red List of Threatened Animals. IUCN, Gland, Switzerland and Cambridge, UK. 448 pp

www.weatherbase.com, /place/Zambia/Lusaka/Lusaka/statistics.

Kwesiga, F. and Kamau, I.N. (1989). Eds: Agroforestry potential in the unimodal upland plateau of Zambia, AFRENA Report No. 7. ICRAF, Nairobi, Kenya, 115 pp.

Sinclair, I and Ryan, P. (2010). Birds of Africa, south of the Sahara: second edition, 500 new images. Struik Nature, Cape Town, South Africa.

Carruthers, V. (ed.) (2008). The Wildlife of Southern Africa: The lager illustrated guide to the animals and plants of the region. Struik Publishers, Cape Town, South Africa.

Colmak Associates. (2017). Environmental Impact Statement Final Report: Graduare Property Development, Development of Business Park and Related Facilities (UNZA PPP Project) Off Great East & Thabo Mbeki Roads, Lusaka Zambia Environmental Management Agency (ZEMA), Lusaka, Zambia

Cotterill, F.P.D. and Maree, S. (2008). Fukomys anselli: The IUCN Red List of Threatened Species 2008: e. T44858A10956247

Google Maps. (2017). Location of East Park Mall. Available at: https://www.google.com/maps/@-15.3905274,28.3222971,673m/data=!3m1!1e3. (Accessed 21 February 2017).

GRZ (1986). Soil Map of Zambia, classification of Map units according to FAO/UNESCO soil Map of the World Legend. GRZ, Lusaka, Zambia.

IUCN. (1996). 1996 IUCN Red List of Threatened Animals. IUCN, Gland, Switzerland and Cambridge, UK. 448 pp

Kwesiga, F. and Kamau, I.N. (1989). Eds: Agroforestry potential in the unimodal upland plateau of Zambia, AFRENA Report No. 7. ICRAF, Nairobi, Kenya, 115 pp.

Sinclair, I and Ryan, P. (2010). Birds of Africa, south of the Sahara: second edition, 500 new images. Struik Nature, Cape Town, South Africa.

SSSRBMAZ (1991). Exploratory Soil Map of Zambia: Scale 1: 1,000,000. Government of the Republic of Zambia, Lusaka, Zambia.

Storrs, A.E.G. (1995). Know your trees. Some of the common trees found in Zambia. Regional Soil Conservation Unit, Nairobi, Kenya.

Wikipedia. (2020). List of Mammals of Zambia. Available at: https://en.wikipedia.org/wiki/List_of_mammals_of_Zambia. (Accessed 21 January 2020)

GRZ, 2011. Environmental Management Act No. 12 of 2011. Government Printers, Lusaka, Zambia.

GRZ, 1997. The Environmental Impact Assessment Regulations, 1997. Statutory Instrument No. 28 of 1997. Government Printers, Lusaka, Zambia.

16. APPENDICES

Appendix A: Curriculum Vitae of the EIA Study Team Members.
Appendix B: Scoping Meeting Advert.
Appendix C: Certificate of Incorporation
Appendix D: Certificate of Title
Appendix E: Lease Agreement
Appendix F: ZAMAQUA Trade Mark Certificate
Appendix G: Ionizing Radiation Licence
Appendix H: Weighbridge ZMA Certificate
Appendix I: ZEMA Licence
Appendix J: Business Levy Certificate
Appendix K: Cooking Oil Processing Plant
Appendix L: Parrogate Plant Specifications

APPENDIX A: CURRICULUM VITAE

Patson Zulu

Position Title and No.	TEAM LEADER & ENVIRONMENTAL EXPERT
Name of Expert:	Patson Zulu
Date of Birth:	27th January, 1960
Country of Citizenship/Residence	Zambia

Education:

Post-Graduate Studies/Training

November 2015 **"Integrity Committee Induction"** by Anti-Corruption Commission March 2009 "**Corporate Governance"** course held in Lusaka

July 2006: **"Management Development Programme for Senior Managers"** held in Lusaka Topics covered:-Managerial Skills and capabilities, Planning process, strategy formulation and control, managing change.

July 2005: **"Strategic Management Workshop for Managers**" held in Siavonga
Topics covered:-Strategic Management, decision making, performance improvement strategies.

November 2003:**"Investigators and Prosecutors Course"**
Held at Zambia Institute of Advanced Legal Education (ZIALE), Lusaka.
Qualification - Postgraduate certificate

December 2001**:** "**Environmental Management Tools"** in **Bonn, Germany**
Topics covered - Environmental Management Systems, Environmental Policy formulation, Green Supply Chain, Environmental Cost Accounting, Environmental Performance Evaluation, Cleaner Production Assessment Environmental Reporting etc

Qualification - Postgraduate certificate

February 2000**:** **"Environmental Technology Assessment"** course held in conjunction with the **Witwatersrand University, South Africa**

Qualification - Postgraduate certificate

March 1 to April 1, 1999: "**ISO-14000 - Environmental Management Systems"** in **Sweden** Topics covered **-** Environmental Auditing, Environmental Policy, Life-Cycle Analysis, Eco-Labelling, Cleaner Production, ISO 14 001 Standard, etc.

Qualification - Postgraduate certificate

Sept. 2, to Nov. 1996: **Planning on Regional Environmental Preservation"** conducted at the **Hokkaido Institute of Environmental Sciences in Sapporo, Japan**

Topics covered - Environmental Administration in Hokkaido, Agenda 21 in Hokkaido, Administration for air quality preservation, chemical pollution, preventive measures against noise, vibration and offensive odour, Environmental Information Systems, Environmental Impact Assessment System, Greenhouse Gas survey, Introduction to oceanic survey, etc

Postgraduate certificate in Hazardous Waste Management

April 16 to May 25, 1995: **Advanced Hazardous Waste Management"** course conducted at the Miljokonsulterna, **Nykoping,** in **Sweden**.

Qualification - Postgraduate certificate in Hazardous Waste Management

Nov. to 10th Dec. 1993: **Advanced Waste Management"** Course in **Dresden**, **Germany**

Qualification - - Postgraduate certificate in Waste Management

Graduate Studies:

University of Zambia P.O Box 32379, Lusaka

- **Qualification:** **Bachelor of Science Degree** (Chemistry)
- **Courses Studied**: Inorganic Chemistry, Advanced Organic Chemistry, Intermediate Physics (Electrostatics and Magnetism) and Mathematics (Analytic Geometry and Calculus)
- **Grade Obtained**: Credit

Secondary School: Kalulushi Secondary

- **Period:** 1975 - 1979
- **Qualification:** Cambridge School Certificate
- **Subjects Studied**: English, Literature in English, Geography, History, Mathematics, Pure Physics, Pure Chemistry and Pure Biology

- **Grade Obtained**: Division One

Employment Record relevant to the Assignment:

Period	Employing Organization And Position. Contact Information	Country	Summary Of Activities Performed Relevant To The Assignment
May 2019 to Present	Chairman and CEO - Environmental Science & Engineering Consultants Limited 10 Jacaranda Road, Town Centre, NDOLA	Zambia	Environmental Consultant - Environmental impact Assessment for the **Construction of an ethanol plant** in Lusaka, a **copper processing plant** in Chambishi Environmental Consultant - Environmental impact Assessment for the **Construction of filling stations, poultry houses** in chongwe, Environmental Consultant – Environmental Impact Assessment **for Mini Hydro-Power Plants** in Southern Province Environmental Consultant - Environmental impact Assessment for the Construction of **a waste recycling plant** in Lusaka Environmental Specialist - Environmental Assessment for the **decommissioning of fuel storage facility** by Syngenta Zambia Limited,2019
May 2004 to Feb. 2018	**Manager, Northern Region,** Zambia Environmental Management Agency	Zambia	•Management and supervision of Inspectorate work, communication and accounts for ZEMA. Advised and educated the public and regulated parties about environmental issues, regulations, policy and compliance. •Provided clients with guidance on how to comply with environmental regulations •Conducted all tests in accordance to the Zambia environmental regulations and then determined the composition of the air, water and gases.
July 1999 to June 2003:	**Cleaner Production Manager** at Zambia Association of Chambers of Commerce and Industry (ZACCI)	Zambia	•Zambian Manager and Counterpart Manager for Det Norske Veritas of Norway to **train Zambian industries in cleaner technology and cleaner production** of goods and services. Coordinated various works under Zambia Association of Chambers of Commerce and Industry (ZACCI).
1985 to 1992	**Nitrogen Chemicals of Zambia** Limited, P.O Box 226, Kafue	Zambia	•Worked as a **Process Engineer** in the Sulphuric Acid Plant. •Trained in **Chemical Process development** by a group of experts from Italy, involving mass balance and energy balance techniques, simple process modifications and design •Worked at the Training centre to organize training materials for plant technicians

			•Worked as a **Laboratory Chemist** in charge of Quality Control, Research and Development

Membership in Professional Associations and Publications:

1. Patson Zulu et al (1996) Solid Waste Management Master Plan Project Document for the City of Lusaka (Diagnosis)
2. "Zambia Railways Environmental Assessment Study" - Patson Zulu and Zebediah Phiri; October 1999.
3. Patson Zulu et al (2002) 'Environmental Management System for Zambia Railways'

Language Proficiency: Fluent in English, Bemba, and Nyanja

Adequacy for the Assignment:

Detailed Tasks Assigned on Consultant's Team of Experts:	**Reference to Prior Work/Assignments that Best Illustrates Capabilities to handle the assigned work**
1. Document Reviews including existing legal frameworks relevant to the projects	1. Review of relevant documents for a proposed Water Pipeline Project for Ramoji Resources in Salamano area Kalulushi District under Environmental Science and Engineering Consultant Limited. Also led Team Experts to a review process for various other environmental impact assessment projects highlighted on the ESEC LTD Company experience
2. Led the team preparing the inception Report	2. July 2018, Team Leader and Environmental Expert for the team that prepare the inception report for Ramoji Resources for the proposed Copper Processing Plant and Water Pipeline Project in Salamano area of Chambishi in Kalulushi District
3. Led the team preparing the EIA terms of Reference for submission to ZEMA	3. GIS and Environmental Expert for the proposed Molasses based ethanol plant By Consolidated Farming Limited in Shibuyunji District under Environmental Science and Engineering Consultant Limited.
4. Led the team for the Scoping meeting to be	4. Team Leader and Environmental Expert for

held at the Proposed Project site	various other environmental impact assessment projects highlighted on the ESEC LTD Company experience.
5. Review of the compiled Draft ToRs, Scoping Report and Specialized reports into a Draft EIS for submission to ZEMA	5. Reviewed the Compiled and drafted EIS for the proposed Copper Processing Plant in Salamano Area of Kalulushi District conducted in 2018 under Environmental Science and Engineering Consultant Limited.
6. Review the Revised (Incorporate comments from stakeholders and ZEMA final of EIS document	6. Reviewed the revised Final EIS for the proposed Copper Processing Plant in Salamano Area of Kalulushi District conducted in 2018 under Environmental Science and Engineering Consultant Limited.

Expert's Contact Information: email patsonzulu@gmail.com Phone: 0977 470849/0955833581/0967470849

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and iam available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my rejection by ZEMA.

PATSON ZULU ……..

Name of Expert Date Signature

PATSON ZULU ……..

Name of authorized Representative of the Consultant Date Signature

Abiud Banda

Position Title and No.	ENVIRONMENTAL ENGINEER (Water, Air & Noise) & GIS SPECIALIST
Name of Expert:	Abiud Banda
Date of Birth:	29th August, 1989
Country of Citizenship/Residence	Zambia

Education:

Master's Degree (Currently enrolled) in Geo-information Science (GIS) and Earth Observation, University of Zambia (2017 – 2019), Zambia.

Bachelor's Degree in Environmental Engineering, Copperbelt University (2011 – 2016), Kitwe, Zambia.

GSCE G12 Division one certificate, Chizongwe Technical School (2007 - 2009 Year), Chipata, Zambia

Employment Record relevant to the Assignment:

Period	Employing Organization And Position. Contact Information	Country	Summary Of Activities Performed Relevant To The Assignment
May 2019 to Present	Environmental & GIS Specialist - **Environmental Science & Engineering Consultants Limited** 10 Jacaranda Road, Town Centre, NDOLA	Zambia	Environmental Consultant - Environmental impact Assessment for the Construction of a filling station at Garneton turnoff in Kitwe by African Grey Limited,2018 Environmental Consultant - Environmental impact Assessment for the Construction of a filling station at Nakadoli in Kitwe by African Grey Limited, 2018 Environmental Consultant - Environmental impact Assessment for the Construction of a filling station in Masala, Ndola by Usangu Logistics Limited,2018 Environmental Specialist - Environmental Assessment for the decommissioning of fuel storage facility by Syngenta Zambia Limited,2019
March 2017 to March. 2018	**Waste Management Inspector, Northern Region,** Zambia Environmental Management Agency	Zambia	•Advised and educated the public and regulated parties about environmental issues, regulations, policy and compliance. •Provided clients with guidance on how to comply with environmental regulations •Conducted all tests in accordance to the Zambia environmental regulations and then determined the composition of the air, water and gases.

2015	**Environmental Engineer,** Mulonga Water and Sewerage Company	Zambia	Evaluated architectural designs for existing pipe networks Supervised sewer, manhole cover designs, unblocking and water treatment plans Examined and updated sanitary inspection log entries on a regular basis Ensured all needed permits and clearances were obtained and all job cards worked on time Ground water pollution spatial distribution in Kamuchanga and AEL compound

Membership in Professional Associations and Publications:

1. Graduate Member- Engineering Institution of Zambia
2. Poster presentation: "Mobile Micro sensors for air monitoring, Lusaka show ground 2016 at Copperbelt University stand
3. Poster presentation: "Mobile Micro sensors for air monitoring, Pretoria, South Africa, May 2017 at SAIMM Young Professional Conference (YPC).
4. Project: "Designing and building a low cost wireless mobile micro sensor for air pollution monitoring, Environmental Lab, CBU 2015 to Department of Environmental lecturers, Kitwe
5. NSTC Presentation: "Designing and Building Mobile Micro-Sensor Prototype for Air Quality Monitoring, School of mathematics and natural sciences conference room, July 2016 to National Science and Technology Council, CBU, Kitwe
6. Industrial Seminar: "Designing and Building Mobile Micro-Sensor Prototype for Air Quality Monitoring, Lunte Lodge, September 2017 to Mopani Copper Mines, Konkola Copper Mines, Kalumbila Mines, Lumwana Mining Limited, Nkana Water & sewerage Company, National Science and Technology Council and CBU Researchers, Kitwe

Language Proficiency: Fluent in English, Bemba, and Nyanja

Adequacy for the Assignment:

Detailed Tasks Assigned on Consultant's Team of Experts:	**Reference to Prior Work/Assignments that Best Illustrates Capabilities to handle the assigned work**
1. Document Reviews including existing legal frameworks relevant to the projects	1. Review of relevant documents for a proposed Water Pipeline Project for Ramoji Resources in Salamano area Kalulushi District under Environmental Science and Engineering Consultant Limited.
2. Part of the team preparing the EIA terms of Reference for submission to ZEMA	2. GIS and Environmental Expert for the proposed Molasses based ethanol plant By Consolidated Farming Limited in Shibuyunji District under Environmental Science and

	Engineering Consultant Limited.
3. Part of the Scoping meeting to be held at the Proposed Project site	3. GIS and Environmental Expert for various other environmental impact assessment projects highlighted on the ESEC LTD Company experience.
4. Collection of satellites maps for the proposed site	4. Data captured for a proposed filling station project by ACM Products Limited at Copperhill Mall Kitwe District
5. Map Production for the Project Site	5. Produced maps for the proposed Diesel Storage tank Project at Mineral Junxion Limited in Kitwe District, 2019
6. Compilation of Draft ToRs, Scoping Report and Specialized reports into a Draft EIS for submission to ZEMA	6. Compiled and drafted the EIS for the proposed Copper Processing Plant in Salamano Area of Kalulushi District conducted in 2018 under Environmental Science and Engineering Consultant Limited.
7. Incorporate comments from stakeholders and ZEMA into a final of EIS document	7. Incorporated comments from ZEMA for the proposed Copper Processing Plant in Salamano Area of Kalulushi District conducted in 2018 under Environmental Science and Engineering Consultant Limited.

References

Patson Zulu (0967470849) **Chairman and CEO** Environmental Science & Engineering Consultants Limited 10 Jacaranda Road, Town Centre Ndola	**Lillian C. Kalenge,** Principal Inspector – Waste Management, Zambia Environmental Management Agency (ZEMA) P.O. Box 71302, Ndola. Email: lkalenge@gmail.com/ lkalenge@zema.org.zm Cell: +260955292799
Dr. Phenny Mwaanga, Project Supervisor - Ecotoxicology Lecturer, The Copperbelt University, School of Mines & Mineral Sciences, P.O. Box 21692, Kitwe, Zambia Email: phennym@yahoo.co.uk Cell: +260969156065	**Eng. Davy Banda,** Former Peri-urban Manager/Sanitation Engineer, Mulonga water and Sewerage Company, P.O. Box 11712, Chingola, Zambia. Email: bandadavy@mwsc.com.zm Cell: +260967362338/955670164

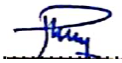
Expert's Contact Information: email abiudbanda@gmail.com Phone: 0972 590297/0953364136

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and iam available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my rejection by ZEMA.

ABIUD BANDA 25/04/2020 

Name of Expert Date Signature

PATSON ZULU 

Name of authorized Representative of the Consultant Date Signature

Alice Muyanga

Position Title and No.	ECOLOGY EXPERT
Name of Expert:	Alice Muyanga
Date of Birth:	28th June, 1989
Country of Citizenship/Residence	Zambia

Education:

2011	to	2016	Copperbelt University, BSc Wood Science and Technology, ZAMBIA	
1995	to	2007	St Jones Convent Secondary School	GCE Levels Certificate

Employment Record relevant to the Assignment:

Period	Employing Organization And Position. Contact Information	Country	Summary Of Activities Performed Relevant To The Assignment
November 2018 - present	Ecology Expert – Environmental Science and Engineering Consultants LTD	Zambia	• Reviewed previous works related to flora and fauna and relevant documents for a proposed Water Pipeline Project for Ramoji Resources in Salamano area Kalulushi District under Environmental Science and Engineering Consultant Limited • Ecological Expert for the proposed Molasses based ethanol plant By Consolidated Farming Limited in Shibuyunji District under Environmental Science and Engineering Consultant Limited • Assessed the flora of the area for the proposed mineral exploration project in Chondwe area Masaiti District by Zambia Weiye Limited, August 2019
2018	Supervisor – ZAFFICO, Ndola	Zambia	• Supervising casual workers in the maintenance of compartments, where small pine trees are grown
April 2017 – May 2017	Waste Management Researcher-Food and Agriculture Organisation	Zambia	• Interviewed the city council, households and the waste management bodies concerning the management of waste and how much was generate.

Membership in Professional Associations and Publication:

1. Member of CBU Anti-AIDS

Language Proficiency: Fluent in English, Bemba, and Nyanja

Adequacy for the Assignment:

Detailed Tasks Assigned on Consultant's Team of Experts:	Reference to Prior Work/Assignments that Best Illustrates Capabilities to handle the assigned work
1. Document Reviews including ecological state of the proposed site and existing legal frameworks relevant to the projects	1. Reviewed previous works related to flora and fauna and relevant documents for a proposed Water Pipeline Project for Ramoji Resources in Salamano area Kalulushi District under Environmental Science and Engineering Consultant Limited.
2. Part of the team preparing the EIA terms of Reference for submission to ZEMA	2. Ecological Expert for the proposed Molasses based ethanol plant By Consolidated Farming Limited in Shibuyunji District under Environmental Science and Engineering Consultant Limited.
3. Part of the Scoping meeting to be held at the Proposed Project site	3. Ecological Expert for various other environmental impact assessment projects highlighted on the ESEC LTD Company experience.
4. Flora and fauna assessment of the proposed project site and compilation of the ecology report	4. Assessed the flora of the area for the proposed mineral exploration project in Chondwe area Masaiti District by Zambia Weiye Limited, August 2019

References

Patson Zulu (0967470849) Environmental Science & Engineering Consultants Limited 10 Jacaranda Road, Town Centre Ndola	**Prof. Jacob Mwitwa** Lecturer at the Copperbelt University (Director at Kapasa Makasa University) School of Natural Resources Jambo Drive, Riverside Kitwe, Zambia. P.O. Box 21692 Tel. +260 212 230 923 Mobile: +260 977 848 462/ +260 966 848 462 EMAIL: mwitwajp@yahoo.com
Dr. Elisha Ncube Lecturer at the Copperbelt University School of Natural Resources	**Mrs Yaki Namiluko** Lecturer at the Copperbelt University School of Mines and Minerals

Jambo Drive, Riverside Kitwe, Zambia. P.O. Box 21692 Tel. +260964612068/ +260977662278	Jambo Drive, Riverside Kitwe, Zambia. P.O. Box 21692 Tel. +260977830770

Expert's Contact Information: email muyanga.alice.am@gmail.com Phone: 0968327998

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and iam available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my rejection by ZEMA.

Alice Muyanga 23/01/20

Name of Expert Date Signature

PATSON ZULU

Name of authorized Representative of the Consultant Date Signature

Siame Ndanji

Position Title and No.	GEOLOGIST
Name of Expert:	Siame Ndanji
Date of Birth:	
Country of Citizenship/Residence	Zambia

Education:

2011 – 2017: University of Zambia – Bachelor of Mineral Science (Geology)

2007 – 2009: Zimba High School – Grade 12 School Certificate

2005 – 2006: Kafue Boys Secondary School – Grade 9 School Certificate

Employment Record relevant to the Assignment:

Period	Employing Organization And Position. Contact Information	Country	Summary Of Activities Performed Relevant To The Assignment
August 2019 - present	**Geology Expert** – Environmental Science and Engineering Consultants LTD	Zambia	• Assessed the geology and possibility of successful exploration activities of the area for the proposed mineral exploration project in Chondwe area Masaiti District by Zambia Weiye Limited, August 2019
May to July of 2019	**Survey Team Member** - Geological Survey Department Geologist, Geological Survey of Zambia Ministry of Mines and Minerals Development Lusaka-10101, Zambia Tel: (+260) 0977563106, (+260) 0956723322	Zambia	• Stream and soil sediment geochemical survey of the Copperbelt and Northwestern province conducted by the geological survey department from May to July of 2019. • In this survey I took part in the planning of the survey and collection of the samples
2017 - July 2019	Geology Researcher – University of Zambia	Zambia	• Conducted two projects that helped me in understanding the practical aspects of my field. • The first was an independent mapping project, in this project I conducted geological mapping on an area of 20 km2 from which I was able to generate a detailed geological map. • The second project was a soil geochemical; survey, in this project soil samples collected in an area were analysed with the objective of finding mineralization in the area from which they were collected.

Licences:

1. Blasting Licence (All mine operations)
2. Valid Silicosis
3. Valid medical certificate of fitness (KCM)

Membership in Professional Associations and Publication:

1. President – The Copperbelt Mines and Minerals Engineering Society (May 2017 – July 2018)
2. Student Counsellor – The Copperbelt University Student Counsellor (May 2017 – June 2018)
3. Committee Member – The Engineering Institute of Zambia – CBU Chapter (May 2017 – July 2018)
4. Registered Member of Engineering Institution of Zambia (EIZ)
5. Registered Member of Southern Africa Institute of Mining and Metallurgy (SAIMM)

Language Proficiency: Fluent in English, Bemba, and Nyanja

Adequacy for the Assignment:

Detailed Tasks Assigned on Consultant's Team of Experts:	**Reference to Prior Work/Assignments that Best Illustrates Capabilities to handle the assigned work**
5. Document Reviews including geological and hydrogeological state of the proposed site and existing legal frameworks relevant to the projects	5. Reviewed previous works related to geology and mining rights and relevant documents for a proposed Water Pipeline Project for Ramoji Resources in Salamano area Kalulushi District under Environmental Science and Engineering Consultant Limited.
6. Geological and mineral quality assessment of the proposed project site and compilation of the mineral and soil assessment report	6. Assessed the geology and possibility of successful exploration activities for the proposed mineral exploration project in Chondwe area Masaiti District by Zambia Weiye Limited, August 2019

References

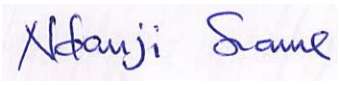
B.N. Upreti, Ph.D. Professor and Head, Department of Geology School of Mines University of Zambia Great East Road Campus, P.O. Box 32379, Lusaka-10101, Zambia Tel: (+260) 0966716572 (Cell) Email: bnupreti@gmail.com Former Head of Department of Geology, and	**Dr. A. Ahmed, Ph.D** Lecturer, Department of Geology School of Mines University of Zambia Great East Road Campus, P.O. Box 32379, Lusaka-10101, Zambia. Tel: (+260) 0978289796 Email: aahmed@unza.zm

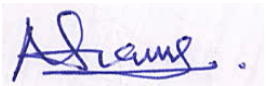
Dean, Institute of Science and Technology Tribhuvan University, Kathmandu, Nepal.	
Mr. C. Mwansa, B.Sc Geologist, Geological Survey of Zambia Ministry of Mines and Minerals Development Corner of Nationalist and Government road, P.O Box 50135, Lusaka-10101, Zambia Tel: (+260) 0977563106, (+260) 0956723322	**Mr. B. Musonda, M.Sc**. Lecturer, Lecturer, Department of Geology School of Mines University of Zambia Great East Road Campus, P.O. Box 32379, Lusaka-10101, Zambia. Tel: (+260) 0978825283

Expert's Contact Information: sndanji@gmail.com **Phone:** 0975750200

Certification:

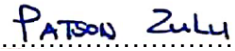
I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and iam available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my rejection by ZEMA.

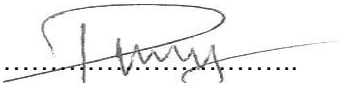




……..

Name of Expert Date Signature





……..

Name of authorized Representative of the Consultant Date Signature

Ernest Mwape

Position Title and No.	SOCIAL ECONOMIC EXPERT
Name of Expert:	Ernest Mwape
Date of Birth:	27th January, 1966
Country of Citizenship/Residence	Zambia

Education:

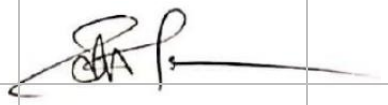
1991 to 1994 University Of Manitoba, (Production Economics) Msc. Agricultural Economics, CANADA

1984 to 1988 University Of Zambia, BA Economics/Statistics, ZAMBIA

1979 to 1983 Mpatamato Secondary School GCE O'levels Certificate

Employment Record relevant to the Assignment:

Period	Employing Organization And Position. Contact Information	Country	Summary Of Activities Performed Relevant To The Assignment
August 2014 to August 2017	Director – Policy and Planning Division, Zambia Development Agency (ZDA)	Zambia	1. Editing, finalizing and publishing eight Annual Reports that were outstanding statutory obligations to the National Assembly since the Agency was established in 2007; 2. Preparing and publishing the 2016-2020 ZDA Strategic Plan; writing the 2016-2020 Strategic Plan for Zambia Export Development Fund (ZEDEF); 3. Reviewing and redesigning the Agency's Monitoring & Evaluation system; 4. Compiling the Agency's Annual Work-Plans and Budgets; and designing the template for Operations Manual for all Divisions at the Agency. 5. coordinated and facilitated a number of capacity workshops for the Agency, in particular officers in the Policy and Planning Division
August 2007 to August 2014	Economic Governance Specialist, Governance Department at the Ministry of Justice	Zambia	1. Provided secretariat services to the Africa Peer Review Mechanism (APRM) 2. Facilitating and coordinating activities undertaken by governance oversight institutions that promote accountability, 3. Transparency, anti-corruption and those that foster increased efficiency and effectiveness in the delivery of public goods and services

			4. co-authored thematic reports on Economic Governance and Management, and Political & Democratic Governance in Zambia's first self-assessment report for the APRM in 2010
November 2006 to July 2007	Program Officer - Private Sector Development Reform Program (PSD – RP) domiciled at the Ministry of Commerce, Trade and Industry (MCTI)	Zambia	1. responsible for coordinating activities that were undertaken through the Trade Expansion Working Group that eventually resulted in review and revision of some policies and regulations governing the business environment
October 2004 to October 2006	Macroeconomics Advisor - Japanese International Cooperation Agency (JICA) in Lusaka, Zambia	Zambia	1. prepared advisory notes on various economic development initiatives that the Zambian Government was undertaking
September 2001 up to November 2004	Policy Component Manager of the USAID-funded Community-Based Natural Resources Management and Sustainable Agriculture (CONASA) project		1. Raise public awareness about the concept and benefits of Community-Based Natural Resources Management (CBNRM). 2. reviewed and analysed policies and legislation that govern the natural resources sector in Zambia
1999 to September 2001	Chief Economist for the Zambia Association of Chambers of Commerce and Industry (ZACCI)		1. Draft position papers that reflected the interests and concerns of the business community for consideration by the Zambian Government and cooperating partners. 2. made a lot of presentations to the Parliamentary Committee on Economic Affairs and Labour, such as the recommendations and proposals that were adopted and implemented by Government through the World Bank sponsored Enterprise Development Project (EDP) that increased participation of commercial banks and made them comfortable to submit their confidential information

Membership in Professional Associations and Publications:

1. Secretariat to the African Peer Review Mechanism (APRM); Ruling Justly component of the Millennium Challenge Account (MCA); the initial Legal and Judicial Reforms Committee; the Governance Sector Advisory Group (GSAG); and the Macroeconomics Sector Advisory Group.
2. In July 2006 I was elected the Vice President of Economics Association of Zambia (EAZ). I did a lot of work for the Association, such as: preparing presentations for the Parliamentary Committee on Economic Affairs and Labour; critiques of the annual national budgets; prepared comments on various Government initiatives, policies, and legislation; drafted project proposals; organized and moderated discussions on topical economic issues; etc.
3. I served as Chairperson of the DFID-funded Revenue Institutions of Zambia

Enhanced Support (RIZES)/CSO project hosted by Economics Association of Zambia (EAZ) between 2004 and 2005.

4. I was involved in negotiations between EAZ and NIZA (a Netherlands-based NGO) to help raise awareness on NEPAD program of the Organization of African Union.
5. I was Vice-Chairman of the Socio-Economic Committee of the Poverty Monitoring and Analysis (PMA) component of the World Bank funded Zambia Social Investment Fund (ZAMSIF) project.
6. Between 1999 and 2001, I served on the Technical Committee of the Directorate of Macro-Economic Policy Analysis (DMPA) project jointly implemented by the Ministry of Finance and Economic Development (MOFED, Zambia); the Africa Capacity Building Foundation (ACBF in Harare, Zimbabwe) and the United Nations Development Program (UNDP in Zambia).
7. Between 2000 and 2001, I served on the Macro-economics and Industry Working Groups that were preparing Zambia's Poverty Reduction Strategy Paper (PRSP) under the auspices of the World Bank's Poverty Reduction Growth Facility (PRGF). From 2001 to 2004, I continued to participate in the PRSP process and maintained active links through the Environment SAG in which I represented the CONASA project and Civil Society for Poverty Reduction (CSPR).
8. Between August 2000 and August 2001 I served as the National Focal Point for Zambia for the second Africa-Asia Business Forum (AABF II). The Government of Japan through UNDP funded AABF with the objective of promoting business linkages between Asian and African companies. I recruited six companies that took part in the process and concluded with the Forum in Pretoria, South Africa.

Language Proficiency: Fluent in English, Bemba, and Nyanja

Adequacy for the Assignment:

Detailed Tasks Assigned on Consultant's Team of Experts:	Reference to Prior Work/Assignments that Best Illustrates **Capabilities to handle the assigned work**
1. Part of the team preparing the inception Report	1. For ten months up to 31st July 2007, I was a Program Officer in charge of the portfolio looking at economic institutions, policy and trade expansion at the Private Sector Development Reform Program (PSD – RP)
2. Input in preparing terms of Reference	2. Socio-economic Expert for the proposed Copper Processing Plant in Salamano Area of Kalulushi District conducted under Environmental Science and Engineering Consultant Limited.

3. Stakeholders and interested parties consultations 4. Socio-economic surveys; 5. Socio-Economic impact assessment Environmental and Social-economic Sustainability Assessment	3. Socio-economic Expert for various other environmental impact assessment projects highlighted on the ESEC LTD Company experience. 4. Under the Ministry of Agriculture & Water Development (MAWD) in February 1989 he worked as Economist/Statistician responsible for organizing and conducting the annual crop forecasting surveys, and production of the National Early Warning Monthly Food Security Bulletins. 5. After the restructuring of the Ministry, I was appointed as Principal Planner (Infrastructure) and served as Project Coordinator of the civil works component of the US$10mn World-Bank funded project called Zambia Agricultural, Marketing, Processing and Infrastructure Project (ZAMPIP)
6. Reviewing of draft EIS document	6. Internal Document Quality Control - reviewed the proposed Copper Processing Plant in Salamano Area of Kalulushi District conducted in 2018 under Environmental Science and Engineering Consultant Limited.

Expert's Contact Information: email: ernmade@yahoo.co.uk Phone: 0967994059/0955994059

Certification:

I, the undersigned, certify that to the best of my knowledge and belief, this CV correctly describes myself, my qualifications, and my experience, and iam available to undertake the assignment in case of an award. I understand that any misstatement or misrepresentation described herein may lead to my disqualification or dismissal by the Client, and/or sanctions by ZPPA.

ERNEST MWAPE ....

Name of Expert Date Signature

PATSON ZULU ....

Name of authorized Representative of the Consultant Date Signature

James Bwalya

Position Title and No.	CIVIL ENGINEER
Name of Expert:	James Bwalya
Date of Birth:	8th February, 1989
Country of Citizenship/Residence	Zambia
Position Title and No.	CIVIL ENGINEER
Name of Expert:	James Bwalya
Date of Birth:	8th February, 1989
Country of Citizenship/Residence	Zambia

James Bwalya

Nationality: Zambian

Date of Birth: 08 February 1989

Gender: Male

NRC No: 285778/66/1

Passport No: ZN 658693

Languages: English, Bemba and Nyanja

Cell: +260 969 535371

Email: bwalyajames.jb.jb@gmail.com

Summary

I am an enthusiastic and determined professional Civil Engineer with a solid background in material testing, water sampling, project management, freshwater monitoring and data layer creation and Management projects. I have extensive experience in planning, executing, monitoring and closing projects, and have yet to encounter a deadline I couldn't meet.

I am highly organized, have good knowledge of project portfolio management software, enjoying interfacing with clients, and can effectively implement projects. I am valued for the passion I put into my work. More than anything, I look forward to a stimulating position in a supportive team where I can continue to exercise and develop my skills.

Education

Copperbelt University — Kitwe, Zambia
Degree of Bachelor of Engineering with Honours in Civil Engineering
Graduated: 2017 with Merit

Copperbelt University — Kitwe, Zambia
Peer Educator's Training Certificate
Graduated: 2015

Copperbelt University — Kitwe, Zambia
Electoral Commission Member Certificate
Saved under Anti-Aids Society: 2014 – 2015

Copperbelt University — Kitwe, Zambia
Social and Outreach Secretary Certificate
Saved under Anti-Aids Society: 2016 – 2017

Copperbelt University — Kitwe, Zambia
Anti-Aids Membership Certificate
Saved under Anti-Aids Society: 2014 – 2017

Kantanshi High School — Mufulira, Zambia
GSCE G12 Division one Certificate
Graduated: 2010

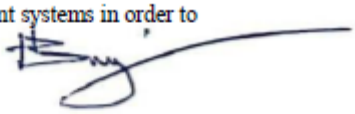
Work Experience

Site Engineer **Currently Working**
SALOBA LIMITED

- To supervise effectively the construction of Ware House at Saloba Batch Plant – Mindolo Township Kitwe
- To supervise effectively the construction of pre-assembly pads for headgear installation at Mopani copper mine – Mindola deeps project Kitwe
- To supervise timely and efficiently the construction of two storey building of 20 apartment flats in riverside Kitwe
- To supervise timely and efficiently the reconstruction of refinery basement floors at Konkola Copper Mine Nkana Plant Kitwe
- Desilting and reconstruction of drains at TLP, at Konkola Copper Mine Nchanga Plant Chingola
- To supervise effectively the development of technical standards and the building of capacity in order to enhance quality control
- To manage effectively the utilization of human and material resources in order to facilitate attainment of set objectives
- To manage the efficient implementation of performance management systems in order to enhance individual and organizational performance

Site Engineer **August – November, 2018**
Southern Mining and Operation Limited (SMOL)

- To supervise effectively 30 skilled workers under my supervision and management of safety in order to create a conducive and health environment
- To supervise timely and efficiently the construction and implementation of Bombay Drainage Project in Lusaka and feeder roads infrastructure development programmes in order to enhance sanitation and accessibility country wide
- To supervise effectively the development of technical standards and the building of capacity in order to enhance quality control
- To manage effectively the utilization of human and material resources in order to facilitate attainment of set objectives
- To manage the efficient implementation of performance management systems in order to enhance individual and organizational performance



Intern Engineer **January - July, 2018**
Ministry of Local Government and Housing
Department of Housing and Infrastructure Development (P-DHID)

- To coordinate and supervise timely the efficient planning and implementation of all infrastructure development projects in eleven Districts or eleven Towns of Luapula province of Zambia in order to develop our country
- To coordinate effectively, the development and implementation of housing development policies and programmes in order to facilitate the provision of adequate, affordable and sustainable housing for all income groups in Zambia
- To supervise timely and efficiently the planning and implementation of urban and feeder roads infrastructure development programmes in order to enhance accessibility country wide
- To supervise effectively the development of technical standards and the building of capacity in the local authority for the delivery of fire and rescues services in order to minimise fire hazards and response to emergencies
- To coordinate and supervise timely the efficient planning and implementation of urban and rural water supply and sanitation infrastructure development in order to facilitate the delivery of safe and clean water and adequate sanitation
- To supervise effectively the planning development and management of markets and bus stations in order to create a conducive trading and commuting environment
- To supervise timely the development and implementation of solid waste management policies and programmes in order to maintain a clean and healthy environment

- To manage effectively the utilization of human and material resources in order to facilitate attainment of set objectives
- To manage the efficient implementation of performance management systems in order to enhance individual and organizational performance
- Monitoring and evaluation of infrastructure programmes undertaken yearly 10 markets, 2 housing, bus stations and urban and feeder roads infrastructure programmes undertaken yearly, urban and rural water supply and sanitation and solid waste
- Coordinate of construction maintenance and rehabilitation of urban and feeder roads with the local authority undertaken yearly
- Participate in the review and final compilation of the National Water Supply and Sanitation Policy
- Participate in the review and final compilation of the National Rural Water Supply and Sanitation Programme (NRWSSP)

Civil Engineer trainee **June – September, 2017**
China Civil Engineering Construction Corporation (Zambia) Limited

- To supervise effectively 15 skilled workers under my supervision and management of safety in order to create a conducive and health environment
- To supervise timely and efficiently the construction and implementation of Bulk Water Project in Chilanga Waterworks in order to facilitate the delivery of safe and clean water and adequate sanitation
- To supervise effectively the development of technical standards and the building of capacity in order to enhance quality control
- To manage effectively the utilization of human and material resources in order to facilitate attainment of set objectives
- To manage the efficient implementation of performance management systems in order to enhance individual and organizational performance

Civil Engineer trainee **March – June, 2015**
Mulonga Water and Sewerage Company (MWSC) Mufulira Division

- Evaluated architectural designs for existing pipe networks
- Supervised sewer, manhole cover designs, unblocking and water treatment plans
- Examined and updated sanitary inspection log entries on a regular basis
- Ensured all needed permits and clearances were obtained and all job cards worked on time
- Ground water pollution spatial distribution in Kamuchanga and AEL compound
- Inspection of wastewater clarifier efficiency
- Health safety and environmental management of wastewater sludge
- Wastewater treatment process management
- Working as a team in providing solutions for water pollution emergencies
- Evaluated architectural designs for existing Mulonga wastewater treatment

Peer Educator **2015 – 2017**
The Copperbelt University Public Health Unity
Sensitization the general public and the entire copperbelt university at large, on the following;

- Sexually Transmitted Infections (STIs)
- Voluntary Counselling and Testing (VCT)
- Women and AIDS
- Methods of Disseminating Information
- Opportunistic Infections
- Positive Living
- Female Reproductive System
- HIV and AIDS Stigma and Discrimination
- Impact of the HIV and AIDS
- Male Reproductive System

- Basic Facts on HIV and AIDS
- Abortion Sensitization
- Effects of HIV on the Immune System

Qualifications/certifications

Degree of Bachelor of Engineering with Honours in Civil Engineering
EIZ Graduate Engineer Certificate
Peer Educator's Certificate
First Aid Certificate
Electoral Commission Member Certificate
Social and Outreach Secretary Certificate
Anti-Aids Membership Certificate
GSCE G12 Division one Certificate
Driver's Licence

Skills

Name	Proficiency	Experience
Microsoft Office 7-16	Advanced	8 years
Microsoft Project 16	Advanced	8 years
ArcGIS 10.1	Intermediate	3 years
AutoCAD/Water CAD	Intermediate	3 year
VISUAL MINTEQ	Advanced	4 years
ILWIS 3.0	Intermediate	3 years

Interests

My interests all infrastructure development projects, include swimming and indoor music.

Extra-Curricular Activities

Volunteering
Appointed as a senior student council member while at Kantanshi High school, this role allowed me to attend meetings with head of departments and to raise pupil issues aimed at improving the school. I enjoyed learning about the high- level issues affecting the school and contributing to the continuous improvement of the organization.

Student Alumni
I am an active member of both Ex Kantanshi High pupils and The Copperbelt University Engineering Instuition of Zambia alumni. As well as enjoying socializing with Schoolmates, classmates and alumni I also enjoy finding out about the engineering projects that the alumni worked and are working on and post them on.

References

Mr Amusa Zaza
The Provincial Local Government Officer
Ministry of Local Government and Housing
Luapula Province
Cell No.: +260 977 323355
Email: amusazaza3@gmail.com

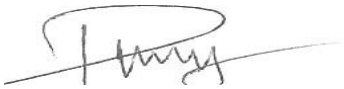
Eng. Davy Banda
Peri-urban Manager/Sanitation Engineer,
Mulonga water and Sewerage Company,
P.O. Box 11712, Chingola, Zambia.
Email: bandadavy@mwsc.com.zm
Cell No: +260 967 362338 / 260 955670164

Mr. Siame
The Copperbelt University,
Public Health Unity,
P.O. Box 21692, Kitwe, Zambia
Contact: +260 977 916071

I hereby certify that all the stated information in this CV is true and complete to the best of my knowledge.

JAMES BWALYA

PATSON ZULU



Bwalya L. Mwale

Position Title and No.	ENVIRONMENTAL ENGINEER
Name of Expert:	Bwalya L. Mwale
Date of Birth:	28th February, 1995
Country of Citizenship/Residence	Zambia

Education:

Bachelor's Degree in Environmental Engineering, Copperbelt University (2013 – 2018), Kitwe, Zambia.
GSCE G12 Division one certificate, Mazabuka Girls Secondary School (2009 - 2011), Mazabuka, Zambia

Employment Record relevant to the Assignment:

Period	Employing Organization And Position. Contact Information	Country	Summary Of Activities Performed Relevant To The Assignment
2019 to Present	Environmental Specialist - **Environmental Science & Engineering Consultants Limited** 10 Jacaranda Road, Town Centre, NDOLA	Zambia	Environmental Consultant - Environmental impact Assessment for the Construction of the China aided International Conference center in Lusaka by Ministry of Housing and Infrastructure Development(MHID), 2019 Environmental Consultant – Feasibility study for improved solid waste management system in Choma District by Choma municipal council and GIZ,2019 Environmental Consultant - Environmental impact Assessment for the Existing Cooking oil processing plant in Lusaka by Parrogate Ginneries LTD,2020
2016	**Environmental Engineer (0fficer),** Zambia Sugar Plc	Zambia	Ensured proper solid waste, surface and ground water management Carried out microbiological, water and waste water analysis Carried out air pollution analysis using stack emission analysis and trend studies Ensured all needed permits and clearances were obtained and all job cards worked on time Ensured safety, health, environment and quality management(SHEQ) were upheld Ground water pollution spatial distribution in njomona and kawama compound

Membership in Professional Associations and Publications:

1. Graduate Member- Engineering Institution of Zambia (MEIZ)
2. Journal of Environment Protection and Sustainable Department: Seasonal variation of nitrate and phosphate levels in groundwater-a case study of Mpongwe farming block in Zambia, 2019. http://files.aiscience.org/journal/article/pdf/70140070.pdf
3. Project: Seasonal variation of nitrate and phosphate levels in groundwater-a case study of

Mpongwe farming block, Copperbelt University 2018 to Department of Environmental lecturers, Kitwe

Language Proficiency: Fluent in English, Bemba, and Nyanja

Adequacy for the Assignment:

Detailed Tasks Assigned on Consultant's Team of Experts:	**Reference to Prior Work/Assignments that Best Illustrates Capabilities to handle the assigned work**
1. Document Reviews including existing legal frameworks relevant to the projects	1. Review of relevant documents for a feasibility study for an improved solid waste management system in Choma District under Environmental Science and Engineering Consultant Limited.
2. Part of the Scoping meeting to be held at the Proposed Project site	2. Environmental Expert for various other environmental impact assessment projects highlighted on the ESEC LTD Company experience.
3. Collection of satellites maps for the existing waste collection containers	3. Data captured for current locations for stationary solid waste collections points and proposed Material recovery facility in Choma District under Environmental Science and Engineering Consultant Limited

References

Patson Zulu (0967470849) **Chairman and CEO** Environmental Science & Engineering Consultants Limited 10 Jacaranda Road, Town Centre Ndola	**Shirley Ndalama,** Environmental Officer - Mazabuka, Zambia Sugar Plc P.O. Box 670240, Mazabuka. Tel: +260 963 317 222
Mr. S Sichilima, Project Supervisor/Lecturer, The Copperbelt University, School of Mines & Mineral Sciences, P.O. Box 21692, Kitwe, Zambia Email: nsichilima@gmail.com Tel: +260 964 825 396	**Inonge P. Mulemi,** SHERQ Officer - Mazabuka, Zambia Sugar Plc P.O. Box 670240, Mazabuka. Email: Inongemulemi@gmail.com Tel: +260 962 242 752

Expert's Contact Information: email bwalyalydiamwale95@gmail.com Tel: +260 953 029495/+260 977 782858

……..

Name of Expert Date Signature

PATSON ZULU ……..

Name of authorized Representative of the Consultant Date Signature

APPENDIX A2: SATELLITE MAP OF THE COOKING OIL PROCESSING PLANT

APPENDIX A3: PHOTOS OF THE COOKING OIL PROCESSING PLANT


ESEC
LTD

APPENDIX B: SCOPING MEETING ADVERT (Times of Zambia/Daily Mail 22/05/2020)

Parrogate

PUBLIC NOTICE

REQUEST FOR COMMENTS ON THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR PARROGATE GINNERIES OIL PROCESSING PLANT IN LUSAKA, ZAMBIA

Parrogate Ginneries Limited wish to bring to the attention of the members of the public that following the acquisition of the oil processing plant located on Mumbwa Road in the Chinika Industrial area of Lusaka, Parrogate Ginneries Limited have embarked on conducting an Environmental Impact Assessment (EIA) in line with the legal requirements of the Environmental Management Act of 2011, and other mandatory requirements for manufacturing companies to possess EIA certificates or approvals.

It is for this reason that Parrogate as new owners of the plant is conducting an Environmental Impact Assessment (EIA) which will provide an elaborate Environmental Management Plan (EMP) which will be regarded as a standard guidance document of operation to monitor the environment within the plant.

You may wish to know that the Edible Cooking oil processing plant located on Mumbwa Road in Lusaka, was established in early 1960s. For a long time it operated under different owners such as Refined Oil Products (ROP) Ltd; Zambecf, Cargill etc. It is therefore an on-going operation entity on a brown field.

The Environmental Impact Assessment Regulations No. 28 of 1997 provide for the Developer or owner of the business undertaking, to consult various stakeholders through a scoping meeting during the process of developing Terms of Reference of a project. However, given Government's guidelines in relation to COVID-19, it is not appropriate to convene face-to-face public meetings. Instead it is proposed that interested stakeholders should provide their comments and input through the company's website page at www.parrogate.com or send their comments to the emails below:

rohitkumar@parrogate.com.zm

steven@parrogate.com.zm

Parrogate

PUBLIC NOTICE

REQUEST FOR COMMENTS ON THE ENVIRONMENTAL IMPACT ASSESSMENT (EIA) FOR PARROGATE GINNERIES OIL PROCESSING PLANT IN LUSAKA, ZAMBIA

Parrogate Ginneries Limited wish to bring to the attention of the members of the public that following the acquisition of the oil processing plant located on Mumbwa Road in the Chinika Industrial area of Lusaka, Parrogate Ginneries Limited have embarked on conducting an Environmental Impact Assessment (EIA) in line with the legal requirements of the Environmental Management Act of 2011, and other mandatory requirements for manufacturing companies to possess EIA certificates or approvals.

It is for this reason that Parrogate as new owners of the plant is conducting an Environmental Impact Assessment (EIA) which will provide an elaborate Environmental Management Plan (EMP) which will be regarded as a standard guidance document of operation to monitor the environment within the plant.

You may wish to know that the Edible Cooking oil processing plant located on Mumbwa Road in Lusaka, was established in early 1960s. For a long time it operated under different owners such as Refined Oil Products (ROP) Ltd; Zambeef, Cargill etc. It is therefore an on-going operation entity on a brown field.

The Environmental Impact Assessment Regulations No. 28 of 1997 provide for the Developer or owner of the business undertaking, to consult various stakeholders through a scoping meeting during the process of developing Terms of Reference of a project. However, given Government's guidelines in relation to COVID-19, it is not appropriate to convene face-to-face public meetings. Instead it is proposed that interested stakeholders should provide their comments and input through the company's website page at www.parrogate.com or send their comments to the emails below:

rohitkumar@parrogate.com.zm

steven@parrogate.com.zm

The deadline for submission of comments is **05th June 2020.**

MINISTRY OF HIGHER EDUCATION

SUPPORT TO SCIENCE AND TECHNOLOGY EDUCATION PROJECT

SPECIFIC PROCUREMENT NOTICE

TENDER FOR THE SUPPLY, DELIVERY AND INSTALLATION OF ICT EQUIPMENT FOR NEWLY CONSTRUCTED AND REHABILITED BUILDINGS UNDER SUPPORT TO SCIENCE AND TECHNOLOGY EDUCATION PROJECT (SSTEP).

Date: *18 May 2020*
Loan No: **21001500194**
IFB No: **MOHE/SSTEP/G/01/2020**

1. This Invitation for Bids (IFB) follows the General Procurement Notice (GPN) for this Project that appeared in *United Nations Development Business online* (***UNDB online***) No. ***[insert number]*** of ***27th January 2015***, and on the African Development Bank's Internet Website (www.afdb.org).
2. The Government of ***the Republic of Zambia has received*** a ***loan*** from the African Development Fund ***(ADF)*** in various currencies towards the cost of implementing the Support to Science and Technology Education Project (SSTEP). It is intended that part of the proceeds of this loan will be applied to eligible payments under the contracts for: the supply, delivery and installation of ICT equipment for the newly constructed buildings at St. Mawaggali in Choma, at NORTEC in Ndola and at Mulungushi University in Kabwe; and the supply, delivery and installation of Desktop Computers.
3. The ***Ministry of Higher Education*** now invites sealed Bids from eligible bidders for ***Lot 1: the supply of various ICT Equipment for Beneficiary Institutions under the Project; and Lot 2: the supply of Computers for Beneficiary Institutions under the Project*** (hereinafter called "the Goods"). National Competitive Bidding will be conducted in accordance with the Bank's ***Rules and Procedures for Procurement of Goods and Works***.
4. Interested eligible bidders may obtain further information from and inspect the bidding documents at the office of ***The Head, Procurement and Supplies Unit, Ministry of Higher Education, P.O. Box 50464, Maxwell House, Longacres, Lusaka. 0966 740451, 0976 883571, Lawrence.simuunza@mohe.gov.zm***.
5. A complete set of Bidding Documents may be purchased by interested bidders upon the submission of a written application to the said Executing Agency, and upon payment of a non-refundable fee of ***Kwacha Seven Hundred and Fifty only (K750.00) or in a freely convertible currency.***
6. The provisions in the Instructions to Bidders and in the General Conditions are those of the Bank's Standard Bidding Document for Procurement of Goods.
7. Bids must be delivered to the above office on or before ***10:30 hours*** on ***19th June 2020*** and must be accompanied by a security of ***K50,000 for Lot 1 and K25,000 for Lot 2.***
8. Bids shall remain valid for ***120 days*** after the deadline for bid submission prescribed above.
9. Bids will be opened in the presence of bidders' representatives who choose to attend at ***10:30 hours*** on ***19th June 2020***, at the offices of ***the Ministry of Higher Education, Ground Floor, Maxwell House,***

APPENDIX C: CERTIFICATE OF INCORPORATION

2791 63460

Republic of Zambia

CERTIFICATE OF INCORPORATION OF A PRIVATE COMPANY LIMITED BY SHARES

(Section 10)

This is to certify that

PARROGATE GINNERIES

..... Limited (full name of company)

is on and from the 30th day of August, 2006

Incorporated as a private company limited by shares.

Given under my hand and Seal at Lusaka, Zambia, this

30th day of August, 2006

B.K. Mwalongo

Assistant Registrar of Companies

(Note that this certificate is not valid unless the official Seal of the Registrar of Companies has been affixed)
Stocked by the Office of the Registrar of Companies

PPENDIX D: CERTIFICATE OF TITLE

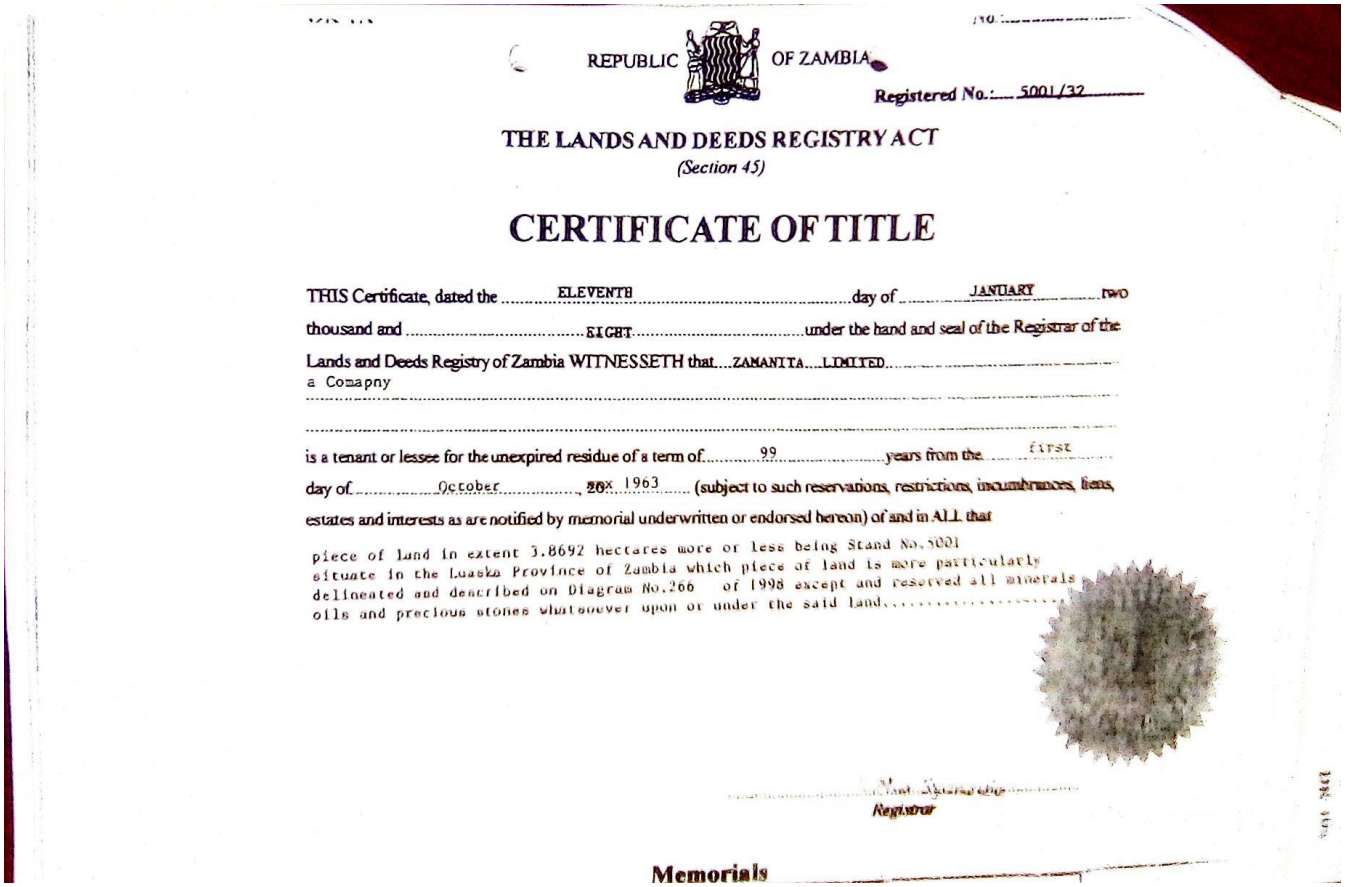
DR 16a

REPUBLIC OF ZAMBIA

CERTIFICATE OF TITLE

No.:...72625.....

Stand No.....5001..... LUSAKA



REPUBLIC OF ZAMBIA

Registered No.: 5001/32

THE LANDS AND DEEDS REGISTRY ACT

(Section 45)

CERTIFICATE OF TITLE

THIS Certificate, dated the ELEVENTH day of JANUARY two thousand and EIGHT under the hand and seal of the Registrar of the Lands and Deeds Registry of Zambia WITNESSETH that ZAMANITA LIMITED a Comapny

is a tenant or lessee for the unexpired residue of a term of 99 years from the first day of October 20~~00~~ 1963 (subject to such reservations, restrictions, incumbrances, liens, estates and interests as are notified by memorial underwritten or endorsed hereon) of and in ALL that

piece of land in extent 3.8692 hectares more or less being Stand No. 5001 situate in the Lusaka Province of Zambia which piece of land is more particularly delineated and described on Diagram No.266 of 1998 except and reserved all minerals oils and precious stones whatsoever upon or under the said land.....

Registrar

Memorials

Registrar

Memorials

Date of Document	Date of Registration	Registered No.		Cancellation
06/01/1965	06/01/1965	5001/1	Subject to the exceptions reservations restrictions restrictive covenants and conditions mentioned contained or referred to in a lease (a copy of which attached hereto) made between The President of the Republic of Zambia of the one part and CITY COUNCIL OF LUSAKA of the other part	
11/01/2008	11/01/2008	5001/33	Mortgage to Barclays Bank Zambia PLC to secure US $10750000 and interest.	
24/07/08	28/07/08	5001/34	Further Charge to Barclays Bank Zambia PLC to secure US $9250000 and intrerest.	
02/07/2010	02/07/2010	5001/35	Discharge of Registered Nos.33 and 34.	
02/07/2010	02/07/2010	5001/36	Mortgage to First National Bank Zambia Limited to secure US$5000000.00 and interest.	
02/07/2010	02/07/2010	5001/37	Discharge of REgistered Nos.33 and 34.	
02/07/2010	02/07/2010	5001/38	Mortgage to First National Bank Zambia Limited to secure US 5,000000 and interest.	
23/06/2011	28/06/2011	5001/39	Discharge of Registered No.38.	
23/06/2011	28/06/2011	5001/40	Mortgage Standard Chartered Bank Zambia PLC to secure US $8500000 and interest.	

PTO

181

48.77	312.51.30
51.89	297.15.00
58.50	27[illegible].[illegible]6.00
75.6[illegible]	260.59.00
94.89	290.50.50
67.06	350.59.00
70.45	80.59.00
105.58	93.[illegible]5.00
84.7[illegible]	95.[illegible].50
97.63	184.37.10
53.53	184.[illegible].10
32.52	156.38.10
30.48	152.51.30

Biyuali
07 05 98

SCALE 1:5000

BEACON DESCRIPTION All are iron pegs in concrete

THE FIGURE A - B - C - D - E - F - G - H - J - K - L - M - N - A

REPRESENTS 3.6692 Hectares

OF LAND BEING Stand 5001 City of Lusaka

SITUATED IN THE Lusaka PROVINCE REPUBLIC OF ZAMBIA

SURVEYED IN January 1964

BY C.P. Harrison and R.C. Coppinger

LAND SURVEYORS

PARENT DIAGRAM NO
SURVEY RECORDS NO 3131/64
S.G. FILE NO C/24/156/1
PLAN NO 27[illegible]/1/6

MAP REFERENCE
City of Lusaka

BINDING

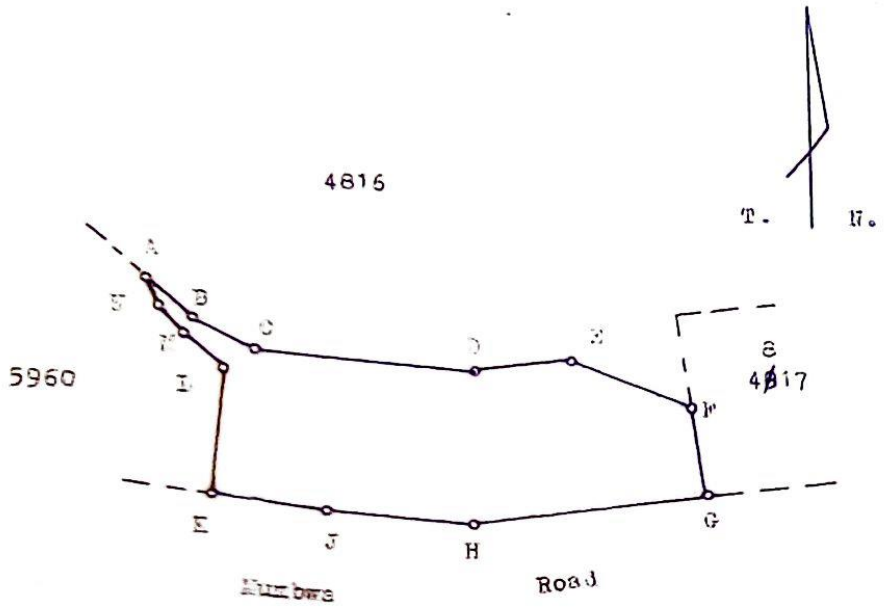
MARGIN

DIAGRAM NUMBER
366/1993

APPROVED

GOVERNMENT SURVEYOR

DATE 07.05.98



Registered 6th January 19 65
Registered No 5001/R Lusaka
Fees Paid 3-10-0
Rec. No 40504 dated 8. 10. 19 64
[illegible] 19

Registry of Deeds,
LUSAKA

Registrar of Land & Deeds

1-10-1
6 65
and L

LEASE NO: 15373

PROVINCE: CENTRAL

STAND NO 5001 LUSAKA

THIS LEASE MADE THE Sixth DAY OF January NINETEEN HUNDRED AND SIXTY-five BETWEEN THE PRESIDENT OF THE REPUBLIC OF ZAMBIA (HEREINAFTER CALLED "THE LESSOR") OF THE ONE PART AND THE CITY COUNCIL OF LUSAKA (HEREINAFTER CALLED "THE LESSEE" WHICH EXPRESSI WHERE THE CONTEXT SO ADMITS INCLUDES ITS SUCCESSORS IN TITLE) OF THE OTHE PART.

WITNESSETH AS FOLLOWS:

1. IN CONSIDERATION OF THE RENT AND PREMIUM HEREINAFTER RESERVED AND THE COVENANTS AND CONDITIONS HEREINAFTER CONTAINED THE LESSOR HEREBY DEMISES UNTO THE LESSEE ALL THAT PIECE OF LAND IN EXTENT NINE ACRES TWENTY-FOUR THOUSAND FOUR HUNDRED AND THIRTY-FOUR SQUARE FEET (9 ACRES 24434 SQUARE FEET) MORE OR LESS BEING STAND NO 5001 SITUATE IN THE CITY OF LUSAKA IN THE CENTRAL PROVINCE OF THE REPUBLIC OF ZAMBIA WHICH PIECE OF LAND IS MORE PARTICULARLY DELINEATED AND DESCRIBED ON DIAGRAM NO 406/1?4 ATTACHED TO THESE PRESENTS (HEREINAFTER CALLED "THE SAID LAND") TO HOLD UNTO THE LESSEE FOR THE TERM OF NINETY-NINE YEARS FROM THE FIRST DAY OF OCTOBER NINETEEN HUNDRED AND SIXTY-THREE (HEREINAFTER CALLED "THE SAID TERM")

HEREINAFTER PROVIDED EXCEPTING AND RESERVING OUT OF THE DEMISE HEREBY MADE ALL MINERALS MINERAL OILS AND PRECIOUS STONES WHATSOEVER UPON OR UNDER THE SAID LAND.

2. THE LESSEE FOR ITSELF AND ITS ASSIGNS HEREBY COVENANTS WITH THE LESSOR AS FOLLOWS:

(1) TO PAY ALL SUCH RATES TAXES ASSESSMENTS AND IMPOSITIONS WHATSOEVER AS MAY HEREAFTER BECOME PAYABLE IN RESPECT OF THE SAID LAND ACCORDING TO LAW.

(2) TO PERMIT DURING THE SAID TERM THE LESSOR OR ANY PERSON OR PERSONS AUTHORISED BY THE LESSOR TO ENTER ON THE SAID LAND AT ANY REASONABLE TIME DURING THE DAY TO LAY OR HAVE ACCESS TO WATER MAINS DRAINS SEWER PIPES TELEGRAPH OR TELEPHONE WIRES AND ELECTRIC MAINS OF ALL DESCRIPTIONS WHETHER THE SAME OR ANY OF THEM BE OVERHEAD OR UNDERGROUND PROVIDED THAT JUST AND FAIR COMPENSATION SHALL BE PAID BY THE LESSOR TO THE LESSEE FOR ANY LOSS OR DAMAGE OCCASIONED THEREBY AND IN DEFAULT OF AGREEMENT AS TO THE AMOUNT OF SUCH COMPENSATION THE SAME SHALL BE REFERRED TO THE ARBITRATION OF TWO INDEPENDENT PERSONS ONE TO BE APPOINTED BY EACH PARTY HERETO OR TO AN UMPIRE APPOINTED BY SUCH ARBITRATORS AND THESE PRESENTS SHALL BE DEEMED A SUBMISSION TO ARBITRATION WITHIN THE ARBITRATION ORDINANCE (CAP. 9 OF THE LAWS OF THE REPUBLIC OF ZAMBIA) OR ANY STATUTORY MODIFICATION OR RE-ENACTMENT THEREOF FOR THE TIME BEING IN FORCE AND SUCH ARBITRATION SHALL BE CONDUCTED IN THE REPUBLIC OF ZAMBIA.

(3) TO PAY ON THE EXECUTION OF THESE PRESENTS THE SUM OF £1.0s.0d BY WAY OF PREMIUM AND £76.10s.0d BEING RENT FOR THE PERIOD FROM THE DATE OF COMMENCEMENT OF THE SAID TERM TO THE THIRTIETH DAY OF SEPTEMBER NINETEEN HUNDRED AND SIXTY-FOUR AND THEREAFTER A YEARLY RENTAL OF £76.10s.0d ON THE THIRTIETH DAY OF SEPTEMBER IN EACH SUCCESSIVE YEAR IN ARREAR FREE OF ALL DEDUCTIONS.

3. THE LESSOR HEREBY COVENANTS WITH THE LESSEE THAT THE LESSEE PAYING THE RENT AND PREMIUM HEREBY RESERVED AND OBSERVING AND PERFORMING THE SEVERAL COVENANTS AND CONDITIONS HEREIN ON THE LESSEE'S PART CONTAINED SHALL PEACEABLY HOLD AND ENJOY THE SAID LAND DURING THE SAID TERM WITHOUT ANY INTERRUPTION BY THE LESSOR OR ANY PERSON LAWFULLY CLAIMING UNDER THE LESSOR.

4. PROVIDED ALWAYS AND IT IS HEREBY MUTUALLY AGREED AS FOLLOWS:

(1) IF AND WHENEVER THE RENT HEREBY RESERVED OR ANY PART

[illegible] THE SAME SHALL [illegible]

[illegible] OF THE [illegible]

[illegible] OBSERVANCE OF ANY OF THE

[illegible] CONTAINED ON THE LESSEE'S PART TO

[illegible] LAWFUL FOR THE LESSOR TO RE-

[illegible] THE SAME AS OF [illegible] ESTATE

[illegible] MADE BUT WITHOUT PREJUDICE TO ANY

[illegible] OF THE LESSOR IN RESPECT OF ANY PRIOR

[illegible] OR NON-OBSERVANCE OF ANY OF THE LESSEE'S

[illegible] CONDITIONS HEREIN CONTAINED.

[illegible] John Falcon Davidson ACTING.

[illegible] OF THE GOVERNMENT OF THE REPUBLIC OF ZAMBIA FOR AND

[illegible] PRESIDENT OF THE REPUBLIC OF ZAMBIA HAS HEREUNTO SET HIS

[illegible] SEAL AND THE COMMON SEAL OF THE CITY COUNCIL OF LUSAKA HAS HERE[illegible]

[illegible] ON THE DAY AND YEAR FIRST BEFORE WRITTEN.

[illegible] SEALED AND DELIVERED

[illegible] THE SAID John Falcon Davidson

FOR AND ON BEHALF OF THE
PRESIDENT OF THE REPUBLIC
OF ZAMBIA IN THE PRESENCE OF:

WITNESS:
ADDRESS: LUSAKA
OCCUPATION: CIVIL SERVANT

THE COMMON SEAL OF

THE CITY COUNCIL OF LUSAKA

WAS HEREUNTO [illegible]
IN THE PRESENCE OF:

1212.

REPUBLIC OF ZAMBIA

CERTIFICATE OF TITLE

No.: 72724

Stand No. 5960 LUSAKA

DR 1A

No.: 72[illegible]64

REPUBLIC OF ZAMBIA

Registered No.: 5960/27

THE LANDS AND DEEDS REGISTRY ACT

(Section 45)

CERTIFICATE OF TITLE

THIS Certificate, dated the ......ELEVENTH...... day of ......JANUARY...... two thousand and ......EIGHT...... under the hand and seal of the Registrar of the Lands and Deeds Registry of Zambia WITNESSETH that......ZAMANITA LIMITED......
a Company incoporated in Zambia and having its registered office at Lusaka
......
is a tenant or lessee for the unexpired residue of a term of......99......years from the......first......day of......June......xx20x..1965......(subject to such reservations, restrictions, incumbrances, liens, estates and interests as are notified by memorial underwritten or endorsed hereon) of and in ALL that

piece of land in extent 2 acres 23849 square feet more or less being Stand No.5960
situate in the Luaska Province of Zambia which piece of land is more particularly
delineated and described on Diagram No. 268 of 1998 except and reserved all minerals
oils and precious stones whatsoever upon or under the said land......

L.M.B. Syanzika

Registrar

Registrar

Memorials

Date of Document	Date of Registration	Registered No.		Cancellation
17/03/1966	17/03/1966	5960/1	Subject to the exceptions reservations restrictions terms... covenants and conditions mentioned contained or referred to in a lease (a copy of which attached hereto) made between The President of the Republic of Zambia of the one part and **CITY COUNCIL OF LUSAKA** of the other part.	
11/01/2008	11/01/2008	5960/28	Mortgage to Barclays Bank Zambia PLC to secure US $10750000 and interest.	
24/07/08	28/07/08	5960/29	Further Charge to Barclays Bank Zambia PLC to secure US $9250000 and interest.	
02/07/2010	02/07/2010	5960/30	Discharge of Registered no.28 and 29.	
02/07/2010	02/07/2010	5960/31	Mortgage to First National Bank Zambia Limited to secure US$5000000.00 and interest.	
02/07/2010	02/07/2010	5960/33	Mortgage to First National Bank ZAmbia Limited to secure US$5000000 and interest.	
23/06/2011	28/06/2011	5960/34	Discharge of Registered No.33.	
23/06/2011	28/06/2011	5960/35	Mortgage to Standard Chartered Bank Zambia PLC to secure US $8500000 and interest.	

PTO

SIDES METRES		ANGLES OF DIRECTION	CO-ORDINATES SYSTEM	
			Y METRES	X
AB	45.77	312.51.10		
BC	30.47	33[illegible].50.00		
CD	32.53	316.41.10		
DE	32.52	304.38.00		
EF	97.60	04.36.50		
FG	43.77	95.11.50		
GH	23.48	131.34.10		
HA	180.94	170.59.00		

[illegible]

24 04 98

SCALE 1: 1250

BEACON DESCRIPTION All are iron pegs in concrete

THE FIGURE A - B - C - D - E - F - G - H - A

REPRESENTS [illegible].0330 Hectares

OF LAND BEING Stand 5960 City of Lusaka

SITUATED IN THE Lusaka PROVINCE REPUBLIC OF ZAMBIA

SURVEYED IN December, 1965

BY J.A. Hewitt

LAND SURVEYOR

PARENT DIAGRAM NO

SURVEY RECORDS NO D221/65

S.G. FILE NO S/24/155/1 Vol. VIII

PLAN NO D221/65

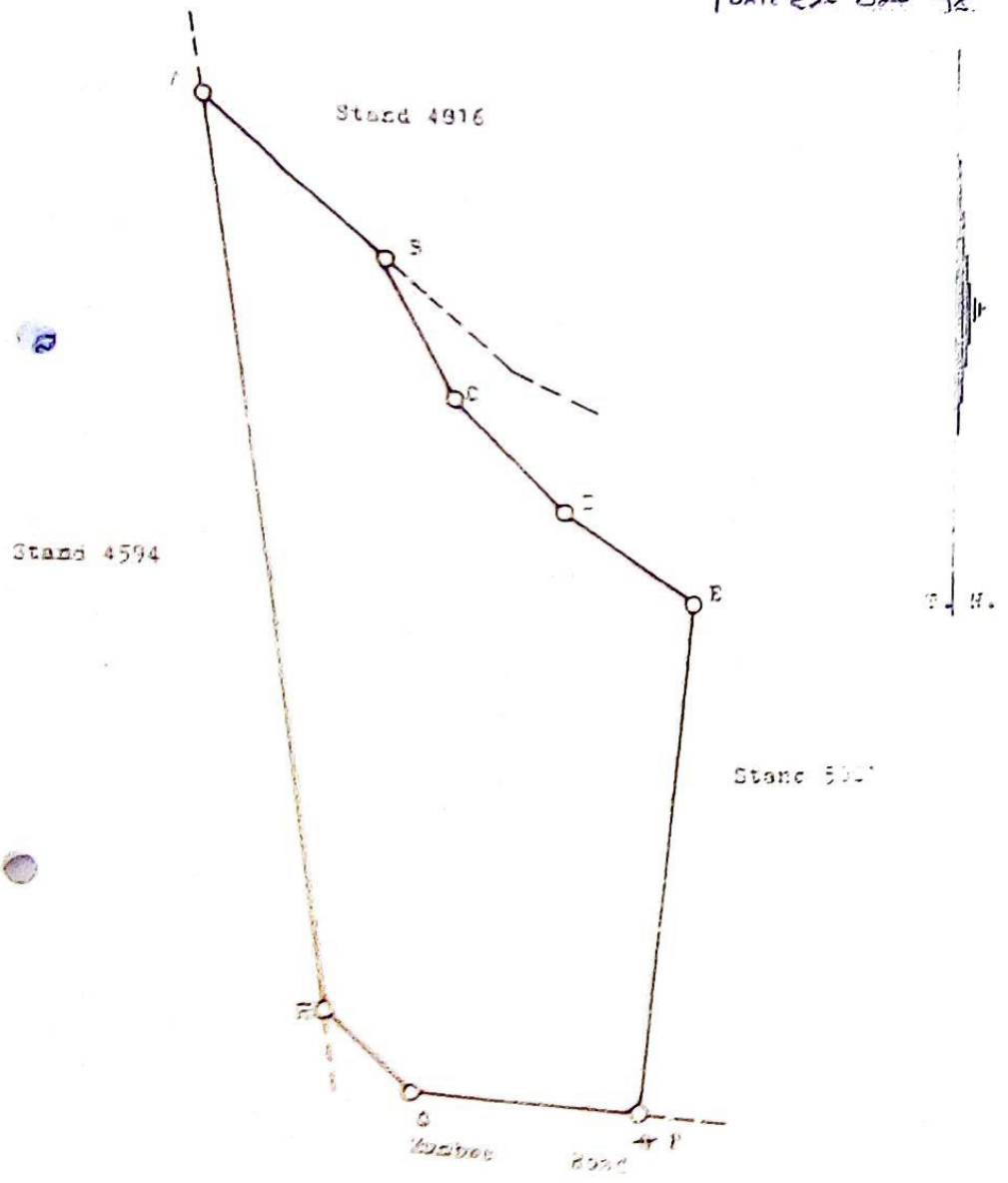
MAP REFERENCE

DIAGRAM NUMBER
368/1794

APPROVED

GOVERNMENT SURVEYOR

DATE 24 OCT 98



17 3 1966.
5960/1 Lusaka

amount
paid
17 3 66

REPUBLIC OF ZAMBIA

Lease No. 15872

Province CENTRAL

Stand No. 5960 LUSAKA

This lease MADE the 17th day of March nineteen hundred and sixty six BETWEEN THE PRESIDENT OF ZAMBIA (hereinafter called " the Lessor ") of the one part and the CITY Council of LUSAKA (hereinafter called " the Lessee " which expression where the context so admits includes its successors in title of the other part).

1. In consideration of the sum of one pound (£1) to the Lessor receipt whereof the Lessor doth hereby acknowledge and of the rent hereinafter reserved and the covenants and conditions hereinafter contained the Lessor hereby demises unto the Lessee ALL THAT piece of land of extent

TWO ACRES TWENTY-THREE THOUSAND EIGHT HUNDRED AND FORTY-NINE SQUARE FEET

(2 ACRES 23,849 SQ.FT.)

more or less being Stand No. 5960 LUSAKA situate in the CENTRAL Province of Zambia which piece of land is more particularly delineated and described on Diagram No. 0 of 19 66 attached to THESE PRESENTS

(hereinafter called "the said land") TO HOLD unto the Lessee for the term of ninety-nine (99) years from the first day of JUNE nineteen hundred and SIXTY-FIVE (hereinafter called "the said term").

YIELDING AND PAYING therefor during the said term the rent as hereinafter provided.

EXCEPTING AND RESERVING out of the demise hereby made all minerals, mineral oils and precious stones whatsoever upon or under the said land.

2. The Lessee for itself and its assigns hereby covenants with the Lessor as follows:

(1) To pay all such rates taxes assessments and impositions whatsoever as may hereafter become payable in respect of the said land according to law.

(2) To permit during the said term the Lessor or any person or persons authorised by the Lessor to enter on the said land at any reasonable time during the day for the purpose of inspection or to lay or have access to water mains drains sewer pipes telegraph or telephone wires and electric mains of all descriptions whether the same or any of them be overhead or underground provided that just and fair compensation shall be paid by the Lessor to the Lessee for any loss or damage occasioned thereby.

(3) To pay on or before the execution of these presents the sum of £.6-16-0 being rent for the period from the date of commencement of the said term to the thirtieth day of September nineteen hundred and SIXTY-FIVE and thereafter a yearly rent of £.20-8-0 on the thirtieth day of September in each successive year in arrear free of all deductions.

3. The Lessor hereby covenants with the Lessee that the Lessee paying the rent hereby reserved and observing and performing the several covenants and conditions herein on the Lessee's part contained shall peaceably hold and enjoy the said land during the said term without any interruption by the Lessor or any person lawfully claiming under the Lessor.

4. PROVIDED ALWAYS and it is hereby mutually agreed as follows:

(1) If and whenever the rent hereby reserved or any part thereof shall be in arrear and unpaid for twenty-eight days after the same shall have become due (whether legally demanded or not) or if the Lessee shall at any time make default in the observance of any of the covenants and conditions herein contained on the Lessee's part to be performed or observed it shall be lawful for the Lessor to re-enter upon the said land and hold the same as of his former estate as if this Lease had not been made but without prejudice to any right of action or remedy of the Lessor in respect of any prior breach non-performance or non-observance of any of the Lessee's covenants or conditions herein contained.

IN WITNESS WHEREOF ....

..................................[illegible]..........................

Commissioner of Lands of the Government of Zambia for and on behalf of the President has hereunto set his hand and seal and the ....CITY..........

Council of ....LUSAKA..........

has affixed its Common Seal on the day and year first before written.

SIGNED SEALED and DELIVERED

by the said ....

..........[illegible]..........

for and on behalf of the President of Zambia in the presence of:

Witness: ....

Address: Lusaka

Occupation: Civil Servant

The Common Seal of the ....CITY..........

Council of ....LUSAKA.......... was here-

unto affixed in the presence of:

.... Councillor

.... Town Clerk

189

APPENDIX E: LEASE AGREEMENT

DATED THE..... DAY OF.....2019

LUSAKA CITY COUNCIL

AND

PARROGATE GINNERIES LIMITED

LEASE AGREEMENT RELATING TO A PIECE OF LAND ON STAND NO. LUS/4816, OFF MUMBWA ROAD, INDUSTRIAL AREA, LUSAKA

TOWN CLERK
LUSAKA CITY COUNCIL
P.O. BOX 30077
CIVIC CENTRE
INDEPENDENCE AVENUE
LUSAKA

THIS LEASE is made on the.....day of.....Two Thousand and Nineteen **BETWEEN LUSAKA CITY COUNCIL** a body corporate established under the Local Government Act No. 2 of 2019 of the Laws of Zambia whose address is P.O Box 30077, Independence Road Civic Centre, Lusaka in the Lusaka Province of the Republic of Zambia (Hereinafter referred to as the "Landlord") of the one part and **PARROGATE GINNERIES LIMITED** a Company incorporated under the companies Act No. 10 of 2017 of the Laws of Zambia (Hereinafter called the "Tenant") and collectively referred to as the "parties".

WITNESSETH as follows: -

1. In consideration of the rent and the Tenant's covenants hereinafter reserved and contained, the Landlord hereby demises unto the Tenant **LAND** and appurtenance described in the schedule attached hereto to **HOLD** the same unto the Tenant for a period of **THREE** (3) years from **1st June 2019** to **31st May ,2022** on terms and conditions hereinafter contained. The Tenant will have the option to renew this lease upon expiry for a further period and on terms agreed upon by both parties.

2. **THE TENANT HEREBY COVENANTS** with the Landlord as follows:-

(a) To pay the Landlord and the Landlord agrees to accept, during the term hereof, at such place as the Landlord shall from time to time direct by notice to the tenant, rent at the following times hereinafter mentioned;

(b) The rental in respect of the demised premises:-

(a) **Annual Net Rent**: Annual rent for the term of the lease shall be **K72, 000.00 (Seventy Two Thousand Kwacha).**

(b) **Monthly rent** shall be **K6, 000.00 (Six Thousand Kwacha)** exclusive of Withholding Tax

(c) **Payment of Annual Rent**: The annual rent shall be payable in advance in equal instalments of one-fourth (1/4) of the total annual

rent, which shall be paid on the first day of each quarter and prorata for the fractional portion of any month.

(d) Reference to annual rent hereunder shall not be implied or construed to the effect that this Lease or the obligation to pay rent hereunder is from year to year, or for any term shorter than the existing Lease term, plus any extensions as may be agreed upon.

(e) **Rent Review:** the demised premises shall be subject to rent review annually.

(iii) To keep the land therein in good tenantable repair and condition except in respect of any injury or deterioration occasioned by ordinary wear and tear by other than natural causes by fire, lightning, tempest or any inevitable accident or by any defects of repair in the roofs, main walls or structure which monies on additions done shall be recovered during the payback period.

(iv) To allow the landlord and its agents and workmen upon giving reasonable notice to the Tenant at all reasonable times to enter the demised premises and thereupon the Landlord may serve upon the Tenant a notice in writing specifying any repairs necessary to be done upon completion of any construction of any building authorized by the Landlord and requiring the Tenant forthwith to execute the same and if the Tenant shall not within fourteen (14) days after notice proceed diligently with the execution of such repair, then to permit the Landlord and its workmen to enter upon the demised premises and execute such repair and the cost thereof shall be a debt due from the Tenant to the Landlord and be forthwith paid failing which it shall be recoverable by action.

(v) Not to assign, underlet or part with or share the possession of or mortgage charge or otherwise encumber the demised premises without the prior consent in writing of the Landlord which consent shall not be unreasonably withheld.

(vi) At all times during the said term to ensure that the demised premises and each part thereof are kept in a good state of repair.

(vii) To keep the whole of the land clean and tidy in a wholesome condition and free from rats, mice and ants and other vermin, and accessible by the public at all reasonable times. The tenant however, may reserve the right of admission upon completing reasonable and approved improvements for the benefit of the public.

(viii) Not to do anything whereby any policy or policies of insurance effected by the Landlord on the demised premises against damage by fire may be rendered void or voidable or whereby the premiums on any such insurance may be increased and to repay to the Landlord forthwith all sums paid by way of increased premiums all expenses incurred by it or any renewal of such policy or policies rendered necessary by breach of the covenant.

(ix) To yield up the land at the determination of the term hereby granted after completion of the building or any extension thereof in good and tenantable repair and condition as shall be in accordance with the terms hereinbefore contained with all locks, keys and fastenings complete.

(x) Not to use or permit to be used the demised premises or any part thereof other than as LAND for a public commercial undertaking duly authorised by the Council.

(xi) Not to make any structural alterations or additions or renovations to the demised premises or any part thereof without the **prior consent in writing** of the Landlord and the Mortgagee (if any) for the time being and not to cut, maim or injure any of the walls or timbers thereof nor to permit any of the aforesaid things to be done after completion of the building.

(xii) To permit the Landlord's Mortgagee (if any) by its appointed officer or agent at all reasonable times to enter upon the demised premises for the purpose of

inspecting the same and carrying out any works of repair which the mortgagee may be entitled to carry out under its mortgage.

(xiii) Not to do or permit to be done anything in or upon the demised premises of an illegal or immoral nature or which may be or become a nuisance or damage to the Landlord or the tenants or occupiers of the remaining portion of the building or the adjoining premises nor to do or suffer any wilful or voluntary waste.

(xiv) To only exhibit any placard, bill, notice or other advertisement with the Landlord's **prior consent in writing** except that which is ordinary to their business nor make nor permit to be made any disturbance, noise, annoyance or whatsoever prejudicial to the premises or to the comfort of any other occupants of any other floors of the said premises nor to do or permit to be done any act or thing which may be or grow to be a nuisance, damage or disturbance of the Landlord or the Landlord's tenants or occupants of the adjoining premises.

(xv) To permit the Landlord or the Landlord's agents or workmen within three (3) calendar months next before the expiration or sooner determination of the term hereby created to enter the demised premises and to put and place on any part thereof a notice board or placard and to permit every person requiring to view the said premises by order in writing from the Landlord or the Landlord's agents to enter into and view the same at all reasonable times during the day time.

(xvi) To indemnify and keep indemnified the Landlord of all costs, charges, claims suits actions or demands to which the Landlord may become liable by virtue of the occupation by the Tenant of the demised premises whether such suits actions or demands arise by virtue of any statute, bye law, regulation or otherwise.

3. **THE LANDLORD HEREBY COVENANTS** with the Tenant as follows:

(i) **That the Tenant paying the rent hereby reserved, and observing and performing all covenants and stipulations herein on its part contained** shall peacefully hold and enjoy the demised premises during the said term without interruption by the Landlord, or any person rightfully claiming through, under or in trust for the Landlord.

(ii) To pay all owners taxes, rates, duties, assessments, impositions present and future or thereafter, during the said term to become payable in respect of the demised premises so far as the Tenant is not liable for such payments under the Tenant's covenants herein contained.

4. **PROVIDED ALWAYS AND IT IS HEREBY AGREED AND DECLARED** as follows:

(i) If the rent hereby reserved or any part thereof shall at any time remain unpaid for Thirty (30) days after becoming due (whether formally demanded or not) or if and whenever there shall be breach by the Tenant of any of its obligations or covenants or stipulations hereunder or if the Tenant or any person or company in which for the time being the term hereby created shall be vested shall become bankrupt or wound up or go into liquidation as the case may be (save for the purpose of amalgamation or reconstruction) then and in any of the said cases it shall be lawful for the Landlord at any time thereafter to re-enter upon the demised premises and thereupon the term hereby created shall be absolutely determined but without prejudice to either party's right of action.

(ii) In case of the demised premises or part thereof at any time during the said term be so destroyed or damaged by fire, storm, tempest or other inevitable accident so as to be unfit for occupation and use and if any policy or policies of insurance effected by the Landlord shall not have been vitiated or payment of the policy monies refused in consequence of some act or default of the

Tenant, the rent hereby reserved or a fair proportion thereof according to the nature and extent of the damage sustained shall be suspended until the demised premises shall again be rendered fit for occupation and use.

(iii) If the Landlord shall re-enter the premises hereby demised during and before the expiry of the period for which rent shall have been paid, the Landlord shall refund the rent to the Tenant for the period the Tenant shall not occupy the demised premises.

(iv) The Landlord and the Tenant shall each have a right to terminate this Lease by giving three (3) months' notice in accordance with clause 4 (v) hereunder and the Lease shall terminate at the expiration of the said period whereby the Landlord shall take possession of the demised premises in a manner and at a time of its choosing.

(v) Any notice required to be served hereunder shall be sufficiently served on the Tenant if sent by registered post to its Registered Office or hand delivered at Lusaka aforesaid and shall be sufficiently served on the Landlord if delivered or sent by registered post or hand delivered to the Office of the Town Clerk at the Civic Centre, Independence Avenue Lusaka.

(vi) If any differences or disputes shall arise between the parties hereto touching their respective rights, duties and liabilities under these presents, the same shall be settled amicably by the parties failing which such a dispute shall be referred to Arbitration to be decided in accordance with the Arbitration Act No 19/2000 of the Laws of Zambia or any statutory modification or re-enactment thereof for the time being in force.

IN WITNESS whereof the Landlord and Tenant have caused their respective common seal and hand to be hereunto affixed the day and year first before written.

The **SCHEDULE** herein before referred to: -

All that piece of land in extent of 3acres more or less being Stand **No. LUS/ 4816** situate in Industrial Area, off Mumbwa Road in the City and Province of Lusaka in the Republic of Zambia except and reserved all minerals, oils and precious stones whatsoever upon or under the said land.

The Common Seal of the)
LUSAKA CITY COUNCIL)
was hereunto affixed)
in the presence of)

7167

.....
TOWN CLERK

.....
DIRECTOR OF LEGAL SERVICES

The Common Seal of the)
PARROGATE GINNERIES LIMITED)
was hereunto affixed in the presence of)

.....
DIRECTOR

.....
COMPANY SECRETARY

APPENDIX F: ZAMAQUA TRADE MARK CERTIFICATE

Form TM No. II

REPLACEMENT CERTIFICATE

Republic of Zambia

The Trade Marks Act

CERTIFICATE OF REGISTRATION OF A TRADE MARK

The Trade Mark shown above has been registered in Part **A** of the Register in the name of **Parrogate Ginneries Limited**, of Plot No. 5001, Mumbwa Road, P.O. Box 50854, Lusaka, Zambia,..... ..... in Class 32 under No 3 J1/2011 as of 5th September, 2011 in respect of mineral water.

Sealed at my direction, this 30th day of October, 2019

B. Mpalo

.....

Assistant Registrar of Trade Marks
The Trade Marks Office,
Lusaka, Zambia.

Registration is for 7 years from the date first above–mentioned and may then be renewed for, and also at the expiration of each period of, 14 years thereafter

NOTE: Upon any change of ownership of this trade mark, or change in the proprietor's name or address, application should AT ONCE be made to the Registrar to register the change

0220645

APPENDIX G: IONISING RADIATION LICENCE

Form IV
(Regulation 6)

THE RADIATION PROTECTION AUTHORITY

The Ionising Radiation Protection Act, 2005
(Act No. 16 of 2005)

The Ionising Radiation Protection (General) Regulations, 2011

Licence No. RPA261/NPG/2020

IONISING RADIATION LICENCE

(Section 22 of the Ionising Radiation Protection Act, No. 19 of 2011)

Holder's name..PARROGATE GINNERIES LIMITED.....

Address.....PLOT NO. 50001, MUMBWA ROAD, LUSAKA.....

The Licensee is authorized to.....USE AND POSSESS THREE (3) PORTABLE NUCLEAR GAUGES

FOR LEVEL MEASUREMENT, DENSITY MEASUREMENT, THICKNESS CONTROL, MOISTURE

MEASUREMENT AND CONTROL AND IN STREAM ANALYSIS OF SLURRIES

This Licence is valid from the 1ST day of JANUARY 20 20
to the 31ST day of DECEMBER 20 20

The conditions of the Licence are as shown in the Annexures attached hereto.

Issued at LUSAKA this 26th day of December 20 19

Secretary

ENDORSEMENT OF REGISTRATION

This Licence has this 26th day of December 20 19 been Entered in the Register.

Chairperson

APPENDIX H: WEIGHBRIDGE ZMA CERTIFICATE

ORIGINAL No.: ZMA 4333

Zambia Metrology Agency

"For confidence in measurements"

ZAMBIA METROLOGY AGENCY

P. O. Box 30989, Tel: +260 211 222 294 Telefax: +260 211 222 297/236 062

OFFICIAL STAMP

CERTIFICATE OF VERIFICATION

Company Name: **PARROGATE GINNERY LTD**
Address: **MUMBWA ROAD LUSAKA**

Equipment Verified	*Serial No.*
1 x 60000 kg METTLER TOLEDO Electronic Road Weighbridge	231

Date of Verification: **2019-06-03** Due Date: **2020-06-02**

Verified by: Bweupe Lombanya
Director Operations: **Humphrey Nkobeni** .....

Certified by/for the Executive Director:....**HIMBA CHEELO** .....

Receipt No:....8719531

This certificate is issued in accordance with Section 18 of the Metrology Act, No. 6 of 2017 of the Laws of Zambia. The certificate may not be published other than in full except with prior written approval of the Executive Director, Zambia Metrology Agency.

NOT VALID WITHOUT OFFICIAL STAMP

"2019-06-17 10:59:03" 3760070805174f7d0cd8722060104480

APPENDIX I: ZEMA LICENCES

Republic of Zambia

Zambia Environmental Management Agency

Environmental Management Act, No. 12 of 2011

SERIAL NO.: **000184**

LICENCE NO.: **LSK/HWL/00169/Z01/2018**

HAZARDOUS WASTE MANAGEMENT LICENCE

Holder's Name: **ZAMANITA ZAMBIA LIMITED**

Address: **P.O BOX 31412, MUMBWA ROAD, LUSAKA**

The licence relates to **Generation and Storage** of hazardous waste.

The licence is granted for a period of **3 Years** commencing on the **25th January, 2018 to 24th day of January, 2021.**

The conditions of grant of the licence are as shown in the Annexures attached hereto.

Issued at **LUSAKA** this 25th day of **January, 2018.**

....
Director-General

ENDORSEMENT OF LICENCE

This Hazardous Waste Licence has this **25th** day of **January, 2018** been entered in the Register.

ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY
21 MAY 2018
LICENSING
P.O. BOX 35131, LUSAKA

Official Stamp

Director General

[redacted]

Republic of Zambia
Zambia Environmental Management Agency

Environmental Management Act, No. 12 of 2011

SERIAL NO.: **00200**

LICENCE NO.: **LSK/EML/00169/Z01/2018**

EMISSION LICENCE

Holder's Name: **ZAMANITA ZAMBIA LIMITED**

Address: **P.O BOX 31412 MUMBWA ROAD, LUSAKA**

The licence relates to the emission or discharge of a pollutant/contaminant to the environment for the following facility and associated location:

(a) **BOILER STACKS at Zamanita Zambia Plot 5000/5001 along Mumbwa Road, Industrial Area, Lusaka.**

The licence is granted for a period of **3 Years** commencing on the **25th day of January 2018, to 24th day of January, 2021.**

The conditions of grant of the licence are as shown in the Annexures attached hereto.

Issued at **LUSAKA** this **25th** day of **January, 2018.**

Director-General

ENDORSEMENT OF LICENCE

This Emission Licence has this **25th** day of **January, 2018** been entered in the Register.

ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY
21 MAY 2018
LICENSING
P.O. BOX 31412, LUSAKA

Official Stamp

Director General

[redacted]

Republic of Zambia

Zambia Environmental Management Agency

Environmental Management Act, No. 12 of 2011

SERIAL NO.: **001645**

LICENCE NO.: **LSK/PTS/00169/Z01/2018**

PESTICIDE AND TOXIC SUBSTANCES LICENCE

Holder's Name: **ZAMANITA ZAMBIA LIMITED**

Address: **P.O BOX 31412 MUMBWA ROAD, LUSAKA**

The licence relates to **Importation** and **Storage** of pesticides or toxic substances.

The licence is granted for a period of **3 Years** commencing on the **25th** day of **January 2018, to 24th** day of **January, 2021.**

The conditions of grant of the licence are as shown in the Annexures attached hereto.

Issued at **LUSAKA** this **21st** day of **May, 2018.**

.....

Director-General

ENDORSEMENT OF LICENCE

This Pesticide and Toxic Substance Licence has this **21st** day of **May, 2018** been entered in the Register.

ZAMBIA ENVIRONMENTAL MANAGEMENT AGENCY

21 MAY 2018

LICENSING

P.O. BOX 35131, LUSAKA

Official Stamp

Director General

[redacted]

APPENDIX J: BUSINESS LEVY CERTIFICATE

LBLC20 No.3815

LUSAKA CITY COUNCIL No. 100005648

CERTIFICATE OF PAYMENT - BUSINESS LEVY

In accordance with the provision of the LOCAL GOVERNMENT ACT No 2 of 2019 as read with Statutory Instrument No 70 of 2011.

This is to certify that (Business Name / Individual)

PARROGATE GINNERIES LTD

Stand No. / Street Name: 5001/5960,MUMBWA RD,CHINIKA,CHINIKA

Has paid a sum of : K 2,499.90

Being payment for (Type of Business)

MANUFACTURERS BUSINESS LEVY-MULTI

For the year of : **2020**

THE FOLLOWING CONDITIONS WILL APPLY

1. Issuance of the above Permit does not preclude Council from effecting othe regulations such as fire, health and building.
2. All reasonable steps shall be taken by Management to ensure orderly behaviour in and around the the premises
3. The Certificate expires on the **31-December-2020**

An application for the renewal should be made not later than 31st October for the permit in respect of the following year.

LUSAKA CITY COUNCIL
CIVIC CENTRE, INDEPENDENCE AVE
10 MAR 2020
PAY BUSINESS & PER
P.O BOX 30077, LUS

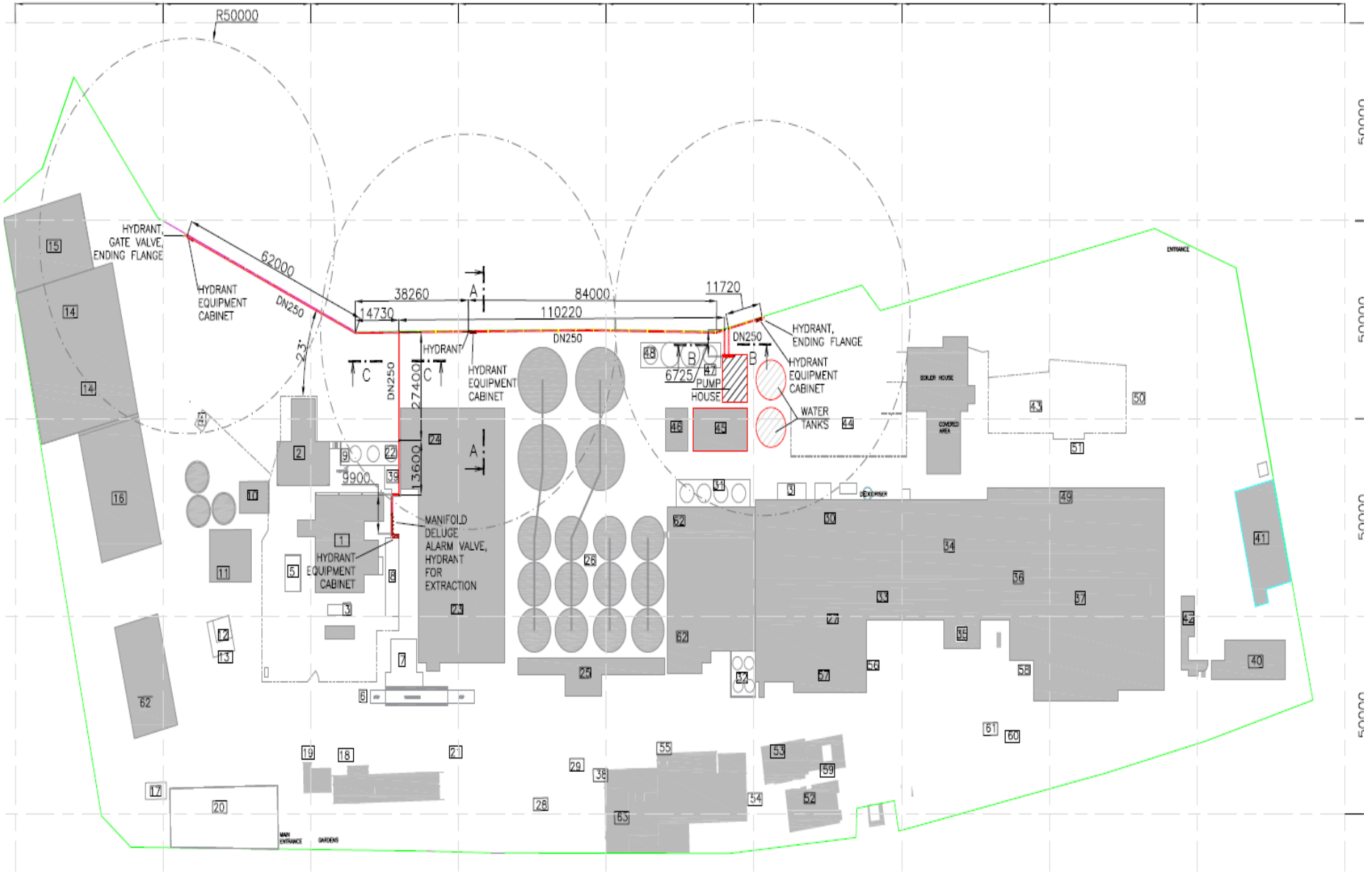
Date: 11-March-2020

RECEIPT No. 01019988

SIGNATURE

Nchimunya Katowa
LICENSING OFFICER

APPENDIX K: COOKING OIL PROCESSING PLANT LAYOUT



APPENDIX L: PARROGATE GINNERIES LTD., LUSAKA, ZAMBIA
ZAMANITA PLANT

FOR SEED STORAGE

8. GIC Sheet silo , Conical bottom - 6 X 1241 MT - 7446 MT (No. 1 to 6) - in operation
9. GIC Sheet silo , Flat bottom - 6 X 1241 MT - 7446 MT (No. 7 to 12) - Not in operation
10. GIC Sheet silo , Flat bottom - 4 X 2244 MT - 8976 MT (No. 13 to 16) - in operation

TOTAL CAPACITY 23686 MT

FOR OIL STORAGE

A) AT TANK FARM

6. Crude Soya , MS Tank , (1 x 205 , 1 x 210 , 1 x 245) - 660 MT
7. Crude Palm , MS Tank (1 X 550 MT) - 550 MT
8. Refined Soya , MS Tank (1 X 65 , 2 X 295 MT) - 655 MT
9. Refined Palm , MS Tank (1 X 550 MT) - 550 MT
10. Soap Stock , MS Tank (1 X 315 MT) - 315 MT

B) AT FILLING SECTION

1. Refined soya , SS Tank (1 X 50 MT) - 50 MT
2. Refined Soya , MS Tank (1 X 40 MT) - 40 MT
11. Refined Palm , SS Tank (1 X 50 MT) - 50 MT
12. Refined Palm , MS Tank (1 X 40 MT) - 40 MT
13. Refined Cotton , SS Tank (1 X 50 MT) - 50 MT
14. Refined Cotton , MS Tank (1 X 25 MT) - 25 MT

C) WARE HOUSE

1. Meal Ware house - 01 No. – size - 22 Mtrs X 32 Mtrs
2. Meal ware house - 0 1 No. – size - 40 mtrs X 35 Mtrs
3. Meal warehouse - 01 no. – size - 20 mtrs X 30 Mtrs
4. Oil dispatch ware house - 01 no - size - 15 Mtrs x 30 Mtrs
5. Chemical ware house - 01 no. – size - 15 Mtrs X 25 Mtrs
6. Plastic ware house - 01 no. - size - 15 Mtrs X 20 Mtrs
7. Store - 1 - 01 no. - size - 15 Mtrs X 50 Mtrs
8. Store – 2 - 01 No. – size - 15 Mtrs X 25 Mtrs
9. Store – 3 - 01 No. – size - 15 Mtrs X 30 Mtrs

APPENDIX M: LABORATORY ANALYSIS CERTIFICATE

Lusaka Water and Sewerage Company Ltd.

Telephone : +260211 257579/257580/257581
: +260 211 257582/257583/250666
Telefax : +260 211 252578/251549
E-mail : lwsc@lwsc.com.zm

All Correspondence to be addressed to the Managing Director

Stand # 871/2
Katemo Road, Rhodes Park
P.O. Box 50198
Lusaka, Zambia

Rev No. 03	Copy No. 1
Document No. 1	
Date issued : 18/09/2015	
Effective date : 21/09/2015	

CERTIFICATE OF ANALYSIS

CLIENT

Client name: Parrogate Ginneries (Zamanita)
Attention: Quality Manager

Physical Address: Plot No. 5000/5001, Mumbwa Road
Lusaka

Telephone:

LABORATORY

Certificate No.: *563.1343/1537 – 05.20*
Date of issue: *May 25, 2020*
Date of sampling: *Apr 27 & May 14, 2020*
Date samples received: *Apr 27 & May 14, 2020*
Date analysis commenced: *Apr 27 & May 14, 2020*
Number of pages: 3
Fax:

Notes
'*' = Public Sewer Discharge Standards
'-'= Not analysed
'ND' = Not done
'MDL' = Method detection limit
'QC' = Quality Control

'TSS' = Total Suspended Solids
'BOD' = Biochemical Oxygen Demand
'COD' = Chemical Oxygen Demand
'SS' = Settleable Solids

Remarks
S' = Satisfactory according to Public Sewer Discharge Standards
'U' = Unsatisfactory according to Public Sewer Discharge Standards

Method of analysis
pH, Conductivity and TDS: Electrometric
Alkalinity, Bicarbonate and Chloride: Titrimetric
COD: Refluxing and Spectrophotometric
BOD: Dissolved oxygen determination using the probe
TSS: Gravimetric

Signature: .....**Designation:** *Senior Chemist*

Date : *May 25, 2020.*

PARROGATE GINNERIES TRADE EFFLUENT QUALITY– MAY 2020

PHYSIO–CHEMICAL ANALYSIS

Sample Identification	Result			Public Sewer Discharge Standard	Remarks
Lab No	*1343*	*1537*	***Average***		
Parameter					
Temp (°C)	23.1	23.1	23.1	**6 0**	S
pH	7.02	7.10	7.06	**6 – 10**	S
BOD (mg/l)	438	502	470	**1 200**	S
COD (mg/l)	1 270	1 456	1 363	**1 800**	S
Chloride (mg/L)	263	404	334	**1 000**	S
SS (ml/L)	1.5	4.5	3.0	**1.0**	U
TSS (mg/L)	148	293	221	**1 200**	S

Key

U: Unsatisfactory
S: Satisfactory
'-': Not done
ND: Not done
BOD: Biological Oxygen Demand
COD: Chemical Oxygen Demand
SS: Settleable Solids
TSS: Total Suspended Solids

Comments

The laboratory results indicate that the average effluent quality failed to meet the **Local Government Act Cap 281- The Local Administration (Trade Effluents) Regulations No.13 of 1994** for Settleable Solids (SS) parameter.

Signature: ..... **Designation:** *Senior Chemist*

Date: *May 25, 2020.*

TRADE EFFLUENT POLLUTION CHARGE (TEPC) COMPUTATION – PARROGATE GINERY

Table No.1: BANDS AND POLLUTION FACTORS FOR COD, SS AND pH PARAMETERS

NO.	Actual COD (mg/L)	COD Factor	Actual Settleable Solids (ml/L)	Settleable Solids Factor	Actual pH	pH Factor
1	0 – 1,800	0	0 - 1.0	0	6 - 10	0
2	1,801 – 2,800	3	1.1 - 5.0	3	(5.9 - 5.0) or (10.1 - 10.8)	5
3	2,801 – 4,800	5	5.1 - 10.0	5	(4.9 - 4.0) or (10.9 - 11.6)	10
4	4,801 – 6,800	10	10.1 - 15.0	10	(3.9 - 3.0) or (11.7 - 12.4)	20
5	6,801 – 15,000	100	15.1 & above	100	≤ 2.9 or ≥ 12.5	100

Table No.2: BANDS AND POLLUTION FACTORS FOR CHLORIDE PARAMETER

NO.	Actual Cl^- (mg/L)	Cl^- Factor
1	1 001 – 2 000	3
2	2 001 – 3 000	5
3	3 001 – 4 000	10
4	4 001 & Above	100

TEPC = $V/1000m^3$ (COD_f + SS_f + pH_f + Cl_f) x C (Kwacha) + fixed charge

Where:

Fixed Charge = Cost of sampling and analysis (***refer to the Appendix I***).

V = Volume discharged in m^3 is 80% of water usage/month
= 8 586 x 0.45
= 3 863.7 m^3 per month

C = Cost per 1000 cubic metres = K36

pH_f = According to pH pollution factor

COD_f = According to Chemical Oxygen Demand factor

SS_f = According to Settleable Solids pollution factor

Total TEPC = 3 863.7/1000(0 + 3 + 0 + 0) x 36 + K 900 = **K 1, 317.28**

Comments

The total trade effluent pollution charge amount of **K 1, 317.28** will be debited to your water/sewer account for the month of June, 2020.

Signature: ..... **Designation:** *Senior Chemist*

Date: *May 25, 2020.*

The *table(2)* below shows the levels of air pollutants in the Flue gas from the Boiler Stack:

Table2: *AIR POLLUTANTS IN THE FLUE GAS*

Parameter	Full Insertion	Half Insertion	Average Results	Flow Rate	ZEMA Limit	Comments
SO_2	*0mg/Nm³*	*0mg/Nm³*	***0mg/Nm³***	***0mg/Nm³/s***	***1000mg/Nm³***	***Acceptable Limit***
CO	*141mg/Nm³*	*120mg/Nm³*	***130.5mg/Nm³***	***0.033mg/Nm³/s***	***175mg/Nm³***	***Acceptable Limit***
CO_2	*0.54%*	*0.32%*	***0.43%***	-	***0.75%***	***Acceptable Limit***
NO_x	*123mg/Nm³*	*94mg/Nm³*	***108.5mg/Nm³***	***0.03mg/Nm³/s***	***750mg/Nm³***	***Acceptable Limit***
NO_2	*0mg/Nm³*	*0mg/Nm³*	*0mg/Nm³*	*0mg/Nm³/s*	*N/A*	*N/A*
O_2	*4.39%*	*1.47%*	*2.93%*	*N/A*	*N/A*	*N/A*
Net Temp	-	-	-	*N/A*	*N/A*	*N/A*
Flue Temp	*32F*	*32F*	*32F*	*N/A*	*N/A*	*N/A*
Ambient Temp	*33⁰C*	*31⁰C*	*32 ⁰C*	*N/A*	*N/A*	*N/A*
Combustion Efficiency	*86%*	*84%*	*85%*	*N/A*	*N/A*	*N/A*

Data source*: **Measurements taken atParrogate Ginneries Limitedon 19/05/20.***

The *table(2)* below shows the levels of air pollutants in the Flue gas from the Boiler Stack:

Table2: *AIR POLLUTANTS IN THE FLUE GAS*

Parameter	Full Insertion	Half Insertion	Average Results	Flow Rate	ZEMA Limit	Comments
SO_2	*0mg/Nm³*	*0mg/Nm³*	***0mg/Nm³***	***0mg/Nm³/s***	***1000mg/Nm³***	***Acceptable Limit***
CO	*141mg/Nm³*	*120mg/Nm³*	***130.5mg/Nm³***	***0.033mg/Nm³/s***	***175mg/Nm³***	***Acceptable Limit***
CO_2	*0.54%*	*0.32%*	***0.43%***	-	***0.75%***	***Acceptable Limit***
NO_x	*123mg/Nm³*	*94mg/Nm³*	***108.5mg/Nm³***	***0.03mg/Nm³/s***	***750mg/Nm³***	***Acceptable Limit***
NO_2	*0mg/Nm³*	*0mg/Nm³*	*0mg/Nm³*	*0mg/Nm³/s*	*N/A*	*N/A*
O_2	*4.39%*	*1.47%*	*2.93%*	*N/A*	*N/A*	*N/A*
Net Temp	-	-	-	*N/A*	*N/A*	*N/A*
Flue Temp	*32F*	*32F*	*32F*	*N/A*	*N/A*	*N/A*
Ambient Temp	*33⁰C*	*31⁰C*	*32 ⁰C*	*N/A*	*N/A*	*N/A*
Combustion Efficiency	*86%*	*84%*	*85%*	*N/A*	*N/A*	*N/A*

Data source*: **Measurements taken atParrogate Ginneries Limitedon 19/05/20.***

Table3; ***Showing Results of Respirable Dust collected at Various Locations.***

Potential Area of Concern	Name of Staff Present	Duration of Sampling (Minutes)	Difference In weight of Filters(mg)	Respirable Dust Concentration ($\mu g/m^3/day$)	ZEMA Limits ($\mu g/m^3/day$)
Boiler/coal Section	Mr. *Chandalala*	30	0.0031	34.72	**50**

Data source:***Measurements taken at Parrogate Ginnery Limitedon 16/04/20.***