

ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT

FOR THE

**PROPOSED REPLACEMENT AND UPGRADE OF FUEL
STORAGE TANKS**

AT

**PUMA LUSAKA DEPOT, PLOT NO.1710, MUNGWI ROAD,
HEAVY INDUSTRIAL AREA, LUSAKA DISTRICT, LUSAKA
PROVINCE**

BY

PUMA ENERGY ZAMBIA PLC



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DH ENGINEERING
CONSULTANTS

PO Box: 37928, Lusaka, Zambia

Telephone: 260 21 1 227176

Fax: 260 21 1 229555

Email: dholfmes@dhengcon.com

EXECUTIVE SUMMARY

This Environmental and Social Impact Statement outlines the environmental impacts and mitigation measures for the proposed replacement and upgrade of fuel storage tanks at the existing Puma Lusaka Depot on plot no.1710, along Mungwi Road, in Lusaka District, Lusaka Province of Zambia. The total area of the Puma Plot is approximately 40,679m² and the depot area covers a total area of 35,800m². The proposed project will take up a total area of approximately 3,150m².

Project Background

Puma Energy Zambia Plc., an established oil marketing company since 1976, operates across the retail, commercial, industrial, lubricants, and aviation sectors, with 69 service stations nationwide. The company has operated the Lusaka Depot for over 50 years, with some fuel storage tanks dating back to 1958. Currently the depot has a storage capacity of 7, 100m³ of which the operational capacity stands at 3,400m³.

Recently, approvals from the relevant authorities have been obtained for four storage tanks designated for storing Jet A1, diesel, and petrol, with a total storage capacity of 7,000 m³. The new tanks will be installed in the northwestern and north-central parts of the plot.

In the northeastern part of the plot, six old tanks currently exist. These tanks have reached the end of their design life, exhibiting critical defects and requiring replacement to ensure continued safe and efficient operations. If left as is, use of these tanks will result in environmental contamination. It is with this background that Puma Energy Zambia Plc wish to replace these tanks an upgrade the depot. As part of the depot upgrade, the proponent plans to replace and upgrade the six old tanks with four modernized tanks at the same location, enhancing storage capacity, safety, and efficiency. This upgrade will increase the total fuel storage capacity, with each of the four new tanks having a capacity of 2,500 m³ for storing diesel and petrol, resulting in a total additional capacity of 10,000 m³.

The proposed upgrade (10,000 m³) combined with the recently approved capacity (7,000 m³) will increase the depot's total storage capacity from 7,100 m³ to 17,000 m³.

Objective of the Project

The objective of the project is to decommission the six outdated tanks in the north eastern part of the Puma Lusaka Depot site and replace them with four modernized storage tanks, thereby increasing the facility's fuel storage capacity, safety, efficiency and ensuring compliance with industry safety and environmental standards.

Project Lifespan

The lifespan of the project is indefinite with the tanks needing repair after a period of 25 – 30years.

Project Location

The site is in the heavy industrial area surrounded by built up infrastructure for industrial use. The site is on plot no.1710 along Mungwi Road, Lusaka District, Lusaka Province. The site is located at approximately 5.9km north-west of Lusaka CBD (Lusaka Main Post Office). The site is easily accessible by road as it is serviced by a good tarred road, from Lusaka CBD (Lusaka Main Post Office), head north on T2 (Great North Road) until Kabwe roundabout. From Kabwe roundabout head west on Kalambo Road for about 500m and then turn right onto Lumumba Road and continue for approximately 1.7km, then turn left onto Mungwi Road and continue for approximately 1.3km, the site will be on the right hand side.

The major landmarks in the project area are the Puma Lusaka Depot itself, Total Energies Fuel Depot and the old Caltex Fuel Depot.

Table 1: GPS Coordinates of the Puma Lusaka Depot

Point	Zone	Easting	Northing	Elevation
A	35L	634447.00m E	8297357.00m S	1276m
B		634789.00m E	8297579.00m S	1277m
C		634787.00m E	8297587.00m S	1277m
D		634642.00m E	8297616.00m S	1276m
E		634628.00m E	8297610.00m S	1276m
F		634620.00m E	8297613.00m S	1277m
G		634591.00m E	8297463.00m S	1277m
H		634652.00m E	8297450.00m S	1277m
I		634649.00m E	8297439.00m S	1277m
J		634655.00m E	8297437.00m S	1277m
K		634642.00m E	8297378.00m S	1277m

Shareholders

Puma Energy Zambia PLC will be responsible for the development of the proposed replacement and upgrade of the Puma Lusaka Depot and will hold the operating approvals. The shareholding is as follows:

Table 2: Puma Energy Zambia Plc Shareholding

NAME	NATIONALITY	SHAREHOLDING %
Puma Energy Ireland Holdings Ltd	Irish	75
Lusaka Stock Exchange	Zambian	25

Investment Cost

The total cost of the project is estimated to be about USD 5,345,000 and is expected to commence as soon as all approvals are obtained. The project is scheduled to be completed within a period of 9 months.

Project Description

Puma Energy Zambia Plc. proposes to replace and upgrade the existing fuel depot by installing new, modern fuel storage tanks to enhance safety, efficiency, and capacity.

The replacement and upgrade will take place in the northeastern part of the plot, which is currently occupied by six old tanks. These old tanks will be removed and replaced with four modernized fuel storage tanks, each with a capacity of 2,500 m³, at the same location. This upgrade will enhance storage capacity, safety, and efficiency, resulting in a total additional capacity of 10,000 m³.

Existing oil interceptors will be retained to manage drainage from the tank farm, directing runoff through a fuel interceptor to prevent fuel leaks into the environment. The new tanks will be used for storing diesel and petrol. The new tanks will be;

- Above-ground vertical steel tanks, welded and constructed in accordance with American Petroleum Institute (API) 650 standards. They will be leak-proof and equipped with emergency vents, containment inspection ports, and inlet and outlet pipes located near the base of the tank, ladders/platforms, and valves to regulate fuel flow and prevent leaks.
- The tanks will also have a vapour recovery system designed to capture and reduce fuel vapours, minimizing environmental impact.
- Installed in a concrete-bunded area on an impermeable floor to ensure compliance with Zambian standards and Energy Regulation Board (ERB). Each tank will be installed in its own bunded area. The bund wall will be 0.2m thick and 3.5m high. The volume of the tank bunded area will be approximately 2,750m³ large enough to contain over 110% volume of the tank which is 110% x 2,500m³, should the tank fail, to prevent environmental pollution. The area of this bund will be approximately 784.09m².
- Interchangeable between diesel and petrol.
- Seamlessly integrated with existing depot infrastructure, including rail and truck offloading/loading facilities, operational drainage and containment systems, and the existing concreted depot flooring.

The proposed upgrade (10,000 m³) combined with the recently approved capacity (7,000 m³) will increase the depot's total storage capacity from 7,100 m³ to 17,000 m³.

This upgrade will modernize the depot, enhance operational efficiency, and ensure long-term regulatory compliance, reinforcing Puma Energy Zambia Plc.'s commitment to safe and sustainable fuel storage operations.

The approach to the development of the project would thus seek to set up the project with the long-term intention of achieving integration and sustainability. The project seeks to stimulate local economic activities, with the provision of vast array of economic opportunities and fixed employment as well as proper storage of bulk fuel.

Generally, major activities of this project will include:

- Decommissioning of the existing tanks and pipes in the north eastern part of the depot
- Construction of four new bunded areas
- Installation of 4 x 2,500m³ fuel storage tanks in separate bunded areas
- Installation of new pipes to connect the new tanks to existing infrastructure (rail and truck offloading/loading facilities)
- The project will be executed in two phases. Phase 1 will involve the installation of the first two tanks (2 × 2,500 m³), while Phase 2 will involve the installation of the remaining two tanks (2 × 2,500 m³) at a later stage. Each of these phases will have a preparation phase, construction phase, operation phase and decommissioning phase.

Technology

The technology that will be used to implement the proposed development during the project phases will be both human and machine labour. Some of the essential machinery to be used include: pumps, gas-freeing equipment, cold cutting tools, mobile cranes, waste containers & skips, environmental monitoring equipment, excavators, compactors, concrete mixers, formwork & shuttering equipment, rebar cutters & benders, tank rollers & positioners, hydraulic jacking systems, welding machines & plasma cutters, sandblasting & coating equipment, scaffolding & man lifts, pipework fabrication equipment, leak testing equipment, fire suppression systems, gas detection & monitoring systems, spill containment equipment, and personal protective equipment (PPE).

During operation

- The types of tanks to be installed are vertical steel tanks. The tanks schematic drawings are attached as an annex of this report.
- The piping will be steel piping with complete containment features to ensure no fuel spills to ground. Secondary containment of the piping will be installed which ensures that if a leak was to occur the fuel would not leak to ground, but flow through to a containment sump and then flow to the oil interceptor and thus be detected and acted upon.
- Each tank will be installed in a bund wall with a capacity of 110% of the tank volume

- Each tank will be constructed on a reinforced concrete base with anchoring systems to prevent movement due to hydrostatic forces.
- Each tank will be equipped with inlet and outlet pipes located near the base of the tank. These pipes will be fitted with high pressure pipelines connected to pumps for efficient loading/unloading.
- Each tank will be equipped with valves to regulate fuel flow and prevent leaks.
- The tanks will also have a vapour recovery system designed to capture and reduce fuel vapours, minimizing environmental impact.
- Waste streams with oil contents will be channelled to the purpose designed drainage system. Drainage will be via an oil interceptor.
- Fire safety technologies to be incorporated - The tanks will be installed aboveground in a concreted bunded area protected against impacts from vehicles and any other thing that may result in impacts that may cause sparks and eventually fire risks. Warning signs will be put around the fire sensitive areas to ensure that naked flames, smoking and use of cell phones around these areas will be strictly prohibited. The tank farm area will have a fire fighting system around. This will include foam and sand. The tanks themselves will be equipped with top and side pourers for cooling the tanks.

Alternatives Considered

The alternatives considered are as follows:

➤ **Project Alternatives**

The proponent had two project alternatives, which is the no action option or to implement the proposed project.

- i. The proposed project alternative means replacing and upgrading the existing Puma fuel depot by installing new, modern fuel storage tanks to enhance safety, efficiency, and increase the fuel storage capacity. The proposed project will involve decommissioning of the six old tanks which are old and are showing signs of structural defects and if these tanks were used in their current condition would result in environmental contamination. The proposed project alternative is in the best interest of the developer and their customers. Implementing the proposed project will ensure environmental protection and prevent product loss which would otherwise arise if the existing tanks are left as is. The tanks to be used would be new and installed in such a way that contamination to the environment would be prevented.
- ii. No Action Alternative – The no-action option meant not implementing the proposed project. The current capacity of the depot is not adequate to meet this growing demand of both diesel and petrol fuel at the Puma existing service stations and consumer facilities. Currently as it is, the six existing fuel storage tanks have reached the end of their design life, making their replacement

necessary to ensure continued safe and efficient operations. The no action alternative risks environmental contamination. The no action alternative is not in the best interest of the developer, their customers and the environment.

Looking at the condition of the existing tanks, the no action alternative was not in the best interest of the developer. The developer chose the proposed project alternative (option i) that is demolishing the old tanks and replacing them with new tanks to ensure compliance to environmental regulations and also prevent product loss.

➤ Technology and / or Design Alternatives

Technology Alternatives

No technology alternatives were considered. The following is the technology that the developer will use as they have been using this technology for their fuel installations. The new tanks will sit on a concreted floor having a concrete bund to ensure that no fuel leaks to soil and underground water courses. Human and machine labour will be used for the proposed replacement and upgrade of fuel tanks.

The developer will use machinery including excavators, cranes, welding machines, compactors and pressurizers as technologies for installing the tanks. Compactors ensure that all soil is properly compacted before operations commence. Pressurizers are to pressure-test the valves so that they operate efficiently.

There are no alternatives to these technologies because they are the approved technologies for fuel storage tank installations and have been deemed as safe and in compliance with the ZABS standards for the installation of above ground fuel storage tanks.

Tank Installation Alternatives

Three types of tank installations were considered for the project namely; underground storage tanks (USTs), containerized storage tanks and skid tanks or aboveground storage tanks.

The developer decided to install aboveground storage tanks for the proposed project as they present less risk of contamination of soil, surface and groundwater from potential leaks due to tank failure which has potential to impact on public health of other users of underground water. The developer also chose to install above ground tanks due to the large quantities of fuel to be stored on site. The tanks will be installed above ground on a concreted plate in a banded area large enough to contain 110% of the largest tank full capacity. With regard to aesthetics the tanks will be painted and designed in a way that prevents odour from the smell of commodities ensuring that there is full compliance to ZABS standards. To reduce the risk of fire the tanks will have top and side pourers for cooling the tanks.

➤ Site Alternatives

The proposed project site is the existing Puma Energy Lusaka Depot, where the developer intends to replace the old existing fuel tanks and upgrade the depot by installing four new aboveground fuel storage tanks of a larger capacity, each within a dedicated bunded containment area to ensure compliance with environmental, safety, and regulatory standards. Given that the project involves upgrading an already established fuel depot, no alternative sites were considered.

➤ Water Supply

Currently, the Puma Lusaka Depot premises is serviced by Lusaka Water and Sanitation Company for water supply supplemented by a site borehole with adequate yield; therefore, water supply demand will be from the Lusaka Water and Sanitation Company supplemented by an existing borehole. No other alternatives were considered.

➤ Sewage Management

The Puma Lusaka Depot premises have on it existing toilets connected to Lusaka Water and Sanitation Company sewage management system. For the proposed project, the existing toilets will be used as they are sufficient, hence no other alternatives were considered.

➤ Power Supply

The Puma Lusaka Depot premises are already connected to ZESCO for power supply and also have a backup generator which is used in case of load shedding. The same will be used as the source of power supply for the proposed project. No other alternatives were considered as the power needs for the proposed project would not result in a significant increase in the current power load.

Regulatory Framework

The project falls under the second Schedule of the Environmental Impact Assessment (EIA) Regulations of the Environmental Management Act No. 12 of 2011 as amended by Environmental Management (Amendment) Act No. 8 of 2023, and it is therefore a requirement that an Environmental Impact Assessment (EIA) study be carried out. The EIA study should also include Environmental policies and framework.

This study took into account the following relevant legislation:

1. The Environmental Management Act No. 12 of 2011 as amended by Environmental Management (Amendment) Act No. 8 of 2023.
2. Environmental Impact Assessment Regulations (No.28 of 1997)
3. Environmental Management (Licensing) Regulations, SI No. 112 of 2013
4. The Standards Act No. 4 of 2017
5. Local Government Act No. 2 of 2019

6. The Water Resources Management Act No. 21 of 2011
7. The Zambia National Public Health Institute Act, No.19 of 2020
8. Statutory Instrument No. 21, Public Health (Corona Virus) Infectious Disease
9. Statutory Instrument No. 22 of 2020, the Public health (infected areas) (Corona Virus Disease) Regulations, 2020
10. The Public Health (Notifiable Infectious Disease) (Declaration) Notice, 2020
11. Urban and Regional Planning Act No. 3 of 2015
12. The Occupational Health and Safety Act, No. 36 of 2010,
13. Roads and Road Traffic Act No. 2 of 2011
14. The Workers' Compensation Act No. 10 of 1999
15. Solid Waste Regulations & Management Act No. 20 of 2018
16. The Lands Act No. 20 of 1996 read as one with the Lands Amendment Act No 20 of 2015
17. The Public Roads Act No. 12 of 2002
18. The Employment Code Act No. 3 of 2019
19. National Council for Construction Act No. 10 of 2020
20. The Factories Act cap 441 No. 2 of 1966
21. The Petroleum Act No. 8 of 1995
22. The Energy Regulation Act No. 12 of 2019
23. The ERB Guidelines for Sitting Petroleum Infrastructure 1st Rev, 2022
24. The Gender Equity and Equality Act No.22 of 2015
25. The National HIV/AIDS/STI & TB Council Act No. 10 of 2002 read as one with The National HIV/AIDS/STI/TB Council (Amendment) Act, No. 8 of 2021
26. Metrology Act No.7 of 2017
27. The Water Supply and Sanitation Act No. 28 of 1997

Baseline Study

The baseline study included the following tasks:

- A desk study was undertaken wherein the consultant concentrated on available data, documents and literature with information relevant to the study.
- Several field trips/surveys were conducted by the study team at the site and surroundings to gather information on the existing environment including topography, soils, fauna and flora, population and settlement, air and noise quality, economic activities and existing physical infrastructure relevant to the environment study.

Identified Environmental and Social Impacts of the Project, Mitigation and Enhancement measures

The proposed replacement and upgrade of the fuel tanks at Puma Lusaka Depot is expected to lead to some negative environmental impacts and social-economic changes which may have implications for the local environment. The project will also have positive impacts which may benefit the local environment. The table below outlines the potential impacts, mitigation and enhancement measures.

Table 3: Potential Impacts, Mitigation/Enhancement Measures

NEGATIVE IMPACT	MITIGATION MEASURE
<p>Negative impacts on the ecology:</p> <ul style="list-style-type: none"> The proposed development will be handling fuel waste and during operation will be stocking large quantities of fuel which should be properly managed to ensure limited release of fumes into the natural environment so as to not result in negative change to the existing atmosphere. Negative change to the existing atmosphere would be the release of exhaust fumes from leaded petrol which results in depletion of the ozone layer and thereby negatively affect the ecosystem. 	<ul style="list-style-type: none"> Fuel will be stored in above ground tanks installed in a concrete bunded area preventing fuel spills All machinery will be serviced reducing emissions and fuel/oil spills into the environment The Developer will only stock non-lead (unleaded) containing fuel at the proposed site. This will mitigate the release of ozone that would come from leaded fuels
<p>Noise pollution during both construction and operation phases:</p> <ul style="list-style-type: none"> This will be from construction machinery, works on site and from increased traffic congestion. During operation phase, this will be due to movement of vehicles to and from the fuel depot. 	<ul style="list-style-type: none"> All vehicles and equipment will be regularly maintained to ensure that they are mechanically sound. Where workers are exposed to elevated sound levels, use of PPE such as ear muffs/plugs will be mandatory. Construction works will be limited to daytime. The site will have a clearly defined access route.
<p>Impacts on areas of historical, archaeological and cultural significance</p>	<ul style="list-style-type: none"> The developer will ensure that if anything is found on site that may be of historical, archaeological or cultural significance, the findings are reported to NHCC.
<p>Air quality:</p> <ul style="list-style-type: none"> Dust from exposed work sites and access roads 	<ul style="list-style-type: none"> Exposed areas on site will be watered by use of a hose and sprinkler system to suppress dust All fine material (sand, cement, etc.) capable of being raised by the wind and causing air nuisance will be stock piled wholly within the construction site.

<p>Waste generation:</p> <ul style="list-style-type: none"> Waste from the proposed project will include, fuel waste, hazardous waste, sewage waste and domestic waste which will include plastics, paper waste, empty cement bags etc. 	<ul style="list-style-type: none"> Removed tank shells will be cleaned on site and sold/given to steel scrap utilization companies Hydrocarbon waste including sludge from the existing tanks will be temporarily disposed of in a drum that will be clearly marked as hazardous waste and will be covered at all times. This hazardous waste bin will be collected by an approved hazardous waste collection agency for further treatment or disposal. Sewage waste will be managed by the use of existing toilets connected to LWSC sewer system Solid waste will be collected in bins at various locations on site and then collected by a local council approved waste collection company. At all phases of the project there shall be no burning of waste and the bins to be used for waste will be leak proof and contained preventing scatter of waste. During operation, the oil interceptor (hydrocarbon waste) will be cleaned out by a licensed company.
<p>Impact on landscape and aesthetics:</p> <ul style="list-style-type: none"> Installation of tanks and compacting using heavy machinery has the potential to change the natural landscape and may therefore have an impact on local aesthetics. 	<ul style="list-style-type: none"> The project’s impact on landscape and aesthetics is minor because it fits within an already industrial environment. Also the new tanks will be a replacement of existing tanks
<p>Pollution of ground water, and contamination of soils</p> <ul style="list-style-type: none"> Contamination of sub soil and water features by sewage and leakages of fuel/oils from construction machinery. Fuel/oil leakages from machinery and fuel storage tanks Waste pollution 	<ul style="list-style-type: none"> There will be an effective machine maintenance system ensuring that all equipment used on site has no fuel leaks/oil spills. Sewage waste will be managed by the use of existing toilets connected to LWSC sewer system The developer will ensure that the construction site has defined stockpile areas for construction material preventing runoff of construction material. There are no natural drainage features passing through the site. Machinery to be adequately maintained, and fuel storage to be contained to prevent any fuel/oil leakages into the water resources Sound waste management protocols to be observed.
<p>Occupational, Public Health Concerns:</p> <ul style="list-style-type: none"> Accidents/ near misses and or fatal occurrences 	<ul style="list-style-type: none"> Puma Energy adheres to internationally recognized standards and holds certifications for ISO 9001 (Quality Management), ISO 14001 (Environmental Management), and ISO 45001 (Occupational Health and Safety Management), the latter

	<p>being a recent addition. These certifications reflect the company’s strong commitment to ensuring that every individual returns home safely after work. The HSSE Policy is to safeguard the health, safety, security, and well-being of the workforce, customers, and the communities Puma Energy interacts with.</p> <ul style="list-style-type: none"> • All workers will be trained and reoriented in occupational health and safety. Applicable protocols will be firmly enforced. • All workers will be provided with personal protective equipment. Only well qualified and experienced workers will be tasked to drive vehicles and operate machinery.
Influx of people to the project area	<ul style="list-style-type: none"> • The influx of people to the project area will be discouraged by giving priority in employment to local residents. The Contractor will also be encouraged to procure supplies from local sources to the maximum extent possible.
Spread of HIV/AIDS	<ul style="list-style-type: none"> • There will be a system for education and sensitization of construction workers on the dangers of HIV/AIDS together with the promotion of self-protection e.g. by use of condoms will be the key intervention.
<p>Road traffic and safety risks:</p> <ul style="list-style-type: none"> • Road traffic accidents 	<ul style="list-style-type: none"> • The site is in an industrial area with carefully designed access roads allowing for vehicular circulation. The tanker drivers will be obliged to obey the speed limit signs. • An alternative parking area has been designated for all Puma Energy trucks, ensuring that only the required number of trucks are called in as needed. • RDA has been engaged on signage and speed humps but feedback has not yet been received. The truck turning lane issue will be revisited with RDA and a traffic risk assessment will be conducted to address any concerns.
POSITIVE IMPACTS	ENHANCEMENT MEASURES
<ul style="list-style-type: none"> • Enhancement of visual appearance 	<ul style="list-style-type: none"> • The upgrade will enhance the visual appearance of the site by replacing older infrastructure with modern tanks, while construction-related impacts will be temporary and localized.
<ul style="list-style-type: none"> • Provision of temporary and permanent employment. 	<ul style="list-style-type: none"> • Workers will be employed based on merit and skills and not based on relationship with the developer, race, gender or tribe.
<ul style="list-style-type: none"> • Capacity building for the local community and contribution to the growth of the construction industry. 	<ul style="list-style-type: none"> • The developer will ensure that the people working on the site will have the knowledge on the technologies used on the site and the reasons why certain tasks are performed will be explained.

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<ul style="list-style-type: none">• Increased public revenue	<ul style="list-style-type: none">• All relevant taxes will be paid and also contributions will be made to NAPSA for formally employed persons.
<ul style="list-style-type: none">• Convenience in the supply of fuel	<ul style="list-style-type: none">• The developer will ensure that the fuel tanks are always stocked to ensure adequate supply of fuel and thereby promoting convenience. The levels of fuel in the tanks will be monitored.

Public Consultation and Disclosure

A scoping meeting was held on 18th February, 2025 (at this meeting the plan presented was to remove the six old existing tanks in the north eastern part of the Puma Depot and installing 4 x 2500m³ which will increase the depot capacity ultimately bringing the total capacity to 17,000m³). A public disclosure meeting was held on 10th April, 2025 (at this meeting the same plan was presented and comments that could not be addressed in the previous meeting were addressed). Minutes of the two meetings are attached as an annex of this report.

The following were the concerns raised and how they have been addressed.

Table 4: Concerns Raised and how they have been addressed

Concerns Raised	How Concerns Were Addressed
<p>1. A concern was raised regarding whether the fire-fighting plans for the depot extension have been submitted to and approved by the relevant authorities.</p>	<p>1. The concern was addressed by clarifying that no drawings have been submitted at this stage because the project is still undergoing ZEMA approval. It was explained that, once this approval is obtained, comprehensive plans for the entire facility will be submitted to the relevant authorities—including the ERB, RDA, and the local council—to facilitate the Fire Department’s review of the proposed fire safety and emergency response measures.</p>
<p>2. Concerns were raised about potential traffic congestion and safety risks due to the increased storage capacity, given the already high volume of fuel tankers in the area. Additional concern was expressed regarding the fire hazard posed by individuals collecting residual fuel from departing trucks. Clarification was requested on the measures in place to mitigate these risks.</p>	<p>2. An alternative parking area has been designated for all Puma Energy trucks, ensuring that only the required number of trucks is called in as needed. To prevent fuel scavenging, the operational exit process has been improved, with trucks undergoing thorough drainage to eliminate any residual fuel. Although incidents occurred in the past, none have been reported in the last six months, and recent cases have been rare. Operations have been structured to eliminate opportunities for fuel collection, and security measures—including the deployment of state police officers—are being enhanced in line with the increased storage capacity to ensure a secure environment around the facility.</p>
<p>3. It is important to acknowledge that groundwater contamination has previously occurred, with traces of carbon detected. While this may result from past incidents, it is essential to implement effective measures in the current setup to prevent further contamination and address any potential worsening of the situation.</p>	<p>3. Puma Energy conducts annual underground water analysis to monitor for hydrocarbons and has invested in reinforced concrete bunding, Advanced Tank Detection (ATD) systems, and alarm mechanisms ensure early detection and containment of leaks. Oil skimmers and expanded interceptors are used for spill</p>

	<p>management and environmental protection.</p> <p>In the EIA groundwater will be a key focus, with water samples collected and sent to UNZA for testing. Reviewing historical data will help track changes and assess potential contamination sources. Establishing baseline environmental conditions is crucial for future comparisons, enabling easier identification of contamination sources if issues arise in the future.</p> <p>Water samples were collected and the results indicate that the water from the existing borehole is compliant to the Zambian (ZABS) standards and WHO permissible guidelines. As such the water is considered portable.</p>
<p>4. A concern was raised regarding whether alternative locations were considered for the depot, given the area’s history of industrial use and ongoing urbanization, which raise questions about the site’s suitability for the proposed fuel depot upgrade.</p>	<p>4. Puma management decided to improve and make the best use of the current depot site rather than relocate, which would mean abandoning it without any upgrades. The focus is on cleaning and enhancing existing infrastructure to continue developing the site responsibly. Relocation was deemed impractical due to potential new risks and the extensive safety assessments already conducted at the current site. Puma also coordinated with stakeholders and ensured proper emergency measures are in place to manage risks effectively.</p>
<p>5. Concerns were raised regarding the anticipated timeline for the decommissioning process, the disposal locations for materials, potential impacts on neighbouring communities, and the mitigation measures that will be implemented to address any effects on the surrounding area.</p>	<p>5. 3-4 weeks tentatively.</p> <p>Decommissioning fuel storage tanks involves risk assessment, safety planning, and cleaning the tanks to remove fuel and contaminants. Tanks are then disconnected, removed and sold to scrap dealers, with hazardous materials disposed of according to ZEMA regulations. If soil contamination is found, it is treated using bioremediation and removed for proper disposal. The site is then restored by backfilling affected areas with clean material and re-compacting them to meet environmental standards, ensuring minimal environmental impact and compliance with regulations</p>
<p>6. A concern was raised regarding whether there are plans with the RDA to create special entrances or adjust truck turn lanes in order to improve traffic flow and reduce congestion.</p>	<p>6. RDA has been engaged on signage and speed humps but feedback had not yet been received. The truck turning lane issue will be revisited with RDA and a traffic risk assessment will be</p>

	conducted to address any concerns.
7. A concern was raised regarding measures put in place in case of tank failure.	7. The tanks are surrounded by thick concrete bund walls and a reinforced concrete area, with comprehensive measures in place to ensure proper containment of any potential spills or leakages.

Conclusion

Puma Energy Zambia Plc. proposes to replace and upgrade the fuel storage tanks at the Puma Lusaka Depot, plot no.1710, Mungwi Road, Heavy Industrial Area, Lusaka District, Lusaka Province. The total area of the Puma Plot is approximately 40,679m² and the depot area covers a total area of 35,800m². The proposed project will take up a total area of approximately 3,150m².

The replacement and upgrade will take place in the northeastern part of the plot, which is currently occupied by six old tanks. These old tanks will be removed and replaced with four modernized fuel storage tanks, each with a capacity of 2,500 m³, at the same location. The new tanks will be used for storing diesel and petrol.

This upgrade will enhance storage capacity, safety, and efficiency, resulting in a total additional capacity of 10,000 m³. The proposed upgrade (10,000 m³) combined with the recently approved capacity (7,000 m³) will increase the depot’s total storage capacity from 7,100 m³ to 17,000 m³.

This upgrade will modernize the depot, enhance operational efficiency, and ensure long-term regulatory compliance, reinforcing Puma Energy Zambia Plc.'s commitment to safe and sustainable fuel storage operations.

Generally, major activities of this project will include:

- Decommissioning of the existing tanks and pipes in the north eastern part of the depot
- Construction of four new bunded areas
- Installation of 4 x 2,500m³ fuel storage tanks in separate bunded areas
- Installation of new pipes to connect the new tanks to existing infrastructure (rail and truck offloading/loading facilities)

Existing oil interceptors will be retained to manage drainage from the tank farm, directing runoff through a fuel interceptor to prevent fuel leaks into the environment. The components of the project will be designed to comply with the relevant Zambian standards and regulations.

The project rationale is to replace and upgrade the aging storage tanks in the north eastern part of the depot, which have reached the end of their design life and pose environmental contamination risks. The company aims to enhance the depot’s storage capacity, safety, and operational

efficiency through this upgrade. The project involves replacing six old tanks with four modernized tanks with a larger capacity, thereby increasing the total fuel storage capacity.

The project will be undertaken in three phases that is preparation, construction and operation phase. During these phases of the project, there will be negative impacts on the biophysical and socio-economic environment. The negative impacts anticipated include air and noise pollution, potential ground water pollution, soil contamination, and occupational health and safety risks. The developer has proposed measures to mitigate the negative impacts that this project is likely to have on the environment.

The project also has significant positive impacts such as employment opportunities, economic revenue (i.e. taxes to the country) that the development will bring, capacity building, and convenience in the supply of fuel and a better-looking facility.

Recommendations

1. The developer should strictly adhere to the Environmental and Social Management Plan (ESMP) to ensure that potential negative impacts of the project are effectively mitigated.
2. A robust monitoring system should be established to regularly assess environmental conditions and worker safety in line with the project's environmental commitments and approved plans. Key parameters to be monitored include:
 - Water quality
 - Solid waste management
 - Fire preparedness and maintenance of firefighting equipment
 - Occupational and public health and safety
 - Site security
 - Soil quality
3. Equipment that produces heat, sparks, or open flames must be prohibited near the fuel storage area to prevent ignition of fuel vapors.
4. The site should enforce a strict no-smoking policy near fuel storage tanks and designate specific vehicle routes and parking areas to reduce fire hazards.
5. Access to the site must be controlled and restricted to authorized personnel only.
6. Fire suppression systems, spill containment structures, and zoning requirements must be regularly inspected and maintained to ensure they function effectively in reducing safety and environmental risks.

NON TECHNICAL SUMMARY (ENGLISH)

The Project

Puma Energy Zambia Plc., an established oil marketing company since 1976, has operated the Lusaka Depot for over 50 years, with some fuel storage tanks being very old and needing to be replaced.

The proposed project involves replacing and upgrading the existing fuel depot by installing four new, modern fuel storage tanks to improve safety, efficiency, and capacity. The new tanks will each hold 2,500 m³ of fuel, increasing the depot’s storage by 10,000 m³. The upgrade will occur on the northeastern part of the site, where six old tanks will be removed.

The fuel storage will continue to store diesel and petrol, and existing systems to manage drainage and prevent leaks will remain in place. The project will not affect the current staff; the same employees will remain after the upgrade, with about 20 people working during construction.

The project will begin once all the necessary approvals are in place and construction works will take about 9 months to be completed.

Location

The project is located in a heavy industrial area on Mungwi Road, about 5.9 km northwest of Lusaka's central business district. It is easily accessible by a well-maintained road.

Investment Cost

The total cost of the project is USD 5,345,000.

Potential Impacts and Mitigation Measures

Table 5: Potential Impacts, Mitigation/Enhancement Measures

NEGATIVE IMPACT	MITIGATION MEASURE
Harm to the Environment (Ecology & Climate): <ul style="list-style-type: none"> Fuel spills and machine leaks could harm the environment. 	<ul style="list-style-type: none"> Fuel will be stored safely in tanks with strong containment structures. Machinery will be regularly serviced to prevent leaks and reduce emissions.
Noise Pollution: <ul style="list-style-type: none"> Construction and fuel truck movements could cause noise. 	<ul style="list-style-type: none"> Work will only happen during the day. Vehicles and machines will be kept in good condition, and workers will use ear protection when needed.
Effects on important historical, archaeological, and cultural places	<ul style="list-style-type: none"> If something important is found on site, like old objects or special places, the developer will tell NHCC about it.
Air quality: <ul style="list-style-type: none"> Dust from construction could affect 	<ul style="list-style-type: none"> Water will be sprayed to control dust, and fine materials will

nearby air.	be stored properly.
<p>Waste generation:</p> <ul style="list-style-type: none"> The project will produce different types of waste, including hazardous fuel waste and domestic rubbish. 	<ul style="list-style-type: none"> Sewage waste will be managed by existing toilets connected to LWSC sewage system. All waste will be collected, stored, and disposed of by approved companies. No burning will take place, and all bins will be leak-proof.
<p>Effect on how the project site looks:</p> <ul style="list-style-type: none"> Installing tanks and using heavy machines may affect the area’s appearance. 	<ul style="list-style-type: none"> Since this is an industrial zone and the tanks are replacing old ones, visual changes will be minor.
<p>Ground water and soil pollution:</p> <ul style="list-style-type: none"> There’s a risk that underground water and soil could be polluted by things like sewage, oil leaks from machinery, fuel and poor waste handling. 	<ul style="list-style-type: none"> All equipment used on site will be well-maintained to avoid leaks. Toilets will be connected to the city sewer system to manage sewage safely. Construction materials will be stored in designated areas to stop them from being washed away into the environment. Importantly, the site doesn’t have any natural water channels running through it, which reduces the risk of pollution spreading. Fuel storage will also be carefully managed to avoid leaks, and strong waste handling practices will be followed to protect the environment.
<p>Worker and Public Safety:</p> <ul style="list-style-type: none"> Risks of accidents or health issues during the project. 	<ul style="list-style-type: none"> The company follows strict international safety standards and trains all workers in health and safety. Protective gear will be provided, and only skilled workers will operate equipment.
<p>A lot of new people coming to the project area</p>	<ul style="list-style-type: none"> Jobs and supplies will be prioritized for local residents.
<p>Spread of HIV/AIDS</p>	<ul style="list-style-type: none"> Workers will be taught about the dangers of HIV/AIDS through site talks and how to protect themselves, like using condoms.
<p>Road traffic and safety risks:</p> <ul style="list-style-type: none"> Road traffic accidents 	<ul style="list-style-type: none"> The project area has well-designed roads for vehicles. Drivers will have to follow speed limits and watch out for animals. Traffic will be managed with designated truck parking, clear signs, and engagement with road authorities. A traffic risk assessment will be done.

POSITIVE IMPACTS	ENHANCEMENT MEASURES
<ul style="list-style-type: none"> • Better Site Appearance - Replacing old tanks with new ones will make the site look more modern and tidy. 	<ul style="list-style-type: none"> • Temporary mess from construction will be cleaned up quickly.
<ul style="list-style-type: none"> • Provision of short term (construction) jobs 	<ul style="list-style-type: none"> • Workers will be hired based on their abilities and qualifications, not because of who they know, their race, gender, or tribe.
<ul style="list-style-type: none"> • Skills Development - Locals working on the project will learn new skills and technologies. 	<ul style="list-style-type: none"> • Workers will be taught how and why tasks are done, improving their knowledge.
<ul style="list-style-type: none"> • More Public Revenue 	<ul style="list-style-type: none"> • The project will contribute to the country’s economy by paying all required taxes and making social security contributions (NAPSA) for employees.
<ul style="list-style-type: none"> • Reliable Fuel Supply 	<ul style="list-style-type: none"> • The developer will ensure that the storage tanks well-stocked at all times, with regular checks to ensure there’s always enough fuel.

In summary, while the project has some environmental, health, and safety risks, strong controls and preventive measures are in place to manage them. At the same time, the project brings clear benefits, including job opportunities, skill-building, a more reliable fuel supply, and a better-looking facility.

There will be close monitoring at all phases (construction, operation and decommissioning phases) of the project to ensure the environment is protected.

NON TECHNICAL SUMMARY (NYANJA)

Polojekiti Iyi

Puma Energy Zambia Plc ndi kampani yopanga mafuta kuyambira 1976, yagwira ntchito ya Lusaka Depot kwa zaka zopitilira 50, ndipo akasinja osungira mafuta omwe amakalamba kwambiri ndipo akufunika kuchosedwa.

Polojekiti yofunsidwa imaphatikizapo kusinthanitsa ndi kukweza mafuta omwe alipo pokhazikitsa akasinja anayi atsopano, mafuta osungira mafuta amakono kuti apititse patsogolo chitetezo, chogwira ntchito, komanso kuthekera. Akasinja atsopano azikhala ndi mafuta a 2,500, kuwonjezera posungirako ndi 10,000 m³. Kukweza kudzachitika kumpoto chakum'mawa kwa malowa, komwe akasinja asanu ndi limodzi akale amachotsedwa.

Kusungidwa kwa mafuta kukupitilizabe kusungitsa dizilo ndi petulo, ndi machitidwe omwe alipo kuti azitha kupendekera komanso kupewa kutaya kutsalira. Ntchitoyi siyikhudza antchito omwe alipo; Ogwira ntchito omwewo amakhala atatsala izi, pafupifupi anthu 20 akugwira ntchito nthawi yomanga.

Ntchitoyi iyamba kamodzi zovomerezeka zonse zili m'malo mwake ndi ntchito zomanga zimatenga miyezi 9 kuti zithetsedwe.

Malo

Pulojekitiyi ili pamalo opangira mafakitale ku Mungwi Road, pafupifupi 5.9 km kumpoto chakumadzulo kwa Chigawo cha bizinesi ya Lusaka. Imapezeka mosavuta ndi msewu wokhazikika.

Mtengo Wogulitsa

Mtengo wonse wa ntchitoyi ndi USD 5,345,000.

Zomwe Zingachitike Komanso Njira Zochepetsa

Table 6: Zokhudza Zomwe Zingachitike, Kuchepetsa/Kukulitsa Miyeso

Zotsatira Zoyipa	Njira Yochepetsa
<p>Kuvulaza chilengedwe (zachelengedwe ndi nyengo):</p> <ul style="list-style-type: none"> Kutulutsa kwa mafuta ndi zochokera ku makina kumatha kuwononga chilengedwe. 	<ul style="list-style-type: none"> Mafuta azisungidwa bwino m'matanki okhala ndi zipilala zamphamvu. Makina adzamasulidwa pafupi pafupi kuti aletse kutaya ndikuchepetsa mpweya.
<p>Kuipitsa Kwaphokoso:</p> <ul style="list-style-type: none"> Kumanga ndi mayendedwe ya malole akunyamula mafuta kumathetsa phokoso. 	<ul style="list-style-type: none"> Ntchito zichitike masana. Magalimoto ndi makina azikhala bwino, ndipo ogwira ntchito amagwiritsa ntchito chitetezo pakamatu.

<p>Zotsatira za mbiri yofunika, zofukula zakale, zakalekale, komanso zikhalidwe</p>	<ul style="list-style-type: none"> • Ngati chinthu chofunikira kupezeka patsamba, monga zinthu zakale kapena malo apadera, wopanga adzadziwitsa a NHCC za izi.
<p>Mpweya wabwino:</p> <ul style="list-style-type: none"> • Fumbi kuchokera ku zomanga kumatha kukhudzanso mpweya wapafupi. 	<ul style="list-style-type: none"> • Madzi azithiridwa kuti ayang'anire fumbi, zinthu zabwino zidasungidwa bwino.
<p>Kupanga kwa zinyalala:</p> <ul style="list-style-type: none"> • Polojekitiyi itulutse mitundu yosiyanasiyana ya zinyalala, kuphatikizapo zinyalala zowopsa zamafuta komanso zinyalala zapakhomo. 	<ul style="list-style-type: none"> • Zinyalala zamu zimbudzi zidzayendetsedwa ndi zimbudzi zomwe zimalumikizidwa ndi dongosolo la LWSC. • Zinyalala zonse zidzasonkhanitsidwa, kusungidwa, ndi kutayidwa ndi makampani ovomerezeka. Palibe kuwotcha kudzachitika, ndipo ma bini onse adzakhala osataya madzi.
<p>Zotsatira za momwe polojekiti imaonekela:</p> <ul style="list-style-type: none"> • Kukhazikitsa matanki ndikugwiritsa ntchito makina olema kungakhudze malowa. 	<ul style="list-style-type: none"> • Chifukwa aya ndi malo ya mafakitale ndiponso akubwezeretsa matanki atsopano pamalo amatanki okalamba, kusintha kowoneka kudzakhala kocheperako.
<p>Madzi apansi ndi kuipitsidwa kwa dothi:</p> <ul style="list-style-type: none"> • Chiwopsezo chakuti madzi pansi panthaka ndi nthaka zitha kuipitsidwa ndi zinthu monga mawonekedwe a chimbudzi, kutayikira mafuta kuchokera kumakina, mafuta ndi zinyalala. 	<ul style="list-style-type: none"> • Zipangizo za zida zonse zomwe zimagwiritsidwa ntchito pamalopo zidasamalidwa bwino. • Zimbudzi zidzalumikizidwa ndi njira ya zonyansa kuti akasunge zimbudzi mosamala. • Zipangizo za zomangamanga zidasungidwa m'malo omwe osankhidwa kuwaletsa ku chilengedwe. • Chachikulu malo aya alibe njira zachilengedwe zamadzi zimadutsamo, zomwe zimachepetsa chiopsezo chowonongeka. • Kusungidwa kwa mafuta kudzathandizanso kupewa kutaya, ndipo zabwino zinali zakusamalira zinyalala zidzatsatiridwa kuti ziteteze zachilengedwe.
<p>Wantchito komanso chitetezo pagulu:</p> <ul style="list-style-type: none"> • Ziwopezo za ngozi kapena zovuta pa nthawi ya polojekitiyi 	<ul style="list-style-type: none"> • Kampani imatsata miyezo yamayiko otetezedwa padziko lonse lapansi ndi maphunziro onse ogwira ntchito komanso chitetezo. Zovala zoteteza zidzaperekedwa, ndipo ogwira ntchito aluso okha amagwiritsa ntchito zida.
<p>Anthu ambiri atsopano akubwera ku malo a polojekitiyi</p>	<ul style="list-style-type: none"> • Zochita ndi zinthu zidzakonzedwa m'malo mwa anthu okhala mderalo.

<p>Kufalikira kwa HIV / AIDS</p>	<ul style="list-style-type: none"> Ogwira ntchito aziphunzitsidwa za kuopsa kwa HIV / AIDS kudzera patsamba komanso momwe angadzitetezere, monga kugwiritsa ntchito makondomu.
<p>Msewu wamagalimoto ndi chitetezo:</p> <ul style="list-style-type: none"> Ngozi zapamsewu 	<ul style="list-style-type: none"> Dera la polojekitiyi ili ndi misewu yopanga bwino yamagalimoto. Madalaivala amayenera kutsatira malire ndikuziyang'anira nyama. Mayendedwe ya magalimoto adza yanganidwa ndi malo yo pumulisa magalimoto, zisonyezo zomveka, ndikusebenza ndi olamulira misewu. Mayeso pankani ya mayendedwe ya magalimoto adza chitidwa.
<p>Zotsatira Zabwino</p>	<p>Njira Zowonjezera</p>
<ul style="list-style-type: none"> Kuonekera bwino kwa mawonekedwe - Kusintha ma tanki akale ndi kuletapo atsopano kudzapangitsa kuti malowa aziwoneka bwino. 	<ul style="list-style-type: none"> Kuchita nkhanza kusokonekera kudzatsukidwa mwamsanga.
<ul style="list-style-type: none"> Kupasidwa yachidule (yazomanga) nchito 	<ul style="list-style-type: none"> Anchito adzasankidwa ndi ziyeneretso zawo, osati chifukwa cha omwe amadziwa, mtundu wawo, kapena fuko lawo.
<ul style="list-style-type: none"> Kukula Kwa Kudziwa - Anthu ogwira ntchito pa polojekitiyi aphunzira kudziwa ndi matekinoloje atsopano. 	<ul style="list-style-type: none"> Ogwira ntchito aziphunzitsidwa momwe ndi chifukwa chake amagwira, kukonza chidziwitso chawo.
<ul style="list-style-type: none"> Kuwonjezera Ndalama Za Anthu Wamba 	<ul style="list-style-type: none"> Polojekiti iyi ithandizira kuti dziko lizipereka msonkho wonse polipira misonkho yonse ndikupereka zopereka zachitetezo cha anthu.
<ul style="list-style-type: none"> Kupereka Mafuta Modalira 	<ul style="list-style-type: none"> Wojambulayo atsimikiza kuti akatswiri osungirako zinthu anali otanganidwa nthawi zonse, ndikuyang'ana pafupipafupi kuti awonetsetse mafuta okwanira nthawi zonse.

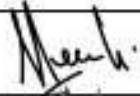
Mwachidule, pamene polojekitiyi ili ndi chilengedwe china, thanzi, ndi chitetezo, zowongolera zamphamvu komanso njira zodzitetezera zili m'malo kuti zisaziyang'anire. Nthawi yomweyo, ntchitoyi imabweretsa zabwino zambiri, kuphatikizapo mwayi, luso lomanga luso, mafuta odalirika, komanso malo abwino owoneka bwino.

Padzakhala kuwunikirana kwambiri mbali zonse (zomanga, opaleshoni ndikuthamangitsa) za polojekiti kuti zitsimikizire kuti malowo amatetezedwa.

THE ESIA TEAM

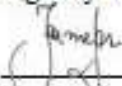
The Environmental Impact Assessment study for the proposed replacement and upgrade of fuel tanks at the Puma Lusaka Depot was undertaken by the Environmental Consultants’ Team and other professional consultants shown in the table below:

Table 7: ESIA Study Team

Name	Qualification	Signature
Danny Holmes	Lead Consultant. Environmental Engineer and Water quality Specialist / EIA Specialist	
Patrick Haambayi	Design/Construction/ Managing Director. Civil Engineer	
Baron Chatupa	Construction Management. Civil Engineer	
Bernadette Chola	Environmental Specialist	
Tobias Muyaba	Social Economic Specialist	
Tiwine Mwanza	Environmental Specialist	
Mubanga Fwambo	Environmental Officer	
Godfrey Mulenga	Environmental and Air Quality Specialist	

Management Statement

We trust the above provides a fair and accurate Executive Summary of the Environmental Impact Assessment studies for the proposed replacement and upgrade of fuel storage tanks at the Puma Lusaka Depot, plot no.1710, Mungwi Road, Heavy Industrial Area, Lusaka District, Lusaka Province by Puma Energy Zambia Plc presented to the Zambia Environmental Management Agency for consideration and approval.



 Director

Puma Energy Zambia Plc

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ABBREVIATIONS AND ACRONYMS

AMSL	Above Mean Sea Level
CBD	Central Business District
DC	District Commission
DPI	Department of Infrastructure
EIA	Environmental Impact Assessment used interchangeably with ESIA
EIS	Environmental Impact Statement used interchangeably with ESIA or EIA report
EMA	Environmental Management Act
EMMP	Environmental Management and Monitoring Plan
EPB	Environmental Project Brief
ESIA	Environmental and Social Impact Assessment used interchangeably with EIA
GPS	Global Positioning System
GRZ	Government of the Republic of Zambia
HIV/AIDS	Human Immune Virus/ Acquired Immune deficiency Syndrome
NHCC	National Heritage Conservation and Commission
NAPSA	National Pensions Scheme Authority
NCS	National Conservation Strategy
NEAP	National Environmental Action Plan
PAYE	Pay As You Earn
PPE	Personal Protective Equipment
SI	Statutory Instrument
TOR	Terms of reference
UNCCC	United Nations Framework Convention on Climate Change
VAT	Value Added Tax
ZABS	Zambia Bureau of Standards
ZEMA	Zambia Environmental Management Agency
ZESCO	Zambia Electricity Supply Corporation
ZRA	Zambia Revenue Authority

1.0 INTRODUCTION

1.1 Background

Puma Energy Zambia Plc., an established oil marketing company since 1976, operates across the retail, commercial, industrial, lubricants, and aviation sectors, with 69 service stations nationwide. The company has operated the Lusaka Depot for over 50 years, with some fuel storage tanks dating back to 1958. Currently the depot has a storage capacity of 7,100m³ of which the operational capacity stands at 3,400m³.

Recently, approvals from the relevant authorities have been obtained for four storage tanks designated for storing Jet A1, diesel, and petrol, with a total storage capacity of 7,000 m³. The new tanks will be installed in the northwestern and north-central parts of the plot and are expected to be commissioned by April, 2025.

In the northeastern part of the plot, six old tanks currently exist. These tanks have reached the end of their design life, exhibiting critical defects and requiring replacement to ensure continued safe and efficient operations. If left as is, use of these tanks will result in environmental contamination. It is with this background that Puma Energy Zambia Plc wish to replace these tanks an upgrade the depot. As part of the depot upgrade, the proponent plans to replace and upgrade the six old tanks with four modernized tanks at the same location, enhancing storage capacity, safety, and efficiency. This upgrade will increase the total fuel storage capacity, with each of the four new tanks having a capacity of 2,500 m³ for storing diesel and petrol, resulting in a total additional capacity of 10,000 m³.

The proposed upgrade (10,000 m³) combined with the recently approved capacity (7,000 m³) will increase the depot's total storage capacity from 7,100 m³ to 17,000 m³.

In line with the provisions of the Environmental Management Act No. 12 of 2011 as amended by Environmental Management (Amendment) Act No. 8 of 2023, and the Environmental Impact Assessment Regulations SI No. 28 of 1997, An Environmental and Social Impact Assessment study of the proposed development which included assessment of the ecological, environmental and socio-economic impacts of the project components where undertaken and the findings of the study are included in this report.

1.2 Project Rationale

As it stands, the six existing fuel storage tanks in the northeastern part of the Puma Lusaka Depot site have reached the end of their design life and are exhibiting critical structural defects. This poses a risk of product loss due to potential tank failure and the need for extensive site clean-up.

The project rationale is to replace and upgrade the aging storage tanks in the north eastern part of the depot, which have reached the end of their design life and pose environmental contamination risks. The company aims to enhance the depot's storage capacity, safety, and operational efficiency through this upgrade. The project involves replacing six old tanks with four modernized tanks with a larger capacity, thereby increasing the total fuel storage capacity.

1.3 Project Description

Puma Energy Zambia Plc. proposes to replace and upgrade the existing fuel depot by installing new, modern fuel storage tanks to enhance safety, efficiency, and capacity.

The replacement and upgrade will take place in the northeastern part of the plot, which is currently occupied by six old tanks. These old tanks will be removed and replaced with four modernized fuel storage tanks, each with a capacity of 2,500 m³, at the same location. This upgrade will enhance storage capacity, safety, and efficiency, resulting in a total additional capacity of 10,000 m³.

Existing oil interceptors will be retained to manage drainage from the tank farm, directing runoff through a fuel interceptor to prevent fuel leaks into the environment. The new tanks will be used for storing diesel and petrol. The new tanks will be;

- Above-ground vertical steel tanks, welded and constructed in accordance with American Petroleum Institute (API) 650 standards. They will be leak-proof and equipped with emergency vents, containment inspection ports, and inlet and outlet pipes located near the base of the tank, ladders/platforms, and valves to regulate fuel flow and prevent leaks.
- The tanks will also have a vapour recovery system designed to capture and reduce fuel vapours, minimizing environmental impact.
- Installed in a concrete-bunded area on an impermeable floor to ensure compliance with Zambian standards and Energy Regulation Board (ERB). Each tank will be installed in its own bunded area. The bund wall will be 0.2m thick and 3.5m high. The volume of the tank bunded area will be approximately 2,750m³ large enough to contain over 110% volume of the tank which is 110% x 2,500m³, should the tank fail, to prevent environmental pollution. The area of this bund will be approximately 784.09m².
- Interchangeable between diesel and petrol.
- Seamlessly integrated with existing depot infrastructure, including rail and truck offloading/loading facilities, operational drainage and containment systems, and the existing concreted depot flooring.

The proposed upgrade (10,000 m³) combined with the recently approved capacity (7,000 m³) will increase the depot's total storage capacity from 7,100 m³ to 17,000 m³.

This upgrade will modernize the depot, enhance operational efficiency, and ensure long-term regulatory compliance, reinforcing Puma Energy Zambia Plc.'s commitment to safe and sustainable fuel storage operations.

The approach to the development of the project would thus seek to set up the project with the long-term intention of achieving integration and sustainability. The project seeks to stimulate local economic activities, with the provision of vast array of economic opportunities and fixed employment as well as proper storage of bulk fuel. Generally, major activities of this project will include:

- Decommissioning of the existing tanks and pipes in the north eastern part of the depot
- Construction of four new bunded areas

- Installation of 4 x 2,500m³ fuel storage tanks in separate bunded areas
- Installation of new pipes to connect the new tanks to existing infrastructure (rail and truck offloading/loading facilities)

The project will be executed in two phases. Phase 1 will involve the installation of the first two tanks (2 × 2,500 m³), while Phase 2 will involve the installation of the remaining two tanks (2 × 2,500 m³) at a later stage. Each of these phases will have a preparation phase, construction phase, operation phase and decommissioning phase.

1.4 Objectives of the Project

The objective of the project is to decommission the six outdated tanks in the north eastern part of the Puma Lusaka Depot site and replace them with four modernized storage tanks, thereby increasing the facility’s fuel storage capacity, safety, efficiency and ensuring compliance with industry safety and environmental standards.

1.5 Proposed Project Cost and Implementation Date

The total cost of the project is estimated to be about USD 5 345 000 and is expected to commence as soon as all approvals are obtained. The project is scheduled to be completed within a period of 9 months.

1.6 Brief Description of the Location

The site is in the heavy industrial area surrounded by built up infrastructure for industrial use. The site is on plot no.1710 along Mungwi Road, Lusaka District, Lusaka Province. The site is located at approximately 5.9km north-west of Lusaka CBD (Lusaka Main Post Office).

Table 8: GPS coordinates of the Puma Lusaka Depot

Point	Zone	Easting	Northing	Elevation
A	35L	634447.00m E	8297357.00m S	1276m
B		634789.00m E	8297579.00m S	1277m
C		634787.00m E	8297587.00m S	1277m
D		634642.00m E	8297616.00m S	1276m
E		634628.00m E	8297610.00m S	1276m
F		634620.00m E	8297613.00m S	1277m
G		634591.00m E	8297463.00m S	1277m
H		634652.00m E	8297450.00m S	1277m
I		634649.00m E	8297439.00m S	1277m
J		634655.00m E	8297437.00m S	1277m
K		634642.00m E	8297378.00m S	1277m

The site is easily accessible by road as it is serviced by a good tarred road, from Lusaka CBD (Lusaka Main Post Office), head north on T2 (Great North Road) until Kabwe roundabout. From Kabwe roundabout head west on Kalambo Road for about 500m and then turn right onto

Lumumba Road and continue for approximately 1.7km, then turn left onto Mungwi Road and continue for approximately 1.3km, the site will be on the right hand side.

The major landmarks in the project area are the Puma Lusaka Depot itself, Total Energies Fuel Depot and the old Caltex Fuel Depot.

1.7 Directors and Shareholders

The shareholding and directors of Puma Energy Zambia Plc is as follows:

Table 9: Puma Energy Zambia Plc Shareholding

NAME	NATIONALITY	SHAREHOLDING %
Puma Energy Ireland Holdings Ltd	Irish	75
Lusaka Stock Exchange	Zambian	25

Table 10: Table of Directors

NAME	NATIONALITY	ADDRESS
Sikazwe Jacob Jones	Zambian	Stand No. 1710 Mungwi Road, P.O.BOX 31999, Lusaka.
Imbwae Getrude Mukuwa	Zambian	Stand No. 1710 Mungwi Road, P.O.BOX 31999, Lusaka.
Sidy Bane	Senegalese	P.O.BOX 31999, Lusaka.
Pinchi Simukwai	Zambian	Stand No. 1710 Mungwi Road, P.O.BOX 31999, Lusaka.
Gregoire Charmetant	French	P.O.BOX 31999, Lusaka.
Susan Inonge Wambulawae	Zambian	Stand No. 1710 Mungwi Road, P.O.BOX 31999, Lusaka.
Mwenechanya Silane Kalenga	Zambian	P.O.BOX 31999, Lusaka.

1.8 The Developer's Physical Address and the Contact Person

Developers' Contact Details;

Puma Energy Zambia Plc
Stand No. 1710 Mungwi Road,
P.O.BOX 31999,
Lusaka, Zambia.

Contact Person

Contact Person: Bwalya Mulenga
Contact Line: +260 971255555
Designation: Engineering Manager
Email: Bwalya.mulenga@pumaenergy.com
Physical Address: Plot No. 1710, Mungwi Road, Heavy Industrial Area
Postal Address: P.O. Box 39111, Lusaka, Zambia

1.9 Environmental Consultants' Details

DH Engineering Consultants

226A Napsa Housing Complex, Nyumba Yanga, Off Leopards Hill Road

PO Box 37928, Lusaka, Zambia

Tel: 260 21 1 227176

Fax: 260 21 1 229555

Mobile: 260 977874162

Email: dholmes@dhengcon.com

1.10 Track Record/Previous Experience of Enterprise Elsewhere

Puma Energy Zambia Plc. is an oil marketing company that was established in 1976. The company was formerly known as BP Zambia plc and changed its name to Puma Energy Zambia Plc in June 2011, with its head office in Lusaka, Zambia. Puma Energy Zambia plc is as a subsidiary of Puma Energy International B.V.

Puma Energy Zambia Plc is in the downstream marketing and distribution of petroleum products in Zambia. The company operates in retail, commercial, industrial, lubricants, and aviation sectors and owns around 69 service stations in Zambia. It is also the single largest supplier of fuels and oils to the largest mines in the country. The company supplies more than 70% of the total mining business in Zambia three Divisions namely: Airport Services, Air Navigation Services and Commercial Services.

Puma Energy Zambia Plc supplies petrol, diesel, heavy fuel oils (HFOs), lubricants and aviation fuels which are used in copper production, transportation, energy for heat and light and retail services for everyday items.

2.0 POLICY, INSTITUTION AND ORGANIZATIONAL FRAMEWORK

2.1 Policy, Legal and Institutional Framework Relevant to the Project

2.1.1 Zambian Environmental Policy

The National Conservation Strategy (NCS) was adopted as a policy document by the Zambian government in 1985, in order to harmonize environmental management in the country. The adoption of NCS led to the establishment of environmental legislation and institutions. In 1990, the Environmental Protection and Pollution Control Act (EPPCA) was passed to provide for the protection of the environment. The Act also provided for the establishment of the Environmental Council of Zambia (ECZ) to implement the provisions of the Act and to harmonize and co-ordinate all issues related to environmental management in the country. The ECZ was later to be renamed the Zambia Environmental Management Agency (ZEMA), following repeal of the EPPCA.

The National Environmental Action Plan (NEAP) was formed in 1994 as a means to review the existing economic framework and policy measures, and identify the relationship between the environment and the economy. The NEAP provides an overview of Zambia's environmental problems, existing legislation and institution, and strategy options for improving environmental quality. The NCS and NEAP are the precursor of the overall policy on environment. The National Policy on Environment (NPE) which was adopted in 2007 (and officially launched in 2009) provides environment and natural resources management policies to address current and future threats to the environment and to human livelihoods and provides policy guidelines for sustainable development.

Relevance: The proposed project will bring about positive impacts and will also bring about negative impacts that may present future threats to the environment. These impacts should be addressed according to the National Policy on Environment as it provides guidelines for sustainable development.

Compliance: The proposed development will be done in accordance with the National Policy on Environment guidelines, to ensure sustainable development which includes Environmental Impact Assessment (EIA) and monitoring of the environment.

2.1.2 Zambian Environmental Legislation

2.1.2.1 Environmental Management Act, No. 12 of 2011 as amended by the Environmental Management (Amendment) Act No.8 of 2023

In April 2011, the Environmental Management Act (EMA) was signed into law. The EMA includes provision for Integrated Environmental Management (IEM), provision for the declaration of protected areas, a general increase in penalties, and the imposition of orders for remedying pollution. Further, the production of State of Environment (SOE) Reports and the need for Strategic Environmental Assessment (SEA) is legislated. The sections of the Environmental Management Act relevant to the project are as follows:

- Section 29 which state 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”, and that “A person shall not prepare an environmental assessment report without registering with the Agency as an environmental assessment expert in accordance with section 29B”.

Relevance: The proposed project is likely to have an effect on the environment and therefore, before undertaking of the project, written approval should be obtained from the Agency (ZEMA). To obtain written approval from the agency, an environmental assessment report needs to be prepared by a registered person.

Compliance: The developer is currently undertaking an environmental impact assessment, and the ESIA report will be reviewed by the Agency before approval. Undertaking of the proposed project will only commence upon receipt of written approval from the Agency. Currently registration of environmental experts is pending the signing of the regulations (registration of Environmental Assessment Experts).

- Part II, section 9(j) provides that, one of the functions of ZEMA is to review environmental impact assessment reports.

Relevance: One of the roles of the Zambia Environmental Management Agency is to review Environmental Impact Assessment (EIA). This report is an Environmental and Social Impact Assessment report compiled from Environmental Impact Assessment study findings. The report should be reviewed by ZEMA.

Compliance: An EIA has been carried out to identify the impacts on the environment and also to put up measures to mitigate the negative impacts the project will have on the environment. The developer has hired a consultant to liaise with Zambia Environmental Management Agency on ensuring that the best environmental management practices are incorporated in the design and that the report from the study is presented to ZEMA for review according to the environmental impact assessment report format set by the Zambia Environmental Management Agency.

- Part iv, Environmental Protection and Pollution Control, Division 4 - waste management, section 54 provides that a person shall not collect, transport, sort, recover, treat, store, dispose of, or otherwise manage waste in a manner that results in an adverse effect, or creates a significant risk of an adverse effect occurring; section 56 provides that a Local Authority shall within its area of jurisdiction ensure that waste is collected, transported and disposed of in accordance with this Act.

Relevance: The proposed development will produce waste which should be collected, transported and disposed of in accordance with this Act.

Compliance: Solid waste will be collected in bins at various locations on site and then disposed of by an approved local council licensed transporter.

2.1.2.2 Environmental Regulations

Environmental Impact Assessment Regulations

The Environmental Impact Assessment Regulations (No. 28 of 1997) prohibits the implementation of a project without undertaking an EIA and the subsequent preparation of an Environmental Project Brief or an Environmental Impact Statement. The nature of the project determines whether the developer should prepare a Project Brief or Environmental Impact Statement.

Stakeholder Engagement

The EMA and EIA Regulations are the key legislation that provides the requirements for stakeholder engagement in Zambia. The EMA states that the public has the right to be informed of the intention of public authorities to make decisions affecting the environment and of available opportunities to participate in such decisions. The EIA Regulations requires that stakeholder engagement involves government agencies, local authorities, non-governmental, community-based organizations and interested and affected parties (affected communities, for example) and specifically states the following:

“The developer shall, prior to the submission of the EIS take all measures necessary to seek the views of the people in the communities which will be affected by the project. In seeking the views of the community in accordance with sub-regulation, the developer shall:

(a) Publicize the intended project, its effects and benefits, in the mass media, in a language understood by the community, for a period not less than fifteen days and subsequently at regular intervals throughout the process; and

(b) After the expiration of the period of fifteen day hold meetings with the affected communities to present information on the project and to obtain the views of those consulted”.

Relevance: The proposed project falls under the second schedule of the EIA regulations which requires comprehensive stakeholder engagement.

Compliance: The Developer will ensure that the ESIA has comprehensive stakeholder engagement through various meetings with stakeholders giving them an opportunity to give views on the project.

In addition, the EMA, through the **Environmental Management (Licensing) Regulations, SI No. 112 of 2013**, controls and regulates the following areas, relevant to the present study:

- **Air and Water Pollution: Part II**

These regulations provide for the ZEMA to regulate the treatment and discharge of sewage and other effluents into the natural aquatic environment.

Relevance: The project will involve the generation, treatment and discharge of sewage from the toilets that the workers will use which will be subject to these regulations.

Compliance: Sewage waste will be managed by existing toilets connected to LWSC sewer mains ensuring that the water resource is protected. The depot will have an oil interceptor to ensure that hydrocarbons do not get discharged into the natural aquatic environment.

- **Hazardous Waste: Part IV**

These regulations provide for the control of generation, collection and storage of hazardous waste. Section 4 part 1 of these regulations state that no person shall generate or store hazardous waste without a license from the Competent Authority.

Relevance: A small amount of hazardous waste may result from construction activities comprising mainly of material soiled with hazardous substances (due to oil spills from machinery or possible leakage of fuel as the existing tanks are cleaned) and this material will be considered as hazardous waste.

During operation the proposed project will be handling fuel waste which includes oil from the interceptor and material soiled with fuel.

Compliance: Hazardous waste will be disposed of in bins that will be covered and clearly label as hazardous waste. When the bins get full, they will be collected by a ZEMA licensed hazardous waste collector. The frequency of collection will depend on the amount of waste generated.

Fuel waste including sludge from the tanks will be considered as hazardous waste and will be collected in a drum. This will be collected by a hazardous waste transporter and disposed of at a hazardous waste approved disposal site. The fuel interceptor will be cleaned regularly. The waste oil from the interceptor will be removed from site according to the Puma waste oil management procedure.

- **Waste Management: Part III**

These Regulations provide definitions of waste and sets out the licensing requirements for transporters and waste disposal sites.

Relevance: Activities of the proposed project will result in the generation of solid waste such as domestic, and construction debris that have to be disposed of at an approved site.

Compliance: Solid waste will be collected in bins at various locations on site and then disposed of by an approved local council licensed transporter.

2.1.3 Other Acts Reviewed

Other than the EMA which is the principal Act on environmental management, Zambia is broadly covered with legislation relating to the protection of the environment and to various developments. Among others the relevant legislation applicable to this Project are discussed below:

2.1.3.1 The Standards Act No. 4 of 2017

This Act provides for standardisation and quality assurance of products and services through the setting of national standards and provision of conformity assessment services for products and services. This Act provides for the continued existence of the Zambia Bureau of Standards (ZABS). The functions of the Bureau relevant to the proposed project are to: administer and maintain standards and ensure conformity with standards;; promote quality health and safety standards for commodities, products and services and to facilitate efficiency in industry and

promote trade through standardisation which are found in the Act in part II section 5 (b)(e) and (f).

Relevance: The development will require that material (pipes, sand, stone, food stuffs, machinery and other finished material) be used for the installation and operation of the new tanks. According to this standard, the material and products to be used for the proposed project should conform to the standards set by the Zambia Bureau of Standards. For the storage of fuel, the development has to comply with the standard ZS385 part 1 which applies to aboveground storage of fuel.

Compliance: All raw material procurement and all designs and layouts will be in compliance with the Zambia Bureau of Standards through the various consultants to be employed by the project. The developer will also ensure that the fuel storage on site is according to the Zambia Bureau of Standards ZS 385 part 1.

2.1.3.2 Local Government Act No. 2 of 2019

The Act provides for an integrated local government system and gives effect to the decentralisation of functions, responsibilities and services at all levels of local government. The part of this Act relevant to the project is Part II which provides for Local Governance of an area by a council.

Relevance: The proposed project site is within an area under the administration of the Lusaka City Council.

Compliance: The project plans will go through the Lusaka City Council for any comments on the plan and for approval.

2.1.3.3 The Water Resources Management Act No. 21 of 2011

This Act provides for the management of the water resource through the Water Resources Management Authority (WARMA) which ensures the sustainable resource use and protection of the resource. Sections of this Act relevant to the proposed Project are section 6 which provides for efficient, sustainable and beneficial use of water in the public interest and that Zambia's water resource shall be protected and the use controlled and that all non-domestic water use shall require a permit.

Relevance: The construction activities may result in fuel spills from machinery and from the existing tanks as they are decommissioned. Also the proposed project during operation, will involve the handling of bulk fuel which if not handled properly may contaminate ground water. The project will require water during construction and minimal quantities during operation, the usage of water should be such that the water resource is not depleted.

Compliance: During construction, sewage waste will be managed by the use of existing toilets connected to LWSC sewer mains ensuring that the water resource is protected. All machinery to be used on this site will be maintained regularly to prevent fuel spills. During operation, the fuel will be stored in corrosion free, leak proof aboveground fuel storage tanks and drainage will be via a purpose designed oil interceptor. The tanks will sit on an impermeable floor in a bunded area large enough to contain 110% volume of the tank in the bund, preventing the contamination of the water resource. At all phases of the project, water supply will be from LWSC water supply supplemented by an existing onsite borehole.

2.1.3.4 The Zambia National Public Health Institute Act, No.19 of 2020

The Act provides for the coordination of public health security; continue the existence of the Zambia National Public Health Institute and provide for its functions; establish the Public Health Emergency Operations Centre; establish the National Public Health Laboratory and establish the National Public Health Emergency Fund. The sections of the Act relevant to the proposed project are part ii section 4 which provides for functions of the Zambia National Public Health Institute. The functions of the institute relevant to this project are: educate the public on public health and develop, publish and disseminate information on public health.

Relevance: During construction and operation, the project works are likely to have an impact on public health such as noise generation, risk of injury to members of the public, transfer of communicable diseases and pollution of surface/underground water courses.

Compliance: The project works will be done in a way that minimises public health risks, including restricting access to the construction site. The project site has restricted access. Safety measures will be adhered to so as to prevent injury to the workforce, and members of the public. Sewage waste will be managed by the use of existing toilets connected to LWSC sewer mains preventing contamination of the water resource. This will also include management of all other activities likely to have an impact on the water resources such as waste generation and limiting of air emissions to safeguard public health.

During operation, the fuel will be stored in a corrosion free, leak proof aboveground storage tanks and drainage will be via a purpose designed oil interceptor. The tanks will be installed in a concreted bunded area. The bunded area is designed to contain 110% volume of the tank in the bund should any of the tanks fail, thereby preventing contamination of the water resource which members of the public depend on.

2.1.3.4.1 Statutory Instrument No. 21, Public Health (Corona Virus) Infectious Disease

This is a notice declaring that the Corona Virus is an infectious disease. The sections of this notice relevant to the proposed project are: section 5 (1) which state that a person shall not enter or leave an infected area without permission of an authorised officer in a local authority of the infected area and complying with any directions given by an authorised officer in a local area; and section 8 which states that a person who becomes aware or has reason to suspect that another person has died or is suffering from Covid 19 shall immediately inform the nearest authorised officer in a local authority or a public health facility.

Relevance: The proposed development will employ people who may enter areas that may be declared as infected areas by the Ministry of Health. Because Covid 19 is an infectious disease, there is a possibility for people on site to catch the disease.

Compliance: The developer will ensure that measures to prevent the spread of the corona virus are put in place according to the Ministry of Health guidelines.

2.1.3.4.2 Statutory Instrument No. 22 of 2020, the Public health (infected areas) (Corona Virus Disease) Regulations, 2020

These regulations provide for the response and measures to address the Corona Virus Disease Pandemic. The section of these regulations relevant to the proposed project is section 8 which states that a person who becomes aware or has reason to suspect that another person has died or is suffering from Covid 19 shall immediately inform the nearest authorised officer in a local authority or a public health facility.

Relevance: The proposed development will employ people who may or may not be immune to Covid 19.

Compliance: The developer will ensure that measures to prevent the spread of the corona virus are put in place according to the Ministry of Health guidelines.

2.1.3.4.3 The Public Health (Notifiable Infectious Disease) (Declaration) Notice, 2020

Regulation 3: The ministry responsible for health may convert a suitable building to a hospital, observation camp or station for the purpose of placing a person suffering or suspected to be suffering from, or who has been in contact with a person suffering from COVID – 19.

Regulation 5 (2): Subject to sub - regulation (1) a person who intends to enter or leave an infected area may, before entering or leaving the infected area, be required to undergo the following;

(a) Medical examination; (b) Disinfection; or (c) Remain for a specified period in a hospital, an observation camp or station converted under regulation 3.

Regulation 6: The body of a person who has died from COVID – 19 shall be disposed of in conformity with the directions of an authorised officer.

Regulation 7: An authorised officer may enter premises to search for a case of COVID – 19 or to enquire whether there is or has been a case of COVID – 19.

Regulation 8: A person who becomes aware or has reason to suspect that another person has died or is suffering from COVID -19 shall immediately inform the nearest authorised officer in a local authority or public health facility.

Regulation 9: A public ceremony or gathering of more than five persons, not being a family shall not be held in an infected area without the written permission of a local authority or Medical Officer of Health.

Relevance: The implementation of the project is subject to provisions of the Public Health (Notifiable Infectious Disease) Notice, 2020.

Compliance: The developer will ensure that measures to prevent the spread of the Corona virus are put in place in accordance to the Ministry of Health guidelines.

2.1.3.5 Urban and Regional Planning Act No. 3 of 2015

This Act provides for development, planning and administration principles in Zambia. The provisions of the Act relevant to the proposed development are section 13 providing for the establishment for Local Authorities as Local Planning Authorities whose functions are to regulate the use of land in its area and receive and process applications for planning permission for the development of land. The Local Councils also give standards for how plans should be drawn up.

Relevance: The proposed development site is in Lusaka District and falls under the Lusaka City Council who review proposed development plans in the area. No development can take off without plans going through the Local Authorities.

Compliance: Plans for the proposed development have been drawn up in accordance with the planning authority guidelines. The plans for the proposed project will be submitted to the Lusaka City Council for processing and review in order to obtain planning permission.

2.1.3.6 The Occupational Health and Safety Act, No. 36 of 2010,

This Act also provide for the protection of persons at work, persons other than persons at work, against risks to health or safety arising from, or in connection with, the activities of persons at work. Sections of this Act relevant to the proposed project are: part section 11- 14 which provides for the establishment of health and safety committees at workplaces; part iv, section 15 – 18 which provides for the health, safety and welfare of persons at work; and part iv section 20 and 21 which provides for the duties of manufacturers, importers and suppliers of articles, devices, items and substances for use at work.

Relevance: The project works will have occupational health and safety risks during both construction and operation phases such as exposing workers on site to high levels of dust, lifting heavy equipment, work in confined spaces, work at heights, trip hazards, movement of trucks and other machinery.

Compliance: Site preparation, construction and operation of the proposed project shall be done in compliance with this Act ensuring that risk assessments are done at the beginning of any job specifications and that workers are provided with appropriate PPE. There will always be a competent supervisor on site ensuring that work is done according to sound health and safety procedures.

2.1.3.7 Roads and Road Traffic Act No. 2 of 2011

The Roads and Traffic Control Act, provides for the control of traffic, and for the regulation of drivers. The sections of this Act relevant to the proposed project are section 14 (2) which provides that building owners shall provide service roads to give access to the buildings: Section 110 which provides for the need for all drivers to have driving licenses; section 198 which provides for the conviction of a person driving under the influence of drink and drugs and section 201 which provides that no person shall use or permit to be used a vehicle in dangerous conditions.

Relevance: The site will have a considerable amount of traffic flowing into and out of the premises. During site preparation, construction and operation phases, machinery and vehicles will have to be driven and operated on site and drivers of these should be in possession of valid

driver's licenses. If drivers are under the influence of drink/drugs, there are likely to be accidents on site and convictions which will result in lost time and unnecessary costs to the project.

Compliance: All signs and directions to control traffic movement and ensure a safe environment will be put in place. The drivers and machinery operators will have valid driver's licenses and the developer will ensure that any workers on site under the influence of alcohol/drugs are prohibited from working at the proposed project site to comply with the provisions of the Act. The proponent will also ensure that machinery to be used on site is regularly checked and only used when in proper working conditions.

2.1.3.8 The Workers' Compensation Act No. 10 of 1999

This Act provides for the welfare of persons at work. The sections of this Act relevant to the proposed project are: part I, section 8 which provides that where any injury is caused to a worker by the negligence, breach of statutory duty or other wrongful Act or omission of the employer, or of any person for whose Act or default the employer is responsible, nothing in this Act shall limit or in any way affect any civil liability of the employer independently of this Act; part III, section 12 which provides for the functions of the Workers' Compensation Fund Control Board to administer fund for the compensation of workers disabled by accident occurring, or diseases contracted in the course of employment and; part v, section 41 which provides for the compensation of workers for disabilities suffered or diseases contracted during the course of employment.

Relevance: The proposed project's activities have potential to cause injury, illness or death to site workers and hence the relevance of the Act.

Compliance: Workers will be compensated in an event of injury, illness or death as a result of the proposed project activities.

2.1.3.9 Solid Waste Regulations & Management Act No. 20 of 2018

This Act provides for the regulation of solid waste and management. The sections of this Act relevant to the proposed project are part ii which provides for the management of solid waste; part iii which provides for the regulation of solid waste and part iv which provides for the provision of solid waste services by licensed solid waste service providers.

Relevance: The proposed development will result in the generation of solid waste at all phases of the project which should be managed according to the provisions of this Act.

Compliance: Solid waste will be collected in bins at various locations on site and then disposed of by an approved local council licensed transporter and also in possession of all the valid waste licenses from ZEMA. At all phases of the project there shall be no burning of waste and the bins to be used for waste will be leak proof and contained preventing scatter of waste.

2.1.3.10 The Lands Act No. 20 of 1996 read as one with the Lands Amendment Act No 20 of 2015

This Act was enacted in 1995 following the repeal of the Land (Conversion of Titles) Act of July, 1975. The section the Act relevant to the proposed project is part II section 9 (1) which prohibits unauthorised occupation of land.

Relevance: The proposed project site falls under statutory land.

Compliance: The developer will ensure that all papers for use of the proposed site are in place. Appended to this document are land documents showing compliance to this Act.

2.1.3.11 The Energy Regulation Act No. 12 of 2019

This Act provides for the licensing of enterprises in the energy sector. The sections of this Act relevant to the proposed project are part II section 4 which provides for functions of the Energy Regulation Board (ERB) to: issue licences and investigate and monitor operations of businesses in the energy sector and formulate measures to minimise the environmental impact of activities carried out in the energy sector.

Relevance: The proposed project will be handling large quantities of fuel, an activity which should be licensed by the ERB

Compliance: The developer will ensure that the storage and handling of fuel is licensed by the Energy Regulations Board before storage and that the storage and handling is according to regulations provided by the ERB, ZEMA and the ZABS.

2.1.3.11.1 ERB GUIDELINES FOR SITING PETROLEUM INFRASTRUCTURE 1ST REV, 2022

These siting guidelines seek to provide potential developers and existing licensees guidelines on the technical and regulatory requirements for siting of key petroleum infrastructure in Zambia. These guidelines will be the basis upon which the ERB will review Environmental Impact Assessments (EIA) for proposed petroleum infrastructure in collaboration with the Zambia Environmental Management Agency (ZEMA). The section of these guidelines relevant to the proposed project is Section 5.3 which refers to bulk fuel depots. The sections relevant to the proposed project are:

- Section 5.3.1- Proposed sites for bulk fuel storage depot will only be approved for installation in designated industrial areas and shall comply with siting requirements as prescribed in *Zambian Standard ZS 385: THE PETROLEUM INDUSTRY CODE OF PRACTICE; Part 1: Storage and Distribution of Petroleum Products in Above-Ground Bulk Installations*;
- Section 5.3.2 - The ERB will not approve installation of a depot in a locality that is prone to activities or incidences that pose a safety, health, product quality or environment risk such as but not restricted to riotous human behaviour, flooding and any other as may be prescribed by the ERB from time to time;
- Section 5.3.3 -The siting of the bulk fuel depot shall be such that adequate access for emergency response teams including but not restricted to Fire Brigade, Police and Ambulance services is provided.

- Section 5.3.4 - The minimum distance from the storage tanks to the boundary of the property that is or can be built on, including the far side of the public road shall be as prescribed in ZS 385: THE PETROLEUM INDUSTRY CODE OF PRACTICE; Part 1: Storage and Distribution of Petroleum Products in Above-ground Bulk Installations;
- Section 5.3.5 - Where there is existing electricity infrastructure, the proposed site shall comply with the requirements for safety distances as prescribed in the ERB's way-leave code of practice.
- Section 5.3.6 - Where there is existing railway line infrastructure, the proposed site shall comply with the requirements for safety distances as prescribed in the Railways Act CAP 453 of the Laws of Zambia;
- Section 5.3.7 - The proposed site shall comply with the requirements as prescribed in the Public Roads Act No. 12 of 2002.
- Section 5.3.8 - The proposed site shall not be located within an area considered to be sensitive by ZEMA, as provided for in the Environmental Management Act of 2011. In this regard, the required distance may be decided appropriately by the relevant agency.
- Section 5.3.9 - The proposed site shall comply with the requirements of other relevant Government Agencies and Institutions, where necessary.

Relevance: The proposed project will involve the installation of bulk fuel storage tanks 4 x 2500m³ at an existing depot. This is considered to be a bulk fuel storage depot.

Compliance: The developer will ensure that the decommissioning of the old tanks, installation/operation of the new tanks is approved by the relevant authorities before implementation of the project. The tank site is not prone to activities or incidences that pose a safety, health, and product quality or environment risk.

The site plan takes into consideration all the required minimum distances according to the ZS 385; provides for adequate access for emergency response teams and safety distances as prescribed by the ERB's way-leave code of practice; and provides for requirements as prescribed in the Public Roads Act No. 12 of 2002 and requirements as prescribed in the Railways Act CAP 453 of the Laws of Zambia.

The site is not located in an area that is considered to be sensitive by ZEMA. The developer will ensure that the site complies with all the requirements of all relevant Government Agencies and Institutions.

2.1.3.12 The Public Roads Act No. 12 of 2002

This is an Act to establish the Road Development Agency and to define its functions; to provide for the care, maintenance and construction of public roads in Zambia; to regulate maximum weights permissible for transmission on roads; and to provide for matters connected with and incidental to the foregoing. The sections of this Act relevant to the proposed project are;

Section 33 (1) Subject to and in conformity with such general or other directions as may be given by the agency, a road authority may cause or permit traffic signs to be placed on or near any road in its area; section 33 (2) Traffic signs shall be of the prescribed size, colour & design except the

agency authorises the erection or retention of a sign to another character; section 55 (a) no person shall encroach on any road or road reserve by making or erecting any building, fence, ditch or other obstacle or by planting trees or otherwise; section 55 (b) leave or place or negligently allow to fall on or over any road any timber, stones or other material so as to obstruct the road or endanger person using the road or deposit rubbish, debris or other material on any road.

Relevance: The development will require that project material be transported by road to the site whose weights should be permissible for transmission on roads.

Compliance: The proponent will ensure that all transportation vehicles do not exceed the maximum permissible weights for transmission on roads.

2.1.3.13 The Employment Code Act No. 3 of 2019

This is an Act to regulate the conditions of employment, 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 and to provide for employment policies, procedures and codes in an undertaking.

Several sections of this Act are relevant to the proposed project:

- Part I which provides for equal employment opportunity and also prohibits forced labour.
- Part III which provides for employment relationship and gives guidelines for contract of employment, minimum employment benefit, suspension and termination of contract of employment.
- Part IV provides for the protection of wages.
- Part V provides for the employment of young children and young persons (prohibition of employment of child in industrial undertakings).
- Part VII provides for employee welfare

Relevance: For the proposed development, this will cover such matters as contracts of work for workers hired during the execution of the project.

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. At all phases of the project, child labour will not be entertained.

2.1.3.14 National Council for Construction Act No. 10 of 2020

This Act provides for the establishment of the National Council for Construction and also defines its functions to provide for the promotion and development of the construction Industry in Zambia and also to provide for the registration of contractors. The section of the Act relevant to the proposed project is part II, section 5 which provides for the functions of the council to promote

and develop the construction industry in Zambian companies; assess the performance of contractors and regulate the behaviour and promote minimum standards and best practice of contractors and all other guidelines for services in the construction industry.

Relevance: There will be construction works taking place on site which should be done in accordance with the regulations set by the National Council for Construction.

Compliance: All contractors engaged on site will be registered with the National Council for Construction, all construction material to be used on site will conform to the Standards Act and foreign firms to be engaged will be registered with the Council.

2.1.3.15 The Factories Act cap 441 No. 2 of 1966

An Act to make further and better provision for the regulation of the conditions of employment in factories and other places as regards the safety, health and welfare of persons employed therein and to provide for the safety, examination and inspection of certain plant and machinery. The parts of this Act relevant to this project are; Part v - Health: General Provisions which provides for cleanliness of workplaces, overcrowding, general ventilation, lighting and sanitary conveniences at the work place; Part vi - Safety: General Provisions which provides for the training and Supervision of inexperienced works and safety access to site, fire prevention and fighting and means of escape and warning in case of fire; Part vii – Safety: Lifting Machinery which provides for the construction and maintenance of hoist and lifts; Part ix – Welfare: General Provisions which provides for drinking water, washing facilities, accommodation for clothing and change rooms, facilities for sitting, first aid and welfare regulations and; Part xi which provides for the notification and investigation of accidents, dangerous occurrences and industrial diseases.

Relevance: For the proposed project, this will cover such matters as provision of protective clothing or uniforms; safety on site, sanitary conveniences at the workplace, general provisions and cleanliness of the work area and its surroundings.

Compliance: The developer will ensure compliance to this Act by ensuring that during construction phase, the contractors on site adhere to good housekeeping practices and comply with the safety provisions of this Act. During operation, the developer will ensure that the safety and health provisions of this Act are adhered to. At all phases of the project there will be a system for notification and investigation of accidents. All works will be done in a conducive environment and sanitary facilities will be provided for the workers on site.

2.1.3.16 The Petroleum Act No. 8 of 1995

This is an Act to make provision for regulating the importation, conveyance and storage of petroleum and other inflammable oils and liquids. The section of this Act relevant to the proposed project is: section 3(3) which provides for the need of a licence for storage of petroleum exceeding 200L; section 3(9) which provides for the possession of valid licence required; section 3(16)(1) which provides guidance for the transportation of dangerous petroleum in bulk.

Relevance: The areas of the Petroleum Act of relevance to this project are regulations for the conveyance and storage of petroleum, inflammable oil and liquids in this case being diesel and petrol fuel.

Compliance: Fuel shall be transported to and / or stored on site in compliance with the provisions of the Petroleum Act that is according to ZABS standards being ZS 385-1.

2.1.3.17 The Gender Equity and Equality Act No.22 of 2015

This Act provides for Gender Equity and Equality in all spheres of life and provides for the elimination of all forms of discrimination. The sections of the Act relevant to the proposed project are part iv: which provides for Gender Equity and Equality - (a and b) both sexes shall enjoy equal rights and equal access to justice and protection before the law; and prohibits gender discrimination.

Relevance: The development will require that people be employed. This means the project will interact with people of different genders.

Compliance: The developer will ensure that project activities are carried out in compliance with this Act. Workers will be employed on the basis of merit and not gender, and gender discrimination will be strictly prohibited.

2.1.3.18 The National HIV/AIDS/STI & TB Council Act No. 10 of 2002 read as one with The National HIV/AIDS/STI/TB Council (Amendment) Act, No. 8 of 2021

This is an Act to establish the National HIV/AIDS/STI/TB Council, define its functions and provide for its composition and to constitute the Secretariat of the Council, define its functions and provide for its composition. The provision relevant to the proposed project is **Provision 4:** The functions of the Council shall be to coordinate Council and support the development, monitoring and evaluation of the multi-sectoral national response for the prevention and combating of the spread of HIV, AIDS, STI AND TB in order to reduce the personal, social and economic impacts of HIV, AIDS, STI and TB.

Relevance: The proposed project will involve people with different medical health conditions.

Compliance: The developer will promote health education on site.

2.1.3.19 Metrology Act No.7 of 2017

This Act provides for the keeping and maintenance of national measurement standards; provide for the use of measurement units of the International System of Units and other units and provide for consumer protection, health, safety and environmental management through legal metrology measures. The sections of this act relevant to the proposed project are: part iii which provides the use of Standard unit of measurement, Units of measurement, Prohibition of use of certain units of measurement and Equivalence of certain units and part iv which provides the use of National measurement standards.

Relevance: The proposed project will require that the implementation be done according to the plans which should be communicated to various specialists engaged on the project.

Compliance: The developer will ensure that all units in the plans are presented according to the International System of Units. The developer will also ensure that all communication, drawings, designs and the actual construction is done in compliance to this Act.

2.1.3.20 The Water Supply and Sanitation Act No. 28 of 1997

An Act to establish the National Water Supply and Sanitation Council and define its functions; to provide for the establishment, by local authorities, of water supply and sanitation utilities; to provide for the efficient and sustainable supply of water and sanitation services under the general regulation of the National Water Supply and Sanitation Council. The part of this act relevant to this project is section 10 (1) which states that a local authority shall provide water supply and sanitation services to the area falling under its jurisdiction.

Relevance: The project site will require that water be supplied to the site and will involve the generation and discharge of sewage water which according to these regulations should be managed by an existing water and sanitation utility company.

Compliance: The depot is connected to Lusaka Water and Sanitation Company for water supply and sewage management. For the proposed project, workers will make use of the existing facilities connected to LWSC for water supply and sewage management.

2.2 International Agreements and Conventions

Zambia is a signatory to a number of international conventions which are related to the environment, the study referred to the conventions below to ensure that the project does not violate any international agreements on environmental protection:

2.2.1 United Nations Framework Convention on Climate Change (UNFCCC), 1992

The UNFCCC (United Nations Framework Convention on Climate Change) is an international treaty established in 1992 to combat global warming and its impacts. It sets out principles and objectives for countries to stabilize greenhouse gas concentrations and prevent dangerous interference with the climate system. The treaty facilitates discussions and negotiations among nations to reduce emissions, adapt to climate change, and provide support to developing countries. The Conference of the Parties (COP) oversees the implementation of the convention, with the Kyoto Protocol being one of its notable outcomes, which mandates emission reduction targets for developed countries.

Relevance: The proposed project will make use of one existing backup generator to be used as backup power sources which are likely to release carbon monoxide. Carbon monoxide reacts with hydroxyl (OH) radicals in the atmosphere, reducing their abundance. As OH radicals help to reduce the lifetimes of strong greenhouse gases, like methane, carbon monoxide indirectly increases the global warming potential of these gases.

Compliance: The developer will ensure that this generator is frequently serviced so that it releases little to no exhaust gases, thereby reducing the emission of green- house gases.

2.2.2 Montreal Protocol on Substances that Deplete the Ozone Layer (1987)

The agreement regulates and identifies chemical substances that are implicated or have potential to contribute to the depletion of the Ozone layer.

Relevance: Exhaust fumes from leaded fuel commodity have potential to deplete the ozone layer

Compliance: The Developer will only stock non-lead (unleaded) containing fuel at the proposed site.

2.2.3 The Paris Agreement (2016)

The Paris Agreement is an agreement that builds upon the UNFCCC and brings nations into a common cause to undertake ambitious efforts to combat climate change and adapt to its effects, with enhanced support to assist developing countries to do so. The Paris Agreement charts a new course in the global climate effort. The key aspects of the agreement relevant to the proposed project is the strengthening of the global response to climate change, limiting global temperature increase to well below 2° Celsius and encouraging parties to conserve and enhance , as appropriate, sinks and reservoirs of GHGs.

Relevance: The proposed project will make use of one existing backup generator to be used as backup power sources which are likely to release carbon monoxide. Carbon monoxide reacts with hydroxyl (OH) radicals in the atmosphere, reducing their abundance. As OH radicals help to reduce the lifetimes of strong greenhouse gases, like methane, carbon monoxide indirectly increases the global warming potential of these gases.

Compliance: The developer will ensure that this generator is frequently serviced so that it releases little to no exhaust gases, thereby reducing the emission of green- house gases.

2.2.4 Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (1992)

The Basel Convention is an international treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries. It does not, however, address the movement of radioactive waste.

Relevance: The proposed development will result in the generation of hazardous waste such as material used to mop up fuel in case of fuel spills during construction/operation; and fuel waste from the oil interceptor during operation phase.

Compliance: The hazardous waste generated will not be moved across borders. Hazardous waste generated will be managed by local licensed hazardous waste management companies. The proponent will not at any phase of the project import/export hazardous waste to comply with this convention.

2.3 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 key institutions whose requirements will need to be complied with.

2.2.1 Zambia Environmental Management Agency (ZEMA)

ZEMA is an independent environmental regulator and coordinating body. It is governed by a board which provides strategic direction, develops policies as well as monitoring its functions as it relates to the administration of the EMA. With respect to the proposed Project, ZEMA is responsible for reviewing the proposed Project Environmental Project Brief and make a decision on whether the proposed project should be implemented or not.

2.2.2 The Lusaka City Council

The Ministry of Local Government is charged with the responsibility of promoting a decentralized and good local governance system, facilitating the delivery of quality municipal services in order to contribute to sustainable social economic development. The Local government (local councils) is an institution, which deals with matters concerning the people living in a particular locality. It represents the microscopic interests of the locality leading to the broader concept of welfare and happiness of its people. The local government institutions have allowed effective participation and involvement of local people in their affairs.

2.2.3 The Energy Regulation Board

The Energy Regulation Board will review the project plans and assess the site suitability for the proposed project and also advise on any changes in the plans required to be made to ensure compliance to the bulk fuel storage regulations set by the board.

2.2.4 The Ministry of Transport

The Ministry of Transport is in charge of administering transport and communication networks. For this project the Ministry will ensure that the transport networks to site and communication networks on site are in compliance to the Zambian legislations.

2.2.5 The Labour Office

For this project, the labour office will be responsible for ensuring that workers conditions of service comply with the Employment Code Act of 2019.

The developer will ensure compliance with institutional provisions and guidelines issued by the above institutions in the process of implementing the project.

3.0 PROJECT DESCRIPTION

3.1 Location

The spatial extent of the project is the specific site located in the Heavy Industrial Area, along Mungwi Road, Lusaka District, Lusaka Province. The site is located at approximately 5.9km north-west of Lusaka CBD (Lusaka Main Post Office).

The site is easily accessible by road as it is serviced by a good tarred road, from Lusaka CBD (Lusaka Main Post Office), head north on T2 (Great North Road) until Kabwe roundabout. From Kabwe roundabout head west on Kalambo Road for about 500m and then turn right onto Lumumba Road and continue for approximately 1.7km, then turn left onto Mungwi Road and continue for approximately 1.3km, the site will be on the right hand side.

Table 11: GPS coordinates of the Puma Lusaka Depot

Point	Zone	Easting	Northing	Elevation
A	35L	634447.00m E	8297357.00m S	1276m
B		634789.00m E	8297579.00m S	1277m
C		634787.00m E	8297587.00m S	1277m
D		634642.00m E	8297616.00m S	1276m
E		634628.00m E	8297610.00m S	1276m
F		634620.00m E	8297613.00m S	1277m
G		634591.00m E	8297463.00m S	1277m
H		634652.00m E	8297450.00m S	1277m
I		634649.00m E	8297439.00m S	1277m
J		634655.00m E	8297437.00m S	1277m
K		634642.00m E	8297378.00m S	1277m



Figure 1: Google Satellite Image of the Site



Figure 2: Google Satellite Location of the Site

Current State of the Site

The proposed project site is located within the Puma Lusaka Depot plot, which is fully enclosed by a boundary wall fence. The depot includes various facilities such as an office building, loading gantry, warehouse, water tanks, water reservoir, fire house, maintenance workshop, and an oil

interceptor. There are three separate above-ground fuel storage tank farms on the site. The first tank farm (having 2 x 1,000m³ aboveground tanks) is located in the north-western part of the plot; the second tank farm (having 2 x 2,500m³ tanks under construction) is located in the northern central part of the plot. The third tank farm (having 6 aboveground tanks (3 x 464m³, 2 x 1,100m³ and 1 x 1,200m³)) is situated in the north-eastern part of the plot. The area around the depot components is concreted and some parts landscaped. The services for water, power and sewage exist within the property. The land use in the project area is heavy industrial.

Surrounding Infrastructure

The site is in the heavy industrial area surrounded by built up infrastructure, some of the infrastructures/ industries around the site area are:

- North of the site is a railway line and at approximately 40m is Elecnor and next to Elecnor is Saro Agro Industrial Limited;
- South west sharing a boundary with the depot within the same plot is the Puma Headquarters;
- South of the site is Mugwi Road and at approximately 30m across Mungwi Road is Tobacco Board of Zambia, also at approximately 30m south is Katanga Road, at approximately 30m south east of the site is Global Logistics , and at approximately 250m south east is Mungwi Centre;
- East sharing a boundary with the site is TotalEnergies Fuel Depot, at approximately 180m is Falcon Gas and at approximately 300m is Fresh Pikt;
- West sharing a boundary with the site is Former Caltex Depot and at approximately 100m is Bulk Oil.

The project area is the Industrial area of Lusaka with no settlements around. The nearest settlement is located at approximately 850m north-west of the Puma depot site.

3.2 Nature of the Project

The nature of the project is storage of hydrocarbons. The proposed project will involve the decommissioning of existing fuel storage tanks and installation of new fuel storage tanks.

Puma Energy Zambia Plc. proposes to upgrade the existing fuel depot by removing the old fuel storage tanks and installing new, modern fuel storage tanks to enhance safety, efficiency, and capacity.

The replacement and upgrade will take place in the northeastern part of the plot, which is currently occupied by six old tanks. These old tanks will be removed and replaced with four modernized fuel storage tanks, each with a capacity of 2,500 m³, at the same location. This upgrade will enhance storage capacity, safety, and efficiency, resulting in a total additional capacity of 10,000 m³.

Existing oil interceptors will be retained to manage drainage from the tank farm, directing runoff through a fuel interceptor to prevent fuel leaks into the environment. The new tanks will be used for storing diesel and petrol. The new tanks will be;

- Above-ground vertical steel tanks, welded and constructed in accordance with American Petroleum Institute (API) 650 standards. They will be leak-proof and equipped with emergency vents, containment inspection ports, and inlet and outlet pipes located near the base of the tank, ladders/platforms, and valves to regulate fuel flow and prevent leaks.
- The tanks will also have a vapour recovery system designed to capture and reduce fuel vapours, minimizing environmental impact.
- Installed in a concrete-bunded area on an impermeable floor to ensure compliance with Zambian standards and Energy Regulation Board (ERB). Each tank will be installed in its own bunded area. The bund wall will be 0.2m thick and 3.5m high. The volume of the tank bunded area will be approximately 2,750m³ large enough to contain over 110% volume of the tank which is 110% x 2,500m³, should the tank fail, to prevent environmental pollution. The area of this bund will be approximately 784.09m².
- Interchangeable between diesel and petrol.
- Seamlessly integrated with existing depot infrastructure, including rail and truck offloading/loading facilities, operational drainage and containment systems, and the existing concreted depot flooring.

The proposed upgrade (10,000 m³) combined with the recently approved capacity (7,000 m³) will increase the depot's total storage capacity from 7,100 m³ to 17,000 m³.

This upgrade will modernize the depot, enhance operational efficiency, and ensure long-term regulatory compliance, reinforcing Puma Energy Zambia Plc.'s commitment to safe and sustainable fuel storage operations.

The approach to the development of the project would thus seek to set up the project with the long-term intention of achieving integration and sustainability. The project seeks to stimulate local economic activities, with the provision of vast array of economic opportunities and fixed employment as well as proper storage of bulk fuel.

The project will be executed in two phases. Phase 1 will involve the installation of the first two tanks (2 × 2,500 m³), while Phase 2 will involve the installation of the remaining two tanks (2 × 2,500 m³) at a later stage. Each of these phases will have a preparation phase, construction phase, operation phase and decommissioning phase.

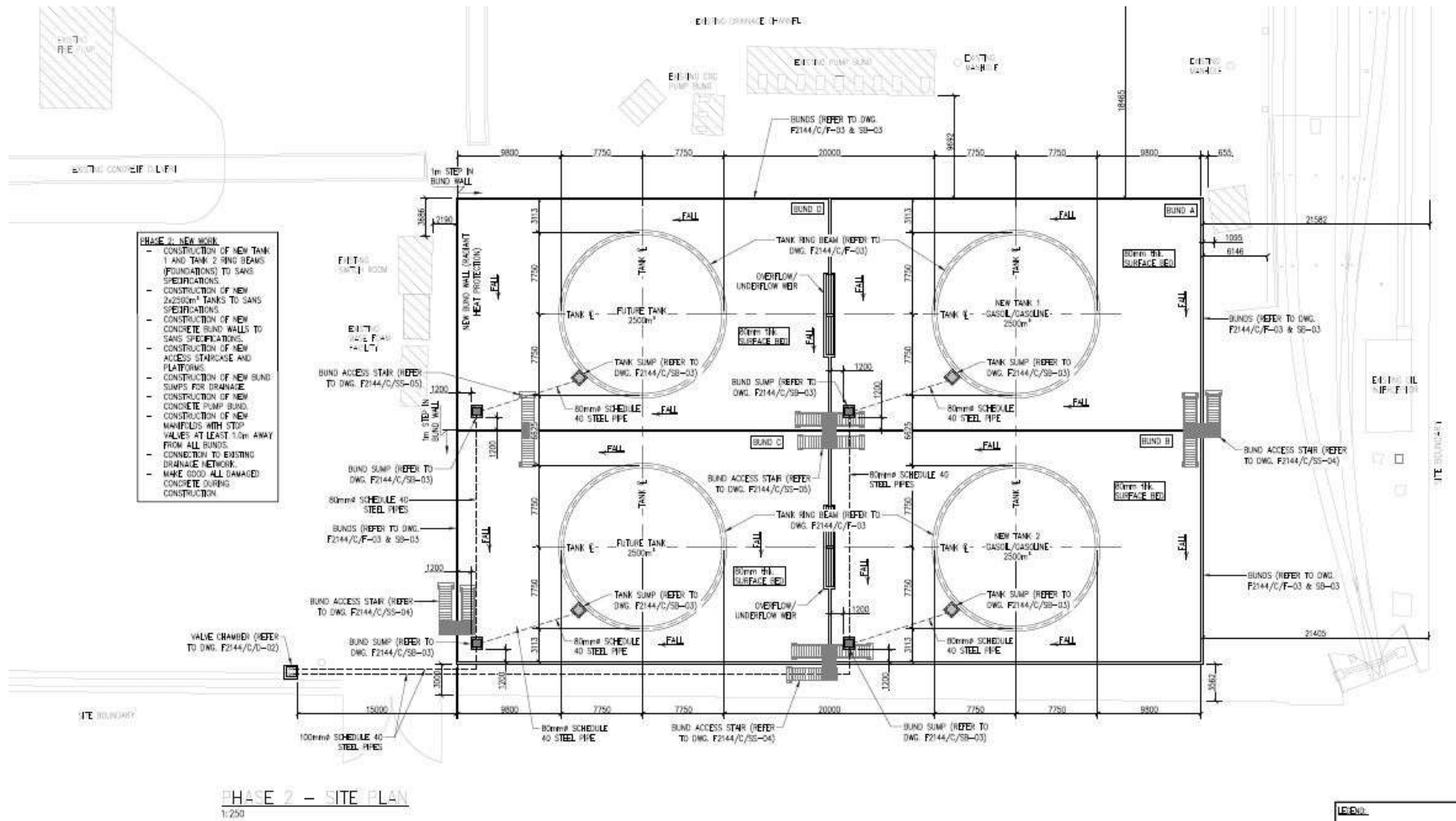


Figure 3: Proposed Tanks Layout in the North-eastern Part of the Puma Lusaka Depot Site

3.2.1 Raw Materials

Raw Materials Input During Preparation and Construction Phase

The raw materials that are expected to be used during the preparation / construction phase of the project will include the following:

Table 12: Raw Materials to be used in Construction and Operation Phase

	Material	Source	Storage on Site	Mode of Delivery
CONSTRUCTION PHASE				
1	River and building sand	Local suppliers	Heaped on an area of site	Road truck
2	Aggregates and laterite	Local approved suppliers	Heaped on an area of site	Road truck
3	Cement	Local	Stored in a temporal storage container on site	Road truck
4	Concrete blocks, ground stone and bricks	To be manufactured off and on site and from local approved suppliers.	Heaped on an area of site	Road truck
5	Water	LWSC supplemented by existing borehole	Water reserve tank	Water pipe network
6	General building materials (e.g. pipes, pump etc.)	Local approved suppliers	Existing store room	Road truck
7	Finished products and equipment, steel plates, and valves	Local approved suppliers and imported ensuring compliance with Zambian Standards and Regulations.	Storage container	Road truck
OPERATION PHASE				
1	Water for domestic use, fire-fighting and for irrigation of the landscaped areas	LWSC supplemented by existing borehole	Water reserve tank	Water pipe network
2	Electricity; for lighting and operation of equipment /pumps	ZESCO power supply	NA	ZESCO power reticulation
3	Bulk fuel	Dare salaam and	Above ground	Road tankers

		Beira	fuel tanks on site installed on a concrete impermeable floor	
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3.2.2 Process and Technology

The technology that will be used to implement the proposed development during the project phases will be both human and machine labour. The following are some of the essential machinery to be used:

- Decommissioning of Existing Bulk Fuel Storage Tanks
 - Pumps – For draining and removing residual fuel and sludge.
 - Gas-Freeing Equipment – Includes blowers, air movers, and nitrogen purging systems to remove flammable vapors.
 - Cold Cutting Tools – For dismantling tanks without generating sparks.
 - Mobile Cranes – For lifting and removing dismantled sections of the tank.
 - Waste Containers & Skips – For collecting and transporting decommissioned materials.
 - Environmental Monitoring Equipment – Gas detectors to ensure safety during decommissioning.
- Site Preparation & Concrete Bunded Area Construction
 - Excavators – For site clearing, grading, and foundation excavation.
 - Compactors (Plate Compactors, Rollers) – For soil stabilization and foundation preparation.
 - Concrete Mixers – To prepare concrete for the bunded area.
 - Formwork & Shuttering Equipment – For shaping the concrete bund.
 - Rebar Cutters & Benders – For reinforcing steel installation.
- Installation of New 4 x 2,500m³ Bulk Fuel Storage Tanks
 - Tank Rollers & Positioners – For aligning and rotating tanks during installation.
 - Hydraulic Jacking Systems – If assembling tanks in sections.
 - Welding Machines & Plasma Cutters – For tank assembly and pipework connections.
 - Sandblasting & Coating Equipment – For corrosion protection of tanks.
 - Scaffolding & Man Lifts (Cherry Pickers, Boom Lifts) – For working at heights.
 - Pipework Fabrication Equipment (Welders, Flanges, Pipe Benders) – For fuel transfer system installation.
 - Leak Testing Equipment (Pressure Testing Kits, Ultrasonic Testers) – To verify tank integrity before commissioning.

- Safety & Environmental Protection Equipment
 - Fire Suppression Systems (Fire Extinguishers, Foam Generators) – To prevent fire hazards.
 - Gas Detection & Monitoring Systems – For hazardous gas control.
 - Spill Containment Equipment (Booms, Absorbent Pads) – To manage accidental leaks.
 - Personal Protective Equipment (PPE) – Including flame-resistant suits, helmets, gloves, and breathing apparatus.

During operation

- The types of tanks to be installed are vertical steel tanks. The tanks schematic drawings are attached as an annex of this report.
- The piping will be steel piping with complete containment features to ensure no fuel spills to ground. Secondary containment of the piping will be installed which ensures that if a leak was to occur the fuel would not leak to ground, but flow through to a containment sump and then flow to the oil interceptor and thus be detected and acted upon.
- Each tank will be installed in a bund wall with a capacity of 110% of the tank volume
- Each tank will be constructed on a reinforced concrete base with anchoring systems to prevent movement due to hydrostatic forces.
- Each tank will be equipped with inlet and outlet pipes located near the base of the tank. These pipes will be fitted with high pressure pipelines connected to pumps for efficient loading/unloading.
- Each tank will be equipped with valves to regulate fuel flow and prevent leaks.
- The tanks will also have a vapour recovery system designed to capture and reduce fuel vapours, minimizing environmental impact.
- Waste streams with oil contents will be channelled to the purpose designed drainage system. Drainage will be via an oil interceptor.
- Fire safety technologies to be incorporated - The tanks will be installed aboveground in a concreted bunded area protected against impacts from vehicles and any other thing that may result in impacts that may cause sparks and eventually fire risks. Warning signs will be put around the fire sensitive areas to ensure that naked flames, smoking and use of cell phones around these areas will be strictly prohibited. The tank farm area will have a fire fighting system around. This will include foam and sand. The tanks themselves will be equipped with top and side pourers for cooling the tanks.

➤ **Water Supply**

Water supply will be from the existing connection to LWSC water supply supplemented by an existing site borehole.

➤ **Sanitation**

Sewage waste will be managed by the use of existing toilets connected to LWSC sewer mains.

➤ **Electricity Supply**

The site is already connected to ZESCO for power supply and has an existing back-up generator. The newly installed tanks will tie into the existing power supply system, all electrical installations (i.e connection of the new pumps and cables) will be carried out in accordance with the Institute of Electrical Engineers regulations and ZABS standards ZS 402 (The Classification of Hazardous Locations and the Selection of Apparatus for use in such Locations).

3.2.3 Products and By-products

3.2.3.1 Products of the Project

The main product of the project are newly installed 4 x 2500m³ new vertical tanks stocking diesel and petrol fuel in the north eastern part of the Puma Lusaka Depot site.

3.2.3.2 By-products during Preparation and Construction

The various waste products expected to be generated during the project preparation and construction phase and their disposal or management methods are as follows:

- Sewage waste: Sewage waste will be managed by the use of existing toilets connected to LWSC sewer system
- Solid waste: Solid waste will be collected in bins at various locations on site and then collected by a local council approved waste collection company. At all phases of the project there shall be no burning of waste and the bins to be used for waste will be leak proof and contained preventing scatter of waste.
- Dust: This is expected to be generated on the site from delivery of material, work on exposed work sites and various construction activities. The active work sites/exposed work areas will be watered daily to suppress dust by use of a water bowser and in some areas a water hose will be used. All fine material capable of being raised by the wind and causing air nuisance will be stock piled wholly within the construction site and where possible in bags until the time for use. Due to the nature of the project, the quantity of fine material required is very small and also the exposed work sites are unlikely as the tank replacement is meant to be on existing foundations
- Tank shells: the removed tank shells will be cleaned on site and sold/given to steel scrap utilization companies
- Hydrocarbon waste: the developer will ensure that contractor(s) on site will have well trained supervisors who will ensure proper maintenance and handling machinery to prevent spills/leakages of hydrocarbons to the environment. Hydrocarbon waste including sludge from the existing tanks will be temporarily disposed of in a drum that will be clearly marked as hazardous waste and will be covered at all times. This

hazardous waste bin will be collected by an approved hazardous waste collection agency for further treatment or disposal.

- Exhaust emissions: This will be from operation of vehicles and machinery on site. To minimize exhaust emissions the developer will ensure that contractor(s) on site will have well trained supervisors who will ensure proper maintenance and handling of machinery.

3.2.2.3 By-Products during Operation

- Sewage waste: Sewage waste will be managed by the use of existing toilets connected to LWSC sewer system.
- Hazardous waste: During operation hazardous waste expected to be generated which includes material soiled with fuel, will be stored in a hazardous waste bin and disposed of by a known hazardous waste collection company for disposal or further treatment.
- Waste oil: The waste oil from the interceptor will be removed from site according to the Puma waste oil management procedure. The interceptor is designed to prevent oil from escaping into the environment. There will be no traces of oil in the wastewater from the interceptor.
- Solid waste: Collection and disposal will be contracted out to the approved Local Council contractor for the area and disposed of in accordance with the local authority.

3.2.4 Fuel Depot Storage Capacity

The new tanks will have a storage capacity of 4 x 2500m³ (2 500 000) interchangeable between diesel and petrol resulting in a total additional capacity of 10 000m³. The proposed upgrade (10,000 m³) combined with the recently approved capacity (7,000 m³) will increase the depot's total storage capacity from 7,100 m³ to 17,000 m³.

3.2.5 Schedule and Lifetime of the Project

The project is scheduled to commence as soon as all approvals are obtained and will be completed over a period of 9 months. The lifespan of the project is indefinite with the tanks needing repair after a period of 25 – 30years, unless the developer decides to stop operation or is forced to stop.

Table 13: Project Schedule

Phase	Duration	Main Activities
Preparation Phase	3 months	<ul style="list-style-type: none"> • Obtaining all relevant approvals
Construction Phase including site handover	9 months	<ul style="list-style-type: none"> • Decommissioning of six existing tanks • Installation of four new tanks • Tying into existing services
Operation Phase	25 years+	<ul style="list-style-type: none"> • Use of the fuel tanks
Decommissioning Phase	3 weeks	<ul style="list-style-type: none"> • Complete stoppage of activities connected to the 4 x 2500m³ fuel storage tanks

		<ul style="list-style-type: none"> • Removal of the fuel tanks and pipes, • Site remediation in case of contamination of soil.
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3.3 Project Activities

The proposed project will essentially have three phases namely; preparation, construction and operation phases.

3.3.1 Activities during Site Preparation

The following will be done during site preparation:

- Appointment of project team
- Planning of the site layout
- Obtaining of approvals/permits from relevant authorities including ZEMA
- Complete stoppage of activities at the site
- Isolation of services (piping and electrical wiring)
- Hiring of machinery to be used

3.3.2 Activities during Construction

The main activities envisaged during construction will include:

- Draining & cleaning of existing tanks
- Dismantling & removal of existing tanks
- Tank assembly & positioning
- Piping & fuel transfer systems
- Coating & protection
- Tank testing & commissioning
- Excavation & earthworks
- Foundation works
- Wall & floor construction
- Access & support structures
- Connection to the main site drainage network

3.3.3 Activities during Operation

Operational activities will include;

- The loading of the road tankers
- The delivery of fuel by road tankers
- Maintenance/inspection of the tank farm and all other depot components
- Management of waste generated on site
- Daily cleaning of the site
- Monitoring and maintenance of fire-fighting equipment

3.3.4 Activities during Decommissioning

The developer will be responsible for decommissioning. At decommissioning phase (post project lifespan or if the developer is forced to close the development) a closure and rehabilitation plan will be elaborated for future use of the area. Activities envisaged at decommissioning phase include:

- Issuing of notices of the decommissioning exercise to all employees
- Complete stoppage of activities on site
- Removal of the fuel tanks and pipes
- Segregation, collection and disposal of waste generated during the decommissioning from the site to a designated dump site
- Site remediation in case of contamination of soils
- Treatment and disposal of contaminated materials
- Restoration of site to as close to natural state as possible.

4.0 PROJECT ALTERNATIVES

Need for the Project

Puma Energy Zambia Plc is an oil marketing company that operates in retail, commercial, industrial, lubricants, and aviation sectors and owns a number of service stations in Zambia. Puma operates a fuel depot in Lusaka's Heavy Industrial Area servicing their service stations and consumer installations.

The six existing tanks in the north eastern part of the depot site have reached their design life and are showing critical structural defects. Puma wishes to decommission these existing tanks and replace them with new tanks of a larger capacity. The project is needed as it will ensure that there is readily available fuel as the depot fuel storage capacity would increase; will prevent environmental pollution and product loss which would be as a result of tank rupture or leaks if the existing tanks which have reached their design life were left as is.

4.1 Project Alternatives

The proponent had two project alternatives, which is the do-nothing option or to implement the proposed project.

4.1.1 Identification and Justification/analysis of Alternatives

- i. The proposed project alternative means replacing and upgrading the existing Puma fuel depot by installing new, modern fuel storage tanks to enhance safety, efficiency, and increase the fuel storage capacity. The proposed project will involve decommissioning of the six old tanks which are old and are showing signs of structural defects and if these tanks were used in their current condition would result in environmental contamination. The proposed project alternative is in the best interest of the developer and their customers. Implementing the proposed project will ensure environmental protection and prevent product loss which would otherwise arise if the existing tanks are left as is. The tanks to be used would be new and installed in such a way that contamination to the environment would be prevented.
- ii. No Action Alternative – The no-action option meant not implementing the proposed project. The current capacity of the depot is not adequate to meet this growing demand of both diesel and petrol fuel at the Puma existing service stations and consumer facilities. Currently as it is, the six existing fuel storage tanks have reached the end of their design life, making their replacement necessary to ensure continued safe and efficient operations. The no action alternative risks environmental contamination. The no action alternative is not in the best interest of the developer, their customers and the environment.

4.1.2 List of Chosen Alternatives in Order of Preference

- i. The proposed project
- ii. The no-action alternative

4.1.3 Reasons for choosing the preferred alternatives and rejecting the other alternatives

Looking at the condition of the existing tanks, the no action alternative was not in the best interest of the developer. The developer chose the proposed project alternative (option i) that is demolishing the old tanks and replacing them with new tanks to ensure compliance to environmental regulations and also prevent product loss.

4.2 Site Alternatives

The proposed project site is the existing Puma Energy Lusaka Depot, where the developer intends to replace the old existing fuel tanks and upgrade the depot by installing four new aboveground fuel storage tanks of a larger capacity, each within a dedicated bunded containment area to ensure compliance with environmental, safety, and regulatory standards. Given that the project involves upgrading an already established fuel depot, no alternative sites were considered.

4.3 Technology Alternatives

No technology alternatives were considered. The following is the technology that the developer will use as they have been using this technology for their fuel installations. The new tanks will sit on a concreted floor having a concrete bund to ensure that no fuel leaks to soil and underground water courses. Human and machine labour will be used for the proposed replacement and upgrade of fuel tanks.

The developer will use machinery including excavators, cranes, welding machines, compactors and pressurizers as technologies for installing the tanks. Compactors ensure that all soil is properly compacted before operations commence. Pressurizers are to pressure-test the valves so that they operate efficiently.

There are no alternatives to these technologies because they are the approved technologies for fuel storage tank installations and have been deemed as safe and in compliance with the ZABS standards for the installation of above ground fuel storage tanks.

Tank Installation Alternatives

Three types of tank installations were considered for the project namely;

4.3.1 Identification and Justification of Alternatives

- i. Underground storage tank (USTs) - underground storage tanks (USTs) are installed in the ground.
- ii. Containerized storage tank – these have in-built primary and secondary spill containment mechanisms and are usually installed as aboveground, a feature which lessens the risk of polluting the environment due to accidental spills or leaks in case of tank failure.
- iii. Skid tanks or aboveground storage tanks - skid tanks or above surface storage tanks are installed within a concrete bund wall with enough capacity to handle

any possible spills from tank failures, they are however, aesthetically unappealing as they have a visual impact on both wildlife and humans.

4.3.2 Analysis of Each of the Identified Alternatives

- i. Underground storage tank (USTs) – these tanks present no impact on the physical aesthetic of the site, but present a high risk of contamination of soil and groundwater from potential leaks due to tank failure which has potential to impact on public health of other users of underground water.
- ii. Containerized storage tank – these tanks have a feature which lessens the risk of polluting the environment due to accidental spills or leaks in case of tank failure. This presented a major reason for settling for these kinds of tanks for the proposed project. Containerized tanks provide an opportunity for easy relocation in case of a situation where an alternative use for the site presents itself in future, a fuel storage facility installed with containerized tanks would be much easier to relocate and at a lower cost (i.e. no need for de-gassing prior to transportation) and as such a more viable option.
- iii. Skid tanks or aboveground storage tank – these tanks are aesthetically unappealing as they have a visual impact on both wildlife and humans. Due to the nature of their installation, skid tanks also presents a risk of odour from the smell of commodities especially during tank cleaning and offloading, however they are constructed with a spill containment measure and because they are above ground it's easy to notice any spillages.

4.3.3 List of Chosen Alternatives in Order of Preference

- i. Skid tanks or aboveground storage tank
- ii. Containerized storage tank
- iii. Underground storage tank (USTs)

4.3.4 Reasons for choosing the preferred alternatives and rejecting the other alternatives

The developer decided to install aboveground storage tanks for the proposed project as they present less risk of contamination of soil, surface and groundwater from potential leaks due to tank failure which has potential to impact on public health of other users of underground water. The developer also chose to install above ground tanks due to the large quantities of fuel to be stored on site. The tanks will be installed above ground on a concreted plate in a bunded area large enough to contain 110% of the tank full capacity. With regard to aesthetics the tanks will be painted and designed in a way that prevents odour from the smell of commodities ensuring that there is full compliance to ZABS standards. To reduce the risk of fire the tanks will have top and side pourers for cooling the tanks.

4.4 Water Supply

Currently, the Puma Lusaka Depot premises is serviced by Lusaka Water and Sanitation Company for water supply supplemented by a site borehole with adequate yield; therefore, water supply demand will be from the Lusaka Water and Sanitation Company supplemented by an existing borehole. No other alternatives were considered.

4.5 Sewage Management

The Puma Lusaka Depot premises have on it existing toilets connected to Lusaka Water and Sanitation Company sewage management system. For the proposed project, the existing toilets will be used as they are sufficient, hence no other alternatives were considered.

4.6 Power Supply

The Puma Lusaka Depot premises are already connected to ZESCO for power supply and also have a backup generator which is used in case of load shedding. The same will be used as the source of power supply for the proposed project. No other alternatives were considered as the power needs for the proposed project would not result in a significant increase in the current power load.

5.0 ENVIRONMENTAL BASELINE STUDY

This section outlines the general climatic conditions of the project area, located in Lusaka District, Lusaka Province.

5.1 Climate

Zambia experiences a predominantly sub-tropical climate characterized by three distinct seasons: a hot and dry season (mid-August to mid-November), a wet rainy season (mid-November to April) and a cool dry season (May to mid-August). Rainfall is strongly influenced by the movement of the Inter-Tropical Convergence Zone (ITCZ) as well as the El Niño/Southern Oscillation (ENSO) phenomenon and varies from an annual average of 600 mm in the lower south up to 1,300 mm in the upper north of the country. Climate is tropical by location near the equator. The annual rainfall in Zambia averages between 700 mm in the south and 1,400 mm in the north. The hot months are very dry, receiving almost no rainfall between May and August. The wet season (September-April) rainfall is controlled by the passage of the tropical rain belt (also known as the Inter-Tropical Conversion Zone, ITCZ) which oscillates between the northern and southern tropics over the course of a year, bringing rain between October and April of 150-300 mm per month.

In Lusaka District as well as the project area the climate is typical of the regional climatic conditions for Zambia, defined by three major seasons: a cool dry season from April to August, a hot dry season from August to November and a warm wet season from November to April. The project area’s climate is classified as warm and temperate. The project area experiences a lot of rainfall in summer compared to winter. There is little or no rainfall in winter.

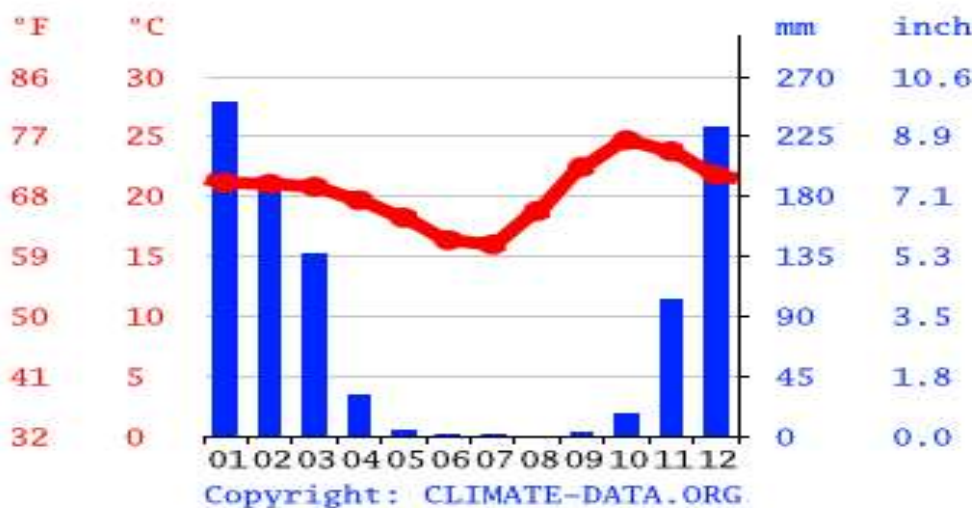


Figure 4: Climate (rainfall & temperature) for Lusaka

5.1.1 Rainfall

The proposed Project area has an average annual rainfall of 970mm. The least amount of rainfall occurs in August. The average in this month is 0mm. On average, the highest amount of rainfall occurs during January with a mean value of 250mm monthly.

Climate Variable	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Annual
Average Precipitation mm (in)	0.1 (0)	0.1 (0)	1.2 (0)	16 (0.6)	102.3 (4)	275.2 (10.8)	264.1 (10.4)	235.8 (9.3)	130.9 (5.2)	48 (1.9)	4.4 (0.2)	0 (0)	1078.1 (42.4)
Precipitation Litres/m ² (Gallons/ft ²)	0.1 (0)	0.1 (0)	1.2 (0.03)	16 (0.39)	102.3 (2.51)	275.2 (6.75)	264.1 (6.49)	235.8 (5.78)	130.9 (3.21)	48 (1.16)	4.4 (0.11)	0 (0)	1078.1 (26.44)
Number of Wet Days (probability of rain on a day)	0 (0%)	0 (0%)	0 (0%)	2 (6%)	8 (27%)	16 (52%)	17 (53%)	18 (57%)	10 (32%)	2 (7%)	0 (0%)	0 (0%)	71 (20%)
Percentage of Sunny (Cloudy) Daylight Hours	82 (18)	84 (18)	77 (23)	73 (27)	82 (18)	84 (18)	89 (19)	87 (18)	84 (18)	71 (27)	61 (17)	28 (23)	65 (23)

Figure 5: Precipitation

5.1.2 Temperature

The project area, situated within Lusaka District, experiences a subtropical highland climate, which is generally mild and temperate throughout the year. The average annual temperature in the project area is approximately 20.4°C, the hottest month of the year is typically October, just before the onset of the rainy season. During this period, the average temperature rises to around 24.7°C. The heat is intensified by dry conditions and high solar radiation, as the region is still under the influence of the dry season with minimal cloud cover to buffer the sun's intensity. October's high temperatures often mark the end of the dry season.

Conversely, the coldest month is July, which falls within the cool dry season. During this time, average temperatures drop to about 16.0°C, with early morning temperatures often dipping further due to clear skies and dry air. These cooler conditions are a result of Lusaka district's position in the Southern Hemisphere winter, when the region receives minimal solar radiation. Although July is relatively cool by tropical standards, it is not extreme, and daytime temperatures usually remain mild and comfortable.

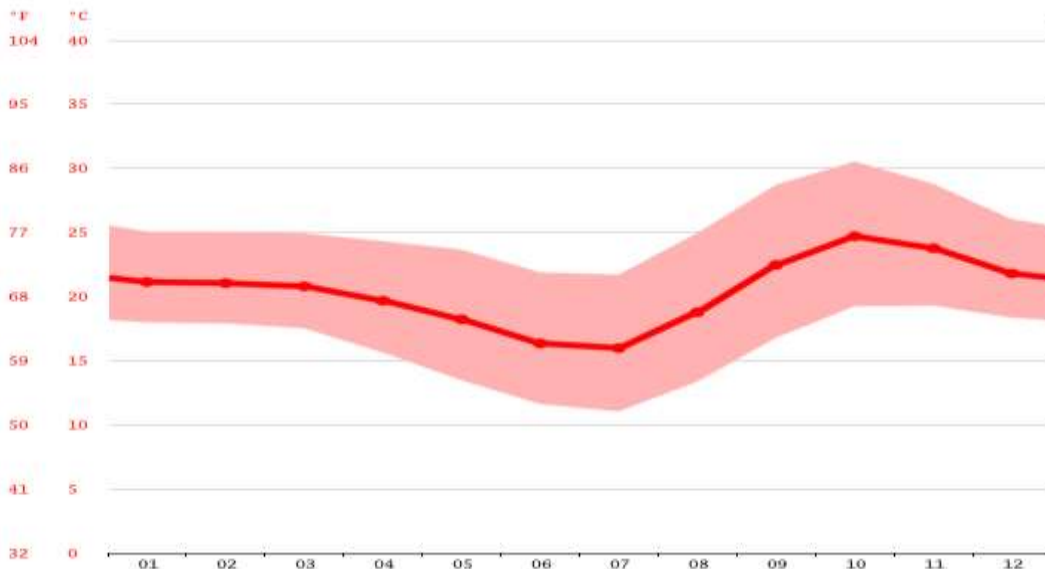


Figure 6: Graph Showing Temperature by Month

5.1.3 Humidity

The proposed project area lies in Lusaka District which experiences an annual average relative humidity of approximately 61%, which is consistent with the broader climatic conditions of the area. Lusaka's climate is influenced by its subtropical highland setting, marked by a distinct wet season from

November to April and a dry season from May to October. Within this context, relative humidity levels vary significantly across the year. The highest levels of humidity are typically recorded in February, coinciding with the peak of the rainy season. During this period, the atmosphere becomes heavily saturated with moisture, and average relative humidity can reach up to 83–87%, creating a humid and often overcast environment.

The lowest humidity levels occur during the dry season, particularly in September, when average relative humidity drops to around 35–36%. The air during this time becomes significantly drier due to minimal rainfall and high evaporation rates.

5.1.4 Wind

Lusaka District inclusive of the project area exhibits distinct seasonal wind patterns that are integral to the region's subtropical highland climate. During the dry season, which spans from May to October, prevailing winds predominantly originate from the east to southeast. These winds are generally drier and contribute to the clear skies and low humidity characteristic of this period. Notably, July and August experience fresh breezes, with average wind speeds reaching approximately 12.2 km/h in July and 12.6 km/h in August.

In the hot dry season, particularly in September and October, wind speeds peak, with September being the windiest month, averaging 13.8 km/h. Conversely, during the rainy season from November to April, wind patterns shift, and the region experiences lighter winds, averaging between 7.8 km/h and 10.2 km/h. These winds are typically from the northwest, bringing moist air masses that contribute to the area's precipitation.

5.1.5 Sunshine

Lusaka District being located in the southern hemisphere and experiencing a humid subtropical climate, generally receives a significant amount of sunlight throughout the year. The average amount of sunlight experienced in Lusaka District over a one-year period can vary, but in general, it can be characterized by distinct seasons that influence the duration and intensity of sunlight.

In Lusaka District, the month with the most daily hours of sunshine is October with an average of 10.67 hours of sunshine. In total there are 330.74 hours of sunshine throughout October.

The month with the fewest daily hours of sunshine in Lusaka District is January with an average of 8.45 hours of sunshine a day. In total there are 261.99 hours of sunshine in January.

Around 3234.54 hours of sunshine are counted in Lusaka District throughout the year. On average there are 269.54 hours of sunshine per month.

It's important to note that these figures are general estimates and can vary slightly from year to year due to natural climate variations. To obtain more specific and accurate information regarding the average sunlight experienced in Lusaka District over a given year, it is advisable to refer to meteorological data or consult local weather authorities in Zambia.

5.1.6 Agro Ecological Zone

Zambia is divided into three major agro-ecological regions (Regions I, II and III), which are primarily based on rainfall amount but also incorporate soils and other climatic characteristics. Agro-Ecological Zones (AEZ) are geographical regions with similar climate, soil, and topographic conditions that determine their suitability for specific agricultural practices and land use.

The proposed project area falls under the Agro-Ecological Zone IIa. AEZ IIa is characterized by relatively moderate temperatures and rainfall patterns, making it suitable for a wide range of agricultural activities. This zone is conducive to crop production, horticulture, and livestock rearing. It typically experiences a bimodal rainfall pattern, with a main rainy season from November to April and a shorter rainy season from December to February.

The soils in AEZ IIa are generally fertile and well-drained, which allows for various types of crops to be cultivated successfully. The area is suitable for staple crops like maize, millet, and sorghum, as well as cash crops like vegetables, fruits, and flowers. Horticultural activities are common in this zone due to the availability of water and favorable climatic conditions.

Lusaka, being located in AEZ IIa, benefits from its agricultural potential, which supports both subsistence and commercial farming. The zone's moderate climate and fertile soils contribute to the diverse agricultural practices that play a crucial role in food security and economic development in the region.

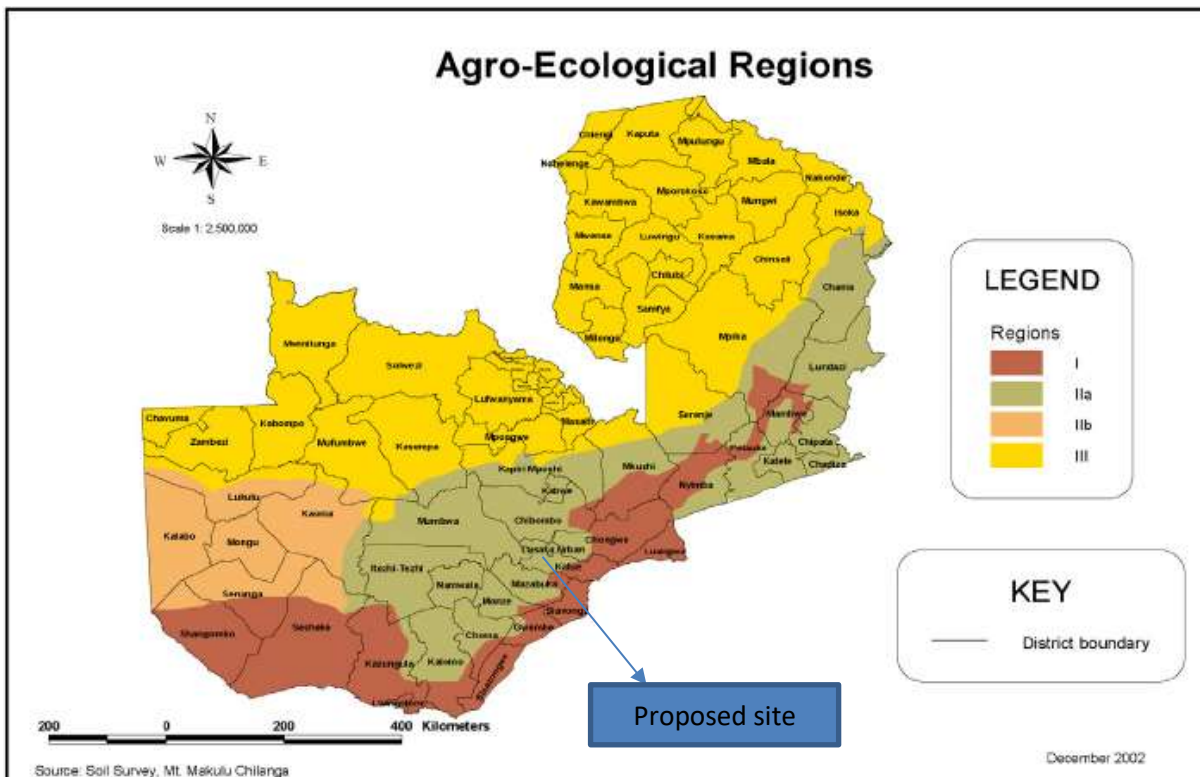


Figure 7: Zambia Agro Ecological Zones in Relation to Project Site

5.2 Air Quality/Noise Levels

The air quality parameters that were measured were Sulphur dioxide (SO₂), Ozone (O₃), Carbon Monoxide (CO), Particulate Matter (PM_{2.5} and PM₁₀) and noise level as major cause of pollution and compare them against ZEMA standards and IFC guidelines. The air and noise quality test results were collected from five (4) sampling points at the proposed project site.



Figure 8: Google Earth Image Showing Location of Air Quality and Noise Level Sampling Points

Table 14: GPS Coordinates of Air Quality and Noise Level Sampling Locations

Label	Coordinates		
	Latitude	Longitude	Elevation
Old Fuel Tanks Area - AQ/NL1	15°23'43.42"S	28°15'20.20"E	1276 m
Sampling Location - AQ/NL2	15°23'42.00"S	28°15'16.48"E	1277 m
Centre of the Site- AQ/NL3	15°23'45.22"S	28°15'18.32"E	1276 m
Along Mungwi Road - AQ/NL4	15°23'49.38"S	28°15'18.23"E	1277 m

The results of the ambient air test obtained were compared with ZEMA standards for ambient air emissions and IFC/WHO ambient air quality guidelines. Measured parameters that fell below guideline values of either of the standards were considered non-polluting at the time of the baseline study. The ZEMA standards and IFC/WHO guidelines are presented in the tables below.

Table 15: ZEMA Standards for Ambient Air Emissions

Parameter	ZEMA Standard ($\mu\text{g}/\text{m}^3$)	Averaging duration
SO ₂	500	10-minutes
	350	1-hour
CO	30 mg/m ³	1-hour
O ₃	120	8-hour
PM2.5	70	24-hour
PM10	70	24-hour

Table 16: WHO Ambient Air Quality Guideline (2021)

Parameter	IFC/ WHO guideline value ($\mu\text{g}/\text{m}^3$) - 2021	Averaging duration
SO ₂	20	24-hours
	500	10 Minute
CO	30 mg/m ³	1-hour
O ₃	100	8-hour daily maximum
PM2.5	15	24-hours
PM10	45	24-hours

5.2.1 Air Quality Results and Particular Matter Results

The air quality and Particular Matter results are presented in the tables below for each site grouped under the respective parameters sampled.

Table 17: Air Quality Results

Old Fuel Tanks Area - No. 1 -15°23'43.42"S, 28°15'20.20"E				ZEMA Standards (µg/m ³)	Averaging Duration	IFC/WHO Guideline Value (µg/m ³)	Averaging Duration
Parameter	Results						
	Min	Max	Ave				
SO ₂	0	0	0	500	10 - minutes	20	24 - hour
				350	1 -hour	500	10 - minutes
CO	0	0	0	30 mg/m ³	1 - hour	30 mg/m ³	1 -hour
O ₃	0	0	0	120	8 - hour	100	8 - hour
PM2.5	2	3	2	70	24 - hour	25	24 - hours
PM10	10	16	13	70	24 - hour	45	24 - hour
Sampling Location - No. 2 -15°23'42.00"S, 28°15'16.48"E				ZEMA Standards (µg/m ³)	Averaging Duration	IFC/WHO Guideline Value (µg/m ³)	Averaging Duration
Parameter	Results						
	Min	Max	Ave				
SO ₂	0	0	0	500	10 - minutes	20	24 - hour
				350	1 -hour	500	10 - minutes
CO	17.80	22.46	20.25	30 mg/m ³	1 - hour	30 mg/m ³	1 -hour
O ₃	0	0	0	120	8 - hour	100	8 - hour
PM2.5	1	4	3	70	24 - hour	25	24 - hours
PM10	2	16	12	70	24 - hour	45	24 - hour
Centre of the Site - No. 3 -15°23'45.22"S, 28°15'18.32"E				ZEMA Standards (µg/m ³)	Averaging Duration	IFC/WHO Guideline Value (µg/m ³)	Averaging Duration
Parameter (µg/m ³)	Results						
	Min	Max	Ave				
SO ₂	0	100	0	500	10 - minutes	20	24 - hour
				350	1 -hour	500	10 - minutes
CO	20.31	22.55	21.68	30 mg/m ³	1 - hour	30 mg/m ³	1 -hour

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O ₃	0	0	0	120	8 - hour	100	8 - hour
PM2.5	5	6	6	70	24 - hour	25	24 - hours
PM10	20	49	32	70	24 - hour	45	24 - hour
Along Mungwi Road - No. 4 - 15°23'49.38"S, 28°15'18.23"E				ZEMA Standards (µg/m ³)	Averaging Duration	IFC/WHO Guideline Value (µg/m ³)	Averaging Duration
Parameter (µg/m ³)	Results						
	Min	Max	Ave				
SO ₂	0	100	0	500	10 - minutes	20	24 - hour
				350	1 - hour	500	10 - minutes
CO	11.86	12.66	12.25	30 mg/m ³	1 - hour	30 mg/m ³	1 -hour
O ₃	0	0	0	120	8 - hour	100	8 - hour
PM2.5	5	7	6	70	24 - hour	25	24 - hours
PM10	50	96	65	70	24 - hour	45	24 - hour

**Note that Carbon Monoxide is being measured in mg/m³ as the ZEMA and IFC/WHO Guidelines Limit*

Primary causes of air pollution

The Study Area is in the Heavy Industrial Area and there are a couple of air pollution sources present in the wider Project Area. Primary causes of air pollution in the project area include the following:

- Vehicular traffic (mobile sources) accessing Mungwi Road and access tracks within the Heavy Industrial Area
- Existing Factories and Around the Site and in the wider Project Area
- Construction activities in the wider Project Area.
- A couple of fuel Depots and service stations in the project Area.

All the outlined primary causes of air pollution are considered moderate to high.



Figure 9: Air Quality Monitoring in Progress at Old Tanks Area (AQ1)

Comparison of Results with Standards

The main observations for the respective parameters are as follows:

Carbon Monoxide

The minimum value recorded is $0\text{mg}/\text{m}^3$ (at Old Fuel Tanks Area) and the maximum value registered is $22.55\text{ mg}/\text{m}^3$ (at the Centre of the Site).

All measurements and 1-hour averages derived for all sites fall within the WHO guideline threshold of $30\mu\text{g}/\text{m}^3$ (1 hour) and the ZEMA guideline value of $30\mu\text{g}/\text{m}^3$ (1 hour) at all sampling points.

Sulphur Dioxide

No detectable levels of SO_2 were recorded at the Old Fuel Tanks Area and at Sampling Location No. 2. However, a concentration of $100\mu\text{g}/\text{m}^3$ was measured at two locations: the central part of the site and along Mungwi Road.

All measurements fall within the 10-minute guideline threshold of $500\mu\text{g}/\text{m}^3$ (ZEMA/WHO)

Ozone

Ozone was not detected at any of the four (04) sampling points - all readings across all sample points registered $0\mu\text{g}/\text{m}^3$.

Particulate matter

PM2.5

Levels of PM2.5 recorded are low for all sites, with values ranging mostly between 1-7 $\mu\text{g}/\text{m}^3$.

The minimum level recorded is $1\mu\text{g}/\text{m}^3$ (at Sampling Location No. 2) and maximum levels of around $7\mu\text{g}/\text{m}^3$ were registered along Mungwi Road.

The 24-hour average values recorded ranged from 2 to $6\mu\text{g}/\text{m}^3$ which is compliant with the WHO guideline limit of $25\mu\text{g}/\text{m}^3$ value and also within the ZEMA regulatory threshold of $70\mu\text{g}/\text{m}^3$.

PM10

Levels of PM10 recorded at all sites, values ranging mostly between 2 - $96\mu\text{g}/\text{m}^3$.

The minimum level recorded is $2\mu\text{g}/\text{m}^3$ (at Sampling Location No. 2) maximum level captured $96\mu\text{g}/\text{m}^3$ along Mungwi Road.

All measurements and 24-hour averages at most of the sites comply with the guideline thresholds set by ZEMA ($70\mu\text{g}/\text{m}^3$) and the WHO ($45\mu\text{g}/\text{m}^3$). However, an exceedance was recorded at Sampling Location No. 4 (along Mungwi Road) where a concentration of $96\mu\text{g}/\text{m}^3$ was observed.

Conclusion

The baseline ambient air quality assessment conducted indicates that the environmental conditions are largely within acceptable thresholds, with a few notable exceptions. Despite the site's location in a high-activity industrial zone characterized by vehicular traffic, operational fuel depots, factories, and ongoing construction, the results show that levels of CO, SO_2 , O_3 , and PM_{2.5} were well within both ZEMA and WHO guideline limits across all sampling points.

However, Particulate Matter (PM₁₀) levels at Sampling Location AQ4 (along Mungwi Road) exceeded both the ZEMA threshold of 70µg/m³ and the WHO limit of 45µg/m³, with a recorded concentration of 96µg/m³. This exceedance is attributed primarily to increased vehicular activity and dust emissions along Mungwi Road.

5.2.2 Noise Level Results

Noise levels are presented in the ensuing tables below. Each table represents noise levels measured for a particular site. Data collection for noise as permitted by weather conditions

Table 18: Noise Level Results

GPS Coordinates of the Location	Noise level reading – dB (A)		
	Minimum	Maximum	Average
Old Fuel Tanks Area – 15°23'43.42"S, 28°15'20.20"E	67.2	73.2	69.7
Sampling Point No. 2 – 15°23'42.00"S, 28°15'16.48"E	63.5	69.2	65.0
Centre of the Site – 15°23'45.22"S, 28°15'18.32"E	64.8	70.0	66.6
Mungwi Road – 15°23'49.38"S, 28°15'18.23"E	69.6	79.0	78.7

To ensure that across the entire survey period, data was collected for a sufficient range of hours so as to be representative of a full 24-hour period. Below is the IFC Noise Level Guidelines for residential; institutional; educational and, industrial; commercial receptors (see table 6) It should be noted that ZEMA also uses IFC guidelines for noise levels.

Table 19: IFC Noise Level Guidelines

Receptor	One Hour LAeq* (dBA)	
	Daytime (07:00 - 22:00)	Night-time (22:00 - 07:00)
Residential; institutional; educational	55	45
Industrial; commercial	70	70

*Equivalent Continuous Level over 1 Hour (in effect, the average sound energy level over 1 hour)



Figure 10: Noise Level Monitoring at the Centre (NL3)

The overall noise pollution in the study area (Heavy Industrial Area) is generally moderate to High. The primary sources of sound recorded during the survey included construction activities within and around the site, movement of fuel tanks onsite (loading and offloading fuel), neighbouring industries and factories and also movement of vehicles along Mungwi Road.

In conclusion, the site exhibited moderate to high ambient noise levels, ranging from 65.0 dB to 78.7 dB, with the highest values recorded at the roadside sampling point. Although elevated, these levels remain within acceptable limits for industrial areas as per IFC and ZEMA standards. Primary sources of noise include traffic, industrial activities, and operational fuel handling within and around the site.

5.3 Geology

The Project site is underlain carbonate rocks, namely marble and dolomites. In most of the existing literature, the marble is referred to as limestone. The carbonate rocks which belong to the Lusaka Dolomite Formation are highly crystalline. There are marble outcrops that have been exposed within the project site and in the immediate surrounding areas. The regional strike of these rocks is northwest (NW) – southeast (SE) with unknown dip and dip direction.

There are three types of rocks that characterize the geology of Lusaka city. These include schists, quartzite and marbles. Lusaka is situated on inverted limb of a large recumbent fold so that the older schists and quartzite's overlie the younger marbles. The northern and eastern suburbs of the city are thus underlain by schist and limestone seems to dominate the southern

and western parts of Lusaka. Therefore, the proposed site is placed over the boundary between the two major formations, with approximately the top quarter of the site underlain by the carbonate sequence of the Lusaka Dolomite and the sandy schistose succession of the Cheta Formation underlying the rest of the site. Additionally, the meta-sediments of the lower Katanga succession have in places been intruded by gabbroic and doleritic basic rocks but are not exposed on the surface in the study area.

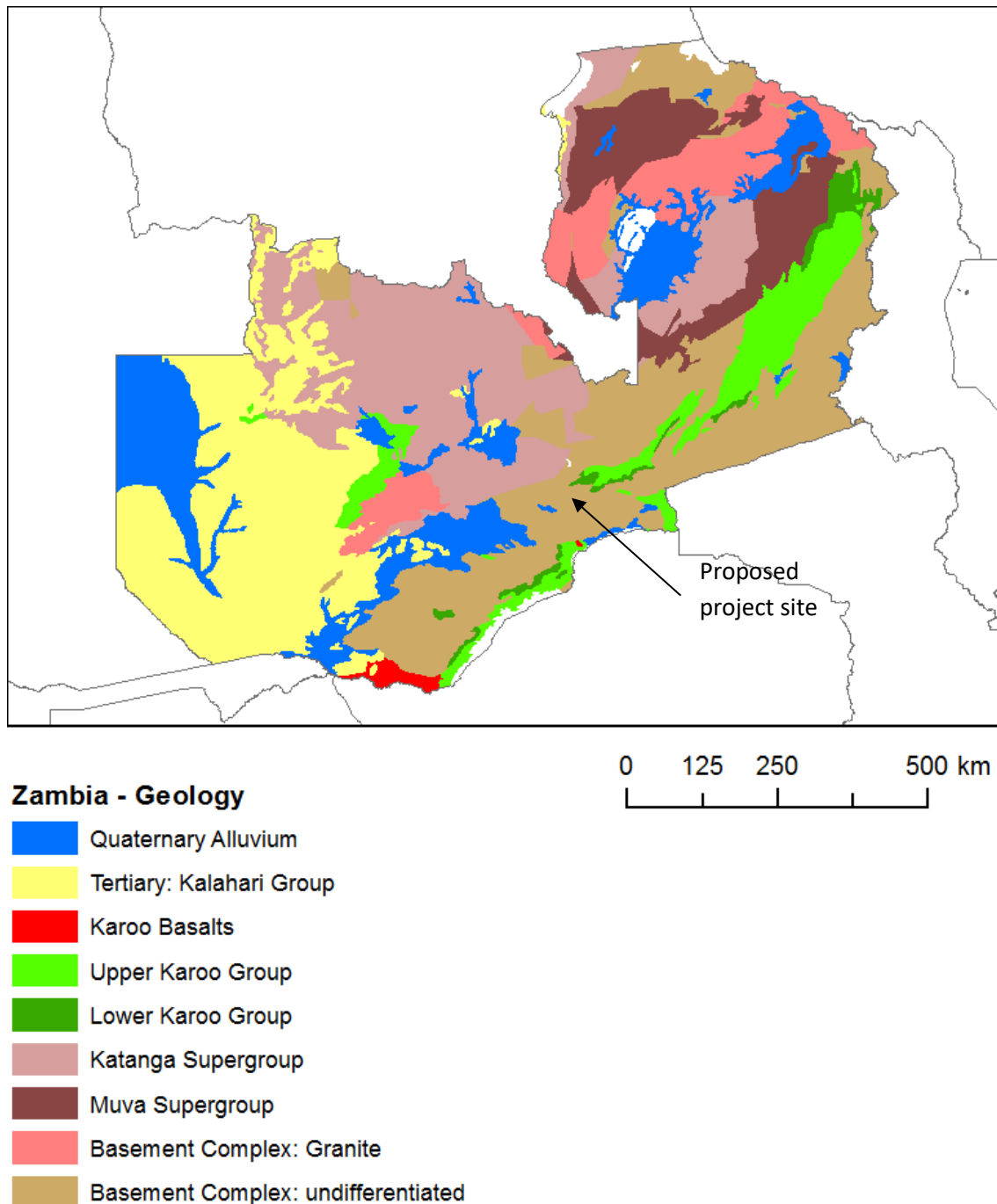


Figure 11: Geology of the project site (source – British Geological Survey)

5.4 Hydrology

The project site and its immediate surroundings do not contain any natural surface water features, with the exception of a 250 m³ emergency reservoir. Lusaka district's hydrology is characterized by a primary reliance on both surface and groundwater resources, with the Kafue River and the Lusaka aquifer being key sources for the city's water supply. While several rivers and streams exist in the district, including the Kafue River near Lusaka and smaller streams within the city, the majority of the city's water supply is drawn from the Kafue River and groundwater. In addition, smaller streams such as the Mwembeshi, Chunga, Ngwerere, Chilongolo, and Chalimbana contribute to the districts surface water system.

In general, Zambia has sufficient water resources for many decades of population growth. Even in drought years, it only consumes 5 per cent of its available surface water. However, many urban households have little access to reliable and safe water.

Lusaka Water and Sewerage Company (LWSC) is responsible for supplying the capital with water and sewerage facilities. It relies on the Kafue River for 97,000 cubic metres per day and a similar amount from 72 boreholes reaching deep groundwater. The boreholes have their own system of tanks and pipes in the peri-urban areas. Another 80,000 cubic metres per day is supplied by private boreholes and shallow wells. The demand for water in Kafue and Lusaka is growing quickly so that demand already outstrips supply of treated water.

5.5 Hydrogeology

The hydrogeology of the proposed project area is characterized by Katanga Super group constituting the Lusaka Dolomite Formation which lies uncomfortably over the Cheta formation. The project area aquifer is composed of an extensive band of calcareous rocks consisting of Kyanite bearing schist, phyllite, and Quartzite. Hence, the aquifers are mostly between 15 and 50m thick. The water table is generally from 20 to 35m below the ground surface.

There is an existing borehole located at GPS coordinates 15°23'46.00"S, 28°15'19.00"E within the depot premises. The borehole, which is currently in use, is approximately 40 meters northeast of the proposed tank area and has a depth of 80 meters.

The laboratory results indicate that all chemical parameters and bacteriological parameters were compliant with both the Zambian Standards and the WHO Guideline permissible limits. The water results are shown in the following table:

Table 20: Laboratory Results

Parameter	Lusaka Puma Depot	Zambian Standards (Maximum Permissible Limit)	WHO Guideline (Maximum Permissible Value)
pH	6.71	6.5 – 8.0	6.5 – 8.5
Turbidity (NTU)	0.36	5.0	5.0
Conductivity	364	1500	1500
Total Dissolved Solids (mg/l)	182	1000	1000
Total hardness (as mg CaCO ₃ /l)	180	500	500
Total Suspended Solids (mg/l)	<1.0	-	-
Calcium hardness (as mg CaCO ₃ /l)	124	500	500
Alkalinity (as mg CaCO ₃ /l)	176	500	500
Iron (mg/l)	<0.01	0.30	0.30
Ammonia (as NH ₄ Nmg/l)	<0.01	1.5	1.50
Sulphates (mg/l)	31.175	400	250
Chlorides (mg/l)	32.0	250	250
Nitrites (as NO ₂ -Nmg/l)	<0.001	1.0	3.0
Nitrates (as NO ₃ -Nmg/l)	<1.001	10	10
Acidity (as mg CaCO ₃ /l)	Nil	500	500
Total Phosphates (mg/l)	<0.01	5.0	5.0
Magnesium (mg/l)	13.44	150	-
Calcium (mg/l)	56.0	200	200
Fluorides (mg/l)	0.14	1.50	1.50
Potassium (mg/l)	6.96	-	-
Sodium (mg/l)	21.12	200	200
Manganese (mg/l)	<0.01	0.10	0.50
Hydrocarbons	<0.005	-	-
Bacteriological Results			
Total coliforms (≠/100ml)	0	0	0
Faecal coliforms (≠/100ml)	0	0	0
E.coli (≠/100ml)	0	0	0

NB – Water Quality Results are appended to this document

5.6 Topography and Soils

Soils

Classification (USCS and COLTO)

Soil samples were obtained on site and were classified according to the USCS classification System. As shown in the figure below, the soil on site is classified from poorly graded sand, sandy silt, clayey gravel with sand, silty, clayey sand, sandy lean clay, Poorly graded sand with clay and gravel, silty gravel with sand and slity sand with gravel.

SN	Sample Numer	Sample Depth	Soil Classification	Fines Class	Group Symbol	Group Name
1	LSK-GR-0091	1m	Sand	ML	SP	Poorly graded sand
2	LSK-GR-0092	11m	Silt	ML	ML	Sandy Silt
3	LSK-GR-0093	11m	Silt	ML	ML	Sandy Silt
4	LSK-GR-0094	1m	Gravel	CL-ML	GC_GM	Silty, clayey gravel with sand
5	LSK-GR-0095	1m	Sand	CL-ML	SP_SC	Poorly graded sand with clay and gravel (or silty clay and gravel)
6	LSK-GR-0096	2-3m	Sand	ML	SM	Silty sand with gravel
7	LSK-GR-0097	1m	Sand	CL	SC	Clayey sand
8	LSK-GR-0098	2-3m	Sand	CL-ML	SC_SM	Silty, clayey sand
9	LSK-GR-0099	1m	Clay	CL	CL	Sandy lean clay
10	LSK-GR-0100	2m	Sand	CL	SC_SM	Silty, clayey sand with gravel
11	LSK-GR-0101	3m	Gravel	ML	GM	Silty gravel with sand

Figure 12: Soil Classifications

Sample number LSK-GR-0099, LSK-GR-0100, LSK-GR-0101 and LSK-GR-0094, where obtained from Trail Pit 3 and BH03 where the existing old tanks are as shown on the map below.



Figure 13: Soil Sampling Points

The results indicate that the soil at the site varies in density, ranging from loose to very dense.

Landscape and Topography

The landscape of the project area is defined by large built structures which are close to each other, landscaped areas and patches of vegetation and cleared areas between buildings. The terrain is mainly flat at an elevation of 1277 m above sea level

5.8 Land Use and Tenure

There are three land tenure systems in the project area namely; state, traditional and municipal lands. Generally, land ownership in the country is on leasehold basis with periods ranging between 14 to 30 years for municipal land and ninety-nine (99) years for state land.

Traditional land is generally not held on title unless on recommendation of the local traditional leaders that it is converted to state land and then a ninety-nine-year lease may be issued. Lusaka Puma Depot is on plot no.1710 Heavy Industrial Area, Lusaka District, Lusaka Province, Zambia by Mount Meru Petroleum Zambia Limited. The proposed land site falls under ‘state land’ of which title deeds exist. The proposed project site is in the heavy industrial area of Lusaka district along Mungwi Road. The land use in this zone is for industrial purposes.

5.9 Built Environment

The proposed project site is located within the Puma Lusaka Depot plot, which is fully enclosed by a boundary wall fence. The depot includes various facilities such as an office building, loading gantry, warehouse, water tanks, water reservoir, fire house, maintenance workshop, and an oil interceptor. There are three separate above-ground fuel storage tank farms on the site. Two of these are located in the north-western part of the plot, while two additional tanks are currently under construction in the northern part of the plot. The third tank farm, situated in the north-eastern part of the plot, contains three petrol tanks each with a capacity of 464 m³, two diesel tanks each with a capacity of 1,100 m³, and one petrol tank with a capacity of 1,200 m³. This third tank farm is the one scheduled for decommissioning, and the proposed tank upgrade will be carried out at the same location where these old tanks will be removed. The area around the depot components is concreted and some parts landscaped.



Figure 14: Neighbouring Land Use and Activities

The site is situated within a heavy industrial zone characterized by a concentration of established infrastructure and industrial activity. Surrounding the site are various facilities,

including manufacturing plants, warehouses, logistics depots, and utility infrastructure that support the area's industrial operations. Some of the infrastructures/ industries around the site area are:

- North of the site is a railway line and at approximately 40m is Elecnor
- North east of the site across the railway at approximately 197m is Saro Agro Industrial Limited;
- South west sharing a boundary with the depot within the same plot is the Puma Headquarters.
- South of the site is Mungwi Road and at approximately 30m across Mungwi Road is Tobacco Board of Zambia, also at approximately 30m south is Katanga Road, at approximately 30m south east of the site is Global Logistics, and at approximately 250m south east is Mungwi Centre;
- East sharing a boundary with the site is TotalEnergies Fuel Depot, at approximately 180m is Falcon Gas and at approximately 300m is Fresh Pikt;
- West sharing a boundary with the site is Former Caltex Depot and at approximately 100m is Bulk Oil.

5.10 Fauna

The site is an active fuel depot.

5.10.1 Terrestrial Species

Mammals

No fauna species were directly observed during the site visit; however, reports indicate the presence of small mammals such as rodents and mice within the site and its immediate surroundings.

Insects (Lepidoptera)

Difference types of insects were observed in the project area these include, termites, butterflies, ants.

Reptiles

There were no reptiles observed at the time of the site visit however the following reptiles are reported within the site; Geckos, Lizards and Chameleons.

5.10.2 Aquatic Fauna Species Observed on Site

As an active fuel depot site and due to lack of significant water bodies, no aquatic flora and fauna studies were identified.

5.10.3 Identification of Rare or Endangered Species

There are no any threatened, rare or endangered species of fauna registered or known to exist on the study site or its immediate surrounding environments with respect to national or international conservation status

Some of the fauna species in Zambia which are classified as endangered on the IUCN Red List are as follows; the African Wild Dog, Shoebill Stork, and Ansell's Shrew. Further, the Hippo is yet another recognizable animal that is on the endangered species list.

5.11 Flora Species

The existing vegetation within the proposed site consists primarily of modified grass, ornamental flowers, and a limited number of exotic tree species. The site currently functions as an active fuel depot, with most of the surrounding area concreted and having a smooth paved surface. Identified tree species include bottlebrush (*Callistemon*), guava (*Psidium guajava*) and mango (*Mangifera indica*).



Figure 15: Evidence of the Smooth Paved Surface within the Site

Identification of Threatened, Rare and Endangered Flora Species

Zambia has the following individual trees classified as endangered on the IUCN Red List; Pod Mahogany (*Azelia Quanzensis*), African Teak (*Pterocarpus Angolensis*), East African Mahogany (*Khaya Nyasica*) and *Mitragyna Stipulosa*. Further, more recently, Mukula tree (*Pterocarpus Chrysothrix*) has being reported to be the most endangered tree species in Zambia. This may be attributed to its rosewood properties, which makes it particularly desirable for furniture processing, with a significant demand from China.

In relation to the proposed project vicinity, no rare or endangered flora species on the IUCN Red List were observed or reported to exist.

5.12 Avifauna (Birds)

No avifauna species were observed or reported to be spotted on site at the times of site assessment.

Identification of Rare and Endangered Species

There are no any threatened, rare or endangered species of birds registered or known to exist on the study site or its immediate surrounding environments with respect to national or international conservation status.

5.13 Archaeological and Cultural Environment

The project site has no known sites that have been confirmed as cultural or archaeological sites. However, it is worth noting that should such sites be discovered the National Heritage Conservation Commission shall be notified at the earliest possible time.

5.14 Social-Economic Set up

5.14.1 Economic Activities

The Heavy Industrial Area of Lusaka District serves as a vital economic hub, contributing significantly to the city's industrial output and employment. This zone accommodates a broad spectrum of manufacturing and industrial operations.

1. **Manufacturing and Processing Industries:** The area is characterized by high concentrations of manufacturing plants involved in the production of food and beverages, plastics, textiles, chemicals, metal products, and construction materials. Notable companies operating here include Zambef Products Plc, Zambian Breweries Plc, Trade Kings Group, and Varun Beverages Zambia Limited. These firms not only cater to local demand but also contribute to exports across the region.
2. **Agro-Processing and Food Industries:** The agro- process sector is particularly active in this area, with companies with companies engaged in meat processing, edible oil production, milling, and beverage manufacturing. Zambef Products Plc, for example, operates a major facility in this zone, handling livestock, meat processing, and cold chain logistics.
3. **Automotive and Engineering Services:** The area hosts several garages, service centers, and suppliers of automotive parts and engineering equipment. These businesses support the logistics and transportation sector by servicing commercial fleets and industrial machinery.
4. **Warehousing and Logistics:** The location's accessibility and its link to the central business district and major highways make it ideal for logistics operations. Several warehousing and freight companies are located here, providing storage, distribution, and customs clearing services for local and cross-border trade.
5. **Construction and Building Supplies:** Companies dealing in construction supplies such as cement, steel, paint, tiles, and hardware are prevalent. These enterprises play a key role in supporting Lusaka's booming real estate and infrastructure development sectors.
6. **Employment and Economic Linkages:** The economic activities within this industrial corridor provide direct employment to thousands of workers and indirectly support a network of service providers, including transporters, food vendors, and security

services. These activities generate significant tax revenue and contribute to the overall economic growth of Lusaka District.

5.14.2 Population

According to the CSO (2022), Lusaka District boasts a total population of 2,204,059 people. The proposed site falls within Matero Constituency, which, as per the CSO (2022), recorded a total population of 320,580 people. In this constituency, females constitute 165,954 individuals, while males account for 154,580.

The settlement pattern in the project area is characterized as clustered and planned.

5.14.2.1 Growth Rate, Population Density and Distribution

According to the CSO (2022), between 2010 and 2022, Lusaka District's population grew from 1,747,152 to 2,204,059 reflecting an average annual growth rate of approximately 2.22%. This growth indicates notable demographic changes within the district. Factors contributing to this increase likely include natural population growth (births exceeding deaths), migration from other regions, and socio-economic developments.

Lusaka District's status as Zambia's capital and its role as an economic hub attract individuals seeking employment and better living standards. Additionally, the district's infrastructure, educational institutions, and healthcare facilities make it a desirable destination for many. These elements collectively contribute to the district's population growth and underscore the need for continued urban planning and resource management to accommodate the expanding populace.

5.14.2.2 Average Household Size:

In 2022, the average household size in Lusaka District was recorded at approximately 5.0 persons per household. Male-headed households had a slightly higher average of 5.2 persons, while female-headed households averaged 4.7 persons. These figures show a modest increase in household size compared to 2010, which may be attributed to ongoing urbanization, population growth, and evolving family structures in the district. The difference in household size between male- and female-headed homes may continue to reflect underlying cultural norms, economic factors, and variations in household composition within the urban setting of Lusaka District.

5.14.3 Administration

Lusaka City Council (LCC):

- Political Wing

Led by the Mayor, this wing comprises elected representatives responsible for policy formulation and decision-making.

- Administrative Wing

Headed by the Town Clerk, this division oversees the implementation of council policies and manages daily operations. It consists of eight departments.

Constituencies and Wards: Lusaka District is divided into seven constituencies. These constituencies are further subdivided into a total of 33 wards, each represented by elected councilors who address local community issues and participate in council decisions. The district acknowledges traditional leadership by including two chiefs' representatives in the council, ensuring that customary perspectives are considered in governance. This administrative framework enables Lusaka District to manage urban development, provide public services, and engage with the community effectively.

The strategic location of Lusaka district within Lusaka Province positions the district as a centre for economic activities, trade, and administrative functions.

5.14.4 Social Services and Amenities

Lusaka District, being the administrative and economic center of Zambia, hosts a broad range of social services and amenities that support both residential and industrial populations. While the Heavy Industrial Area is primarily zoned for industrial activities, it nonetheless benefits from the district-wide network of services that ensure a stable and functional urban environment.

1. **Healthcare facilities:** Lusaka District boasts several public and private healthcare facilities ranging from clinics to tertiary hospitals. Major hospitals such as the University Teaching Hospital (UTH), Levy Mwanawasa University Teaching Hospital, and Chipata Level One Hospital serve as critical healthcare providers not only to Lusaka residents but also to patients referred from across the country. In and around the industrial zones, private clinics and occupational health facilities cater specifically to the health needs of workers, including emergency response and occupational health assessments.
2. **Manufacturing and Industrial Activities:** Lusaka District, being the capital city, hosts a range of manufacturing and industrial activities. This includes the production of textiles, food and beverages, construction materials, plastics, chemicals, and various consumer goods. The proposed project area, specifically, has a notable presence of industrial establishments and factories.
3. **Education:** The city is home to various educational institutions, including primary and secondary schools, colleges, and universities. Lusaka District boasts reputable universities such as the University of Zambia (UNZA) and the Copperbelt University (CBU), offering a wide range of academic programs.
4. **Public Transportation:** Lusaka District has a well-developed public transportation system, including buses and minibuses (locally known as "combi" or "bushe"). These public transport options help commuters navigate the city and its suburbs.
5. **Banking and Financial Services:** Lusaka District houses numerous banks, microfinance institutions, and other financial service providers, offering a range of banking and financial products to individuals and businesses.
6. **Shopping and Retail:** The city has several shopping malls, supermarkets, and markets that provide access to a variety of goods and services.

7. Recreation and Entertainment: Lusaka District offers various recreational and entertainment options, including parks, movie theaters, sports facilities, restaurants, and nightlife venues.
8. Government Offices and Services: As the capital city, Lusaka District is home to various government offices, ministries, and institutions, providing administrative services and facilitating governance.
9. Utilities: The city provides essential utilities such as electricity, water supply, and sanitation services to its residents.
10. Hotels and Accommodation: Lusaka District offers a range of hotels, lodges, and guesthouses, catering to tourists, business travelers, and visitors.
11. Security and Emergency Services: The city has police stations, fire stations, and other emergency services to ensure public safety and security.

5.14.5 Literacy Levels, Health and Gender Equity

Education, as a fundamental human right, is intricately linked to the overall development of a society, especially concerning literacy, health, and gender equity/equality. In the context of Lusaka district and the project area these interconnected factors play a pivotal role in shaping the socio-economic landscape.

- Literacy Levels: In alignment with the broader trends in Lusaka Province, Lusaka District places a significant emphasis on literacy. As of 2010, Lusaka District, recorded the highest literacy rate in Zambia at 85.1%. However, gender disparities persist, with the literacy rate for males (84.7%) slightly higher than that for females (81.5%). Ongoing efforts aim to improve literacy rates for both genders in urban and rural areas.
- Gender equity and women's empowerment are focal points in Lusaka District. While strides have been made, gender disparities persist. In 2020, the labour force participation rate for women in Lusaka Province was 60%, emphasizing the need for ongoing initiatives to promote gender equity in education, healthcare, economic opportunities, and decision-making.

The commitment to education in Lusaka District aligns with national goals, fostering a well-educated population capable of contributing to economic and social progress. This commitment extends beyond literacy, encompassing health and gender equity, creating a comprehensive approach to development. The collaboration between the Zambian government, civil society organizations, and international partners underscores the shared vision for an inclusive and prosperous society for all residents of within the broader context of Lusaka District.

5.14.6 Transport/Communication

The proposed Project site is situated along Mungwi Road Heavy Industrial area, of Lusaka district. The proposed site is well serviced by an adequate road network. As such, access to the site is very good and accessible in all seasons.

Transport Networks:

1. **Road Infrastructure:** Lusaka benefits from a well-maintained road network, including major highways like the Great North Road (T2), Lumumba Road and city roads. The Roads Development Agency (RDA) is a government entity responsible for maintaining and improving the road infrastructure in the city.
2. **Public Transportation:** Public transportation in Lusaka is mainly served by minibuses. The main bus terminals in the city include the Lusaka Intercity Bus Terminal and Kulima Tower Bus Station. Popular bus companies Likili Motors and Juldán Motors provide transport services within and beyond Lusaka. District. The project site is located in a heavily industrial area along Mungwi Road, which is a key route for both commercial and industrial activities, making it easily accessible for logistics and transport operations.
3. **Taxis and Ride-Sharing:** Taxis are widely available in Lusaka, with various taxi companies and independent drivers offering services throughout the city. In recent years, ride-sharing services like Indrive and Yango gained popularity, providing convenient transportation options.
4. **Railway:** Zambia Railways provides freight services for cargo transportation, supporting trade and commerce. The government has been exploring options for the development of passenger railway services in the future.
5. **Air Transport:** The Kenneth Kaunda International Airport (LUN) is the primary air transport hub in Lusaka. Airlines like Proflight Zambia, Ethiopian Airlines, and South African Airways operate both domestic and international flights, connecting Lusaka with other cities in Zambia and various international destinations.

Communication Networks:

The project area is well serviced by the major telecommunications providers in Zambia, including MTN, Airtel, and Zamtel. These companies offer a wide range of services such as mobile voice and data, internet connectivity, and mobile money platforms, ensuring reliable communication and digital access within the area.

1. **Telecommunications:** Major telecommunications providers in Lusaka District and the project area include MTN Zambia, Airtel Zambia, and Zamtel. These companies offer mobile phone services, internet data plans, and landline connections to residents and businesses.
2. **Internet Service Providers (ISPs):** Various ISPs operate in Lusaka District, offering broadband and wireless internet services. Some of the notable ISPs include Liquid Telecom, Vodafone Zambia, and Hai Zambia.
3. **Postal Services:** Zambia Postal Services Corporation (Zampost) is responsible for providing postal and courier services in Lusaka District and other regions of Zambia.

4. Media: Lusaka District hosts several radio stations, television channels, and newspapers. Radio stations like Hot FM and QFM, television channels like ZNBC and Muvi TV, and newspapers like Daily Nation, Zambia Daily Mail and Times of Zambia are prominent media outlets in the city.

5.15.7 Water Supply/Sanitation

The majority of areas within the project area are serviced by municipal water and sanitation systems. Lusaka Puma Depot is currently connected to the municipal mains for both water supply and sewer management. The depot is also supplemented by an onsite borehole for water supply.

LWSC is a government- owned utility responsible for providing water supply and sanitation services across Lusaka Province, including the districts of Lusaka, Chongwe, Chilanga, Luangwa, and Kafue. LWSC offers a range of services to its customers, including bill payments. Sewer services and customer support

5.15.8 Power Generation and Supply

The Puma Lusaka Depot premises are already connected to ZESCO for power supply and also have a backup generator which is used in case of load shedding.

ZESCO is Zambia’s state-owned power utility, responsible for generating, transmitting, distributing, and supplying electricity national wide. It is the largest electricity provider in the country, producing approximately 80% of Zambia’s electricity.

5.14.9 HIV/AIDS in the Project Area

According to the National HIV/AIDS Strategic Framework (2017-2021), Lusaka Province had the highest HIV prevalence in Zambia at 16.1%, which aligned with the country's status as one of the most affected in Sub-Saharan Africa. The report highlighted that in Zambia, about 46,000 new infections occurred annually, with women bearing a disproportionate burden of the epidemic due to an annual incidence of 1.08%, compared to 0.33% for men. Although Lusaka’s prevalence was significantly high due to its cosmopolitan and commercial nature, as well as contributing factors such as unprotected casual sex, sexual abuse, sexual cleansing practices, and limited cases of mother-to-child transmission, recent data shows a slight decline in prevalence. The latest ZAMPHIA 2021-2022 findings indicate that Lusaka's HIV prevalence among adults aged 15 and above has reduced to 14.4%, while the national adult HIV prevalence now stands at 11.2%, marking a 19% reduction from 2003 levels. This decline is attributed to intensified efforts, including the scale-up of antiretroviral therapy (ART), improved HIV testing coverage, Prevention of Mother-to-Child Transmission (PMTCT) programs, the introduction of Pre-Exposure Prophylaxis (PrEP), and continued community sensitization. However, despite this progress, the burden remains high, especially among women and young people, due to persistent socio-economic and cultural risk factors within the province. Efforts in place to address the problem include;

- Education and sensitization programs as well as, Voluntary Counselling and Testing.

- Radio and TV programs on HIV/AIDS,
- Posters and billboards encouraging safe acts to minimize the spread of HIV/AIDS,
- Voluntary counseling and testing made free and easily accessible,
- Free HIV/AIDS talk line and availability of condoms in most retail outlets at an affordable price.
- The developer will also include HIV/AIDS topic in the toolbox talks to promote safety practices on site.

Lusaka Province has long faced high HIV/AIDS prevalence, largely due to risky behaviors among both young and older populations, low counselling attendance, and limited sexual health education, as noted in past reports like the 2013 Lusaka Times article. Interventions such as free voluntary counselling and testing, mass media campaigns, condom distribution, and workplace HIV/AIDS talks have helped improve awareness and prevention. As a result, Lusaka's prevalence has slightly declined from 16.1% to 14.4% according to the latest ZAMPHIA 2021-2022 report. However, challenges like peer pressure, gender inequality, and recreational risky behaviours still contribute to the high burden, especially among women and youth, making continued and targeted interventions essential.

5.15.10 Traditional and Religious Practice

Religious Practices

Lusaka District, as the capital and central hub of Zambia, plays a significant role in the country's religious landscape. Declared a Christian nation in the 1996 Constitution, Zambia has Christianity as its dominant religion, with Catholicism being particularly prominent in Lusaka District. However, due to Lusaka's status as the political, economic, and administrative centre, it also hosts a wide range of religious groups and serves as the headquarters for many denominations. These include major Christian churches such as the Roman Catholic Church, United Church of Zambia, New Apostolic Church, Pentecostal Holiness Church, and the Seventh-day Adventist Church and other Pentecostal Churches. Additionally, Lusaka District accommodates minority religious communities such as Muslims, Hindus, Baha'is, and a small Jewish population, mostly of Ashkenazi descent. The presence of diverse religious institutions reflects Lusaka district's multicultural composition and its role as a meeting point for people from across the country and the region.

Places of worship are integrated into almost every residential and commercial zone, offering convenient access to spiritual services and community support.

Specifically, in the proposed project area—there are a number of religious institutions reflecting the broader religious landscape of Lusaka. Churches in the area include the Maranatha Bible Church, Pentecostal Holiness church (Muchinga) Emmasdale Baptist Church and Impact for Christ Ministries- Lusaka Branch. These institutions serve as key anchors of community life, offering not only worship services but also programs in education, youth mentorship, marriage counseling, and charity outreach.

Traditional

While no traditional or cultural ceremonies are practiced within a 10km radius of the project site, the broader Lusaka District is still rooted in Zambia's rich cultural heritage. Traditionally, Lusaka District sits on the boundary of different ethnic territories, notably those of the Lenje and Soli people. To the north of Lusaka District, in areas such as Chibombo District, Chief Mungule is a recognized traditional leader of the Lenje people. The Soli people, considered among the original inhabitants of Lusaka, are represented by traditional leaders such as Senior Chieftainess Nkomeshya Mukamambo II, whose chieftom lies to the east of Lusaka District in Chongwe District. These traditional authorities play important roles in land administration, cultural preservation, and local governance.

Language

English remains the official language of communication and instruction in Zambia. The Observation indicates that Nyanja is the most widely used language of communication followed by Bemba and English, within the project area.

5.14.11 Need for Resettlement and Compensation

The developer has leasehold rights (title deed) to the project site, plot no. 1710, located in the Heavy Industrial Area along Mungwi Road, Lusaka District, Lusaka Province. The proposed site is an active fuel depot for Puma Energy Zambia Plc. As such, there is no need for resettlement and compensation.

5.15.13 Stakeholder Consultation

This section outlines the stakeholder consultation process undertaken as part of the Environmental and Social Impact Assessment (ESIA) for the proposed depot upgrade for Puma Energy Zambia plc Lusaka District, Lusaka Province of Zambia. The process was designed to ensure transparency, inclusivity, and meaningful participation of stakeholders in the ESIA process.

Objectives of Stakeholder Consultation

The primary objectives of the stakeholder consultation process were to:

- Provide accessible and timely information about the project to potentially affected communities, stakeholders, and the general public.
- Create opportunities for stakeholders to express their views, concerns, and suggestions regarding the project's potential environmental and social impacts.
- Incorporate stakeholder feedback into the ESIA process and project design.
- Promote transparency and accountability in the project's development.

Stakeholder Identification and Analysis

A comprehensive stakeholder identification and analysis was conducted to identify individuals, groups, and organizations that may be affected by or have an interest in the project. Key stakeholders included:

- Potentially affected immediate neighbors to Puma Energy.
- Government agencies at national, provincial, and district levels, including District Commissioners and Town Councils, the Road Development Agency (RDA), The Energy Regulation Bored (ERB) and The Ministry of Health.
- Businesses and private sector entities, including ZESCO AND LWSC.

Methods of Stakeholder Engagement

The stakeholder engagement process employed a variety of methods to ensure effective communication and participation, including:

- **Structured Consultation Meetings:**

Formal meetings were organized to provide information about the project and gather feedback. These included:

Scoping Meeting - Held to gather initial input on the scope of the ESIA

This meeting was held on the 18th February, 2025 at Puma Headquarters Board Room along Mungwi Road, Lusaka Zambia. A total number of 7 stakeholders were represented in the meeting.



Figure 16: Scoping meeting with stakeholders

Public Disclosure Meetings: Held to share findings from the specialist studies conducted during the ESIA process, including the Air Quality and Noise Assessment and the Water

Quality Assessment. This meeting took place on the 10th of April, 2025 at 10:00hrs. A total number of 8 stakeholders were represented in the meeting.



Figure 17: Public Disclosure Meeting

Key issues Raised by Stakeholders

- Alternative Site location
- Ground water contamination
- Traffic Flow
- Occupational Health and Safety
- Decommissioning process
- Spillage control

Consideration of Stakeholder Input

Stakeholder feedback was carefully considered and incorporated into the ESIA process and project design. Key measures include:

- A designated parking area has been identified for trucks waiting offloading, ensuring that only the required number of trucks are called in as needed. This approach is intended to manage traffic flow and reduce congestion around the site.
- Puma Energy is taking the expansion as an opportunity to implement the most advanced design and safety systems currently available. The new infrastructure will follow the API 650 standard, which governs the design and construction of large, field-erected storage tanks.
- Overall impact on the environment is expected to be minimal, with all activities conducted in full compliance with applicable regulations.
- Spillage management plan is in place, there is a well-structured plan to manage spillages, beginning with the tank infrastructure.

6.0 IMPACTS

Through stakeholder consultations and field assessment, the perceived environmental and socio-economic issues during construction and operation phases include the following.

6.1 Biophysical Environment

6.1.1 Positive Impacts

Construction and Operation Phase

- There are no anticipated positive impacts on the biophysical environment.

6.1.2 Negative Biophysical Impacts

6.1.2.1 Effects on Ecology

- **Natural Environment**

Construction Phase

Movement of vehicles to and from the site will result in negative impact on the ecology due to vehicle exhaust emissions and exhaust fumes from fuel stored on site.

Evaluation of Impact: The impact is direct, reversible, long term, cumulative and local

Operation phase

The proposed development will be stocking large quantities of fuel which if it were to leak into the environment would result in environmental contamination. The contamination of the environment would have a massive negative impact on the ecosystem as the hydrocarbon contaminates the soil inhibiting flora growth, contaminates ground water and thereby affects the quality of surface water. The contamination of the water resource inhibits aquatic life. Movement of vehicles to and from the site will result in negative impact on the ecology due to vehicle exhaust emissions and exhaust fumes from fuel stored on site.

Evaluation of Impact: The impact is direct, irreversible, long term, cumulative and regional

6.1.2.2 Impact on Hydrology

Construction Phase

The proposed development will cause some temporary changes in hydrology during the construction phase. Changes to be caused by this development are as follows:

Surface Water

There are no surface water features on or close to the site. The project will have no impact on the surface water features.

Evaluation of Impact: The impact is insignificant

Ground Water

Sources of ground water pollution during this phase are sewage waste and oil/fuel spillages from construction machinery which can seep through the soil and pollute ground water.

Evaluation of Impact: The impact is direct, reversible, short term, cumulative and local

Operation Phase

Sewage waste if not managed adequately may result in the contamination of the ground water in the project area. Fuel storage on site may contaminate groundwater.

Evaluation of Impact: The impact is direct, reversible, short term, cumulative and local

6.1.2.3 Impact on Soil

Construction Phase

The existing tanks which are to be removed contain sludge which if not properly handled is likely to contaminate the soil on site. Machinery used during this phase is likely to have oil spills, which might contaminate the soil vulnerable due to this process.

Evaluation of Impact: The impact is direct, reversible, short term, cumulative and local

Operation Phase

During this phase solid and liquid waste if not handled properly may be a source of soil contamination as waste piles (food waste and sewage waste) may serve as bacteria breeding areas.

Evaluation of Impact: The impact is direct, reversible, short term and local

The proposed development will involve the storage of large quantities of fuel underground. In an event where any of the fuel storage tank leaks or there is no proper pipe connection, the fuel may leak into the soil, thereby contaminating the soil.

Evaluation of Impact: The impact is direct, reversible, short term, cumulative and local

6.1.2.4 Waste generation

Construction Phase

A number of waste streams are expected to originate from the project. The various kinds of waste will include solid and liquid waste. Unsafe disposal of waste (contaminated soils if any, sludge, paper and food etc.) poses a health risk as waste piles may become a breeding site for bacteria that causes diseases like cholera and typhoid. Empty used bottles/ storage cans used by the workers on site present tripping hazards. Empty used bottles/ storage cans if not disposed of at approved disposal sites may lead to accumulation of waste on the streets. If the bottles are not properly

disposed of, they may be re-used for uncertified water and other beverages by street kids and other illegal entities.

Evaluation of Impact: The impact is direct, reversible, short term, cumulative and local

During the construction phase, generation of rubble material or construction waste such as steel parts, scrap metal, plank pieces, etc. is unavoidable and if this waste is not properly managed may become a health and safety risk causing tetanus from metals and trip hazards from poor housekeeping practices. Therefore, rubble and construction waste should be piled in one area of site and in bins to prevent health and safety risks.

Evaluation of Impact: The impact is direct, reversible, short term, cumulative and local

Operation Phase

During this phase the waste expected to be generated is organic waste (food waste, fruit, vegetable peels, and sewage and flower trimmings), liquid waste (wash water and water from mopping floors) and solid waste (broken furniture, old newspapers, plastics, tissue paper, empty boxes, bottles etc.). Inappropriate management of the waste generated during this phase may also impact the health of those coming into the premises negatively by inducing respiratory illnesses and bacteriological diseases.

Evaluation of Impact: The impact is direct, reversible, short term, cumulative and local

Generation of Hazardous waste

All Project Phases

The proposed development will result in the generation of hazardous waste such as material used to mop up fuel spills and fuel sludge from the tanks.

During operation the proposed project will be handling fuel from the cleaning of the oil interceptor and sludge from the regular cleaning of the tanks which will be considered as waste. If this is not disposed of properly, it may result in waste nuisance.

Evaluation of Impact: The impact is direct, reversible, short term, cumulative and local

6.2.1.5 Impact on Landscape and Aesthetics

Construction Phase

The installation of tanks and compacting using heavy machinery has the potential to change the natural landscape and may therefore have an impact on local aesthetics. However, the project's impact on landscape and aesthetics is minor because it fits within an already industrial environment. Also the new tanks will be a replacement of existing tanks

Evaluation of Impact: The impact is insignificant

Operation phase

If the tanks are not constructed according to the approved plans, the development may not be architecturally uniform. This can be an aesthetic nuisance. In addition, heaps of unprocessed raw materials or piles of indiscriminately disposed waste, can have a significant impact on the appearance of the local environs.

Evaluation of Impact: The impact is direct, irreversible, long term and local

6.2 Socio-economic and Cultural

6.2.1 Positive Impacts

6.2.1.1 Increase in Employment Opportunities

All Project Phases

The project will create employment opportunities for people in the project area during construction phase and operation phase (although No additional personnel are expected to be employed during the operational phase, as the existing workforce will be retained). This positive impact of this development will improve the livelihoods of the affected communities.

Evaluation of Impact: The impact is direct, reversible, long term, cumulative and local

6.2.1.2 Public Revenue

All Project Phases

Multiplier effects resulting from increased employment will include increased public revenues such as taxes (PAYE to ZRA, VAT) and contributions to NAPSA from formally employed persons.

Evaluation of Impact: The impact is direct, reversible, long term, cumulative and regional

6.2.1.3 Capacity Building and Skills Development

All Project Phases

The project will contribute to capacity building and skills development of the people who will be employed through on-the-job training and interaction with other skilled personnel from different disciplines.

Evaluation of Impact: The impact is direct, reversible, long term, cumulative and local

6.2.1.4 Enhancement of Visual Appearance

The upgrade will enhance the visual appearance of the site by replacing older infrastructure with modern tanks, while construction-related impacts will be temporary and localized.

Evaluation of Impact: The impact is direct, reversible, long term, isolated and local

6.2.1.5 Convenience in the Supply of Fuel

The proposed project will result in Puma Energy increasing the fuel storage capacity of the fuel depot. This will enable them to fully meet current market demand which necessitated the expansion of storage capacity.

Evaluation of Impact: The impact is direct, irreversible, long term, cumulative and regional

6.2.2 Negative Impacts

6.2.2.1 Spread of HIV/AIDS & STIs

All Project Phases

Presence of workers on site during these phases may attract behaviours that may lead to contraction of HIV/AIDS & STIs due to interaction between fellow workers and also interaction between workers and members of the public.

Evaluation of Impact: The impact is indirect, irreversible, long term, cumulative and regional

6.2.2.2 Health and Safety Risks

All Project Phases

The implementation of the project will involve activities and procedures with potential risk to the health and safety of workers and members of the public. These will include:

- Movement of machinery around the site,
- Work around services, and work in confined spaces
- Use of machinery to perform activities. Improper usage of construction equipment can lead to human fatalities. Human life can also be lost through road accidents during the transportation of construction raw materials and operation materials. This is a negative and direct impact, localized and of low significance
- Work with open flames (e.g. welding) and cutting operations,
- Work in dusty environment,
- Work at heights (during fitting of pipe works, tank shell welding/painting and inspection of machinery),
- Work in noisy environment,
- Work with sharp objects and
- Movement on slippery floors
- Spread of Covid 19 and other infectious diseases
- Potential contact with fuel. When fuel comes into direct contact with the workers (ingested, inhaled or on skin) it may result in negative effects on the workers such as poisoning, skin rash or suffocation.

Evaluation of Impact: The impact is direct, irreversible, short term, cumulative and local

6.2.2.3 Noise and vibrations

Construction Phase

Project activities such as breaking of tank foundations, excavations, welding, and transportation during the project phases have potential to generate noise and vibrations. The construction works will involve the use of heavy equipment and these generate high levels of noise. Apart from being a nuisance, high noise levels (above 85dB) can harm hearing ability if sustained over a long period of time. Similarly vibrations can also cause damage to property such as cracking of existing property. Patients of hypertension can also have their situation worsened under high noise and vibration conditions.

Evaluation of Impact: The impact is direct, reversible, short term and local

Operation Phase

Sources of noise will include noise from the movement of trucks and from the pumps during offloading of the fuel to the tanks and the loading of fuel from the fuel tanks to the road tankers. Because the loading and offloading is not 24/7, the depot is quiet most times.

Evaluation of Impact: The impact is direct, reversible, long term and local

6.1.2.4 Air pollution

Construction Phase

Air pollution is another key issue of concern for the project. Material handling (loading and off-loading) and movement on exposed worksites are dust generating activities. Material stockpiles (sand and cement) can also be a source of air pollution under windy conditions if not properly covered. Apart from it being an environmental pollutant, dust is equally a nuisance and an occupational as well as a public health issue of concern. Generation of dust has potential to cause nuisance, occupational and public health concerns to workers on site.

Evaluation of Impact: The impact is direct, reversible, short term, cumulative and local

Similarly exhaust fumes from increased traffic to and from the construction site has potential to cause air pollution. The impact is localized and can be severe depending on how close the worker and/or human settlement is to the source of air pollution.

Evaluation of Impact: The impact is direct, reversible, short term, cumulative and local

Operation Phase

During operation, exhaust fumes from the fuel delivery/collection vehicles and inadequate management /maintenance of the tank farm may result in reduced air quality. Poor waste management may result into reduced air quality as solid waste and sewage waste tends to produce a foul smell.

Evaluation of Impact: The impact is direct, reversible, short term, cumulative and local

6.2.2.5 Impacts on Areas of Historical, Archaeological and Cultural Significance

All Project Phases

On the proposed site itself there are no historical, archaeological or cultural sites known to exist; however, it is likely that historical, archaeological or cultural sites may be found which should be treated with great importance.

Evaluation of Impact: The impact is direct, reversible, short term, cumulative and local

6.2.2.6 Influx of People into the Project area

All Project Phases

The prospect of employment at the project site is a catalyst for influx of people into the area with the consequent of increased population and the birth of unplanned settlements. Crime is also likely to increase as some of those people coming to the area may have criminal motives. The influx of people into the project area may also put a strain on the natural environment.

Evaluation of Impact: The impact is indirect, reversible, long term, cumulative and local

6.2.2.7 Impacts on Road Safety

All Project Phases

During construction there will be some danger to road users due to construction traffic and the transportation of equipment. Road safety for motorists, cyclists and pedestrians may increase during the construction and operation phases due to potential increase in traffic.

Evaluation of Impact: The impact is direct, reversible, long term and local

6.2.2.8 Risk of Fire

Operation Phase

During operation, the development will involve the stocking, transportation and handling of large quantities of fuel (Petrol and diesel). Fuel (especially petrol fuel) is highly combustible and will ignite if there is a spark or flame nearby.

6.3. Characterization and Assessment of Impact Significance

Characterization and assessment of impact significance was based on a criterion that took into account the *frequency* of occurrence of the source of impact, *duration* of the impact, *severity* of the impact, *spatial extent* of the impact and *Sensitivity* of the element being impacted. Table 6.1 is a detailed presentation of the criterion used in assessing impact significance while Table 6.2 is a presentation of project impact significance characterization using the above criterion.

Characterisation of impact significance involved consideration of the following factors:

- Beneficial or detrimental (Positive, Negative)
- Severity of the impact (Very High, High, Moderate, Low),
- Spatial extent of the impact (Local, regional),
- Duration of the impact (Short-term, Medium-term, Long-term),
- Timing of the impact (Construction, Operation, Post Decommissioning/Closure),
- Frequency of impact occurrence (Continuous, Frequent, Infrequent, Occasional),
- Probability of impact occurrence (Unlikely, Possible, Probable, Certain), and
- Significance of Impact (Very high, High, Moderate, Low).
 - The significance weightings for each potential impact are as follows:
 - Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
 - Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
 - High (i.e. where the impact must have an influence on the decision process to develop in the area.

Impacts were also characterized as direct or indirect in order to have a full appreciation of the impacts and facilitate effective management of the impacts. The process of impact identification and assessment involved all study team members and with each consultant presenting their findings within their specialist area of study for discussions.

Table 21: Impact Criterion Used

Impact Criterion	Description	Criterion Classification	
		Term	Description
Positive or Negative Impact	Will the impact have a beneficial or detrimental effect on the environment?	Positive	A beneficial effect
		Negative	A detrimental effect
Intensity or amplitude of the Impact	To what degree will the effect be felt or how good or bad will the effect be	Very high	Very good or very bad effect
		High	Good or bad effect
		Moderate	Relatively good or relatively bad effect
		Low	Slightly good or slightly bad effect
Extent of Impact	What is the geographical extent of the impact?	Local	Impact limited to Project footprint

		Limited	Impact limited to Project footprint & immediate neighbourhood
		Regional	Impact felt beyond neighbourhood
Duration of Impact	For how long will the impact continue to manifest or be felt?	Short-Term	Impact will cease once the project activities stop
		Medium-Term	Impact will last for a limited period after project activities (eventually reversible)
		Long-Term	Impact will be permanent & irreversible
Timing of Impact	At what point in time will the impact occur or be felt?	During Preparation	Impact will occur during preparation phase
		During Construction	Impact will occur during construction phase
		During Operations	Impact will occur during operation phase
		Post decommissioning	Impact will occur after the life time of the project
Frequency of Impact	What is the likely frequency of occurrence?	Continuous	Impact will be continuous
		Frequent	Impact will occur frequently
		Infrequent	Impact will occur infrequently
		Occasional	Impact will occur occasionally
Likelihood of Impact occurring	What is the probability of Impact occurrence?	Certain	Impact is certain to occur
		Probable	Impact is likely to occur
		Possible	Impact may possibly occur
		Unlikely	Impact is unlikely to occur
Significance of Impact	What is the Magnitude of impact (will the impact be of high, moderate or low severity?)	Very High	Very high Impact
		High	High Impact
		Moderate	Moderate
		Low	Low Impact

Table 22: Environmental Impact Assessment Matrix

Potential Environmental Impact	Environmental Impact Characterization							
	Positive / Negative Impact	Intensity of Impact	Spatial Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Significance of Impact
Bio-Physical Environment								
Change of existing atmosphere due to the handling of fuel	Negative	Very high	Regional	Short term	Construction phase	Occasional	Improbable	Insignificant
- Contamination of groundwater from accidental material spillages, material store areas, drainage channels and sewage waste. - Contamination from fuel handling and storage	Negative	Moderate	Local	Short – medium term	All project phases	Occasional	Probable	High
Depletion of the water resource	Negative	Moderate	Local	Short term	Construction and operation phase	Occasional	Improbable	Insignificant
Soil contamination due to fuel spills from machinery and from sewage waste	Negative	Low	Local	Short term	Construction and operation phase	Occasional	Probable	Low
Soil erosion	Negative	Moderate	Local	Short term	Construction and operation phase	Occasional	Probable	Insignificant
Air pollution	Negative	Moderate	Local	Short term	Construction and operation phase	Occasional	Certain	Medium
Aesthetics/visual impacts	Positive	Moderate	Local	Long term	All Project Phases	Continuous	Certain	Insignificant
Non- hazardous waste nuisance	Negative	High	Local	Medium – Long term	All project phases	Continuous	Certain	Medium
Pollution from Hazardous waste	Negative	High	Localized	Medium –	All project	Occasional	Certain	High

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generated			Project Area	Long term	phases			
Loud noises	Negative	Medium	Local	Short term	All Project Phases	Occasional	Certain	Low
Impacts on Landscape and aesthetics	Negative	Medium	Local	Short – long term	All Project Phases	Continuous	Certain	Low
Socio-economic and Cultural Environment								
Increase in employment opportunities	Positive	Moderate	Local-regional	Long term	All project phases	Continuous	Certain	Medium
Increase in Public Revenue	Positive	High	Regional	Long term	All project phases	Continuous	Certain	High
Capacity building and skills development	Positive	Moderate	Local	Long term	All project phases	Continuous	Certain	Medium
Convenience in the supply of fuel	Positive	High	Local	Long term	Operation phase	Continuous	Certain	High
Spread of STI's and HIV/AIDS	Negative	High	Regional	Long term	All project phases	Occasional	Certain	High
Health & safety risks due to work activities, fire risk	Negative	High	Local	Short term	All project phases	Occasional	Probable	High
Influx of people into the area	Negative	Moderate	Local	Medium term	All project phases	Frequent	Probable	Low
Dust nuisance	Negative	Moderate	Local	Short term	During construction	Frequent	Certain	Medium
Disturbance of areas of historical, archaeological & cultural significance	Negative	Low	Local	Short term	During construction	Infrequent	Probable	Low
Traffic and safety risks	Negative	High	Local	Short term	All project phases	Occasional	Probable	High
Sensitivity of environment being impacted	Negative/Positive	Low	Local	Long term	All project phases	Continuous	Certain	Insignificant

7.0 ENVIRONMENT AND SOCIAL MANAGEMENT PLAN

7.1 MANAGEMENT OF IDENTIFIED IMPACTS

7.1.1 Mitigation of Negative Biophysical Impacts

7.1.1.1 Impacts on Ecology

- **Natural Environment**

Construction Phase

All machinery to be used on site will be frequently serviced to ensure that the exhaust emissions are below the permissible limits.

Operation Phase

The Developer will only stock non-lead (unleaded) containing fuel at the proposed site. The fuel will be stored in leak proof fuel storage tanks which will be installed on an impermeable lining. The design is so that the fuel does not seep into the natural environment, thereby preventing negative impact on the ecosystem. This will mitigate the release of ozone that would come from leaded fuels. All machinery to be used on site will be frequently serviced to ensure that the exhaust emissions are below the permissible limits.

7.1.1.2 Hydrology

Construction Phase

Sewage waste will be managed by the use of existing toilets connected to LWSC sewer mains. To prevent oil/fuel leaks into ground water resources, all machinery that uses or requires oil will be checked for spillages and properly maintained before usage on this site. All routine maintenance of construction machinery and vehicles will be carried out off-site at workshops. Poorly maintained machinery will not be allowed to operate on site.

Operation Phase

Water supply for the site is from LWSC supplemented by an onsite borehole. The project will not result in the change of the current water demand at the depot.

Sewage waste will be managed by the use of existing toilets connected to LWSC sewer mains. Waste generated on site will be collected in bins that will be emptied on a regular basis into a waste collection truck managed by the Local Council and then transported to an approved disposal site. This will prevent the contamination of the water resource.

The operation of the fuel facility and the design of the mechanical equipment ensure no leaks and spills from the tank. Fuel will be stored in corrosion free, leak proof aboveground fuel storage tanks. Each tank will sit on an impermeable floor in a concrete bunded area large enough to contain 110% volume of the tank in the bund,

preventing the contamination of the water resource in case of tank failure. Fuel leaks in the piping system will be detected instantaneously and before petroleum has been discharged into the groundwater, these will then be worked on ensuring that no fuel seeps to the ground and surface water.

The floor around the whole depot is concreted and drainage from the tank farm and the whole fuel depot will be via a fuel interceptor to prevent fuel leaks into the environment. The fuel interceptor will be cleaned regularly by a company licensed to manage waste oil. This licensed company will also remove the waste oil from the site. The interceptor is designed to prevent oil from escaping into the environment. As long as the interceptor works efficiently, there will be no traces of oil in the wastewater from the interceptor.

7.1.1.3 Impact on Soil

Construction Phase

Sludge from the existing tanks will be temporarily disposed of in a drum that will be clearly marked as hazardous waste and will be covered at all times. This hazardous waste bin will be collected by an approved hazardous waste collection agency for further treatment or disposal. To prevent oil/fuel leaks into ground water resources, all machinery that uses or requires oil will be checked for spillages and properly maintained before usage on this site. All routine maintenance of construction machinery and vehicles will be carried out off-site at workshops. Poorly maintained machinery will not be allowed to operate on site.

Operation Phase

Sewage waste will be managed by the use of existing toilets connected to LWSC sewer mains. Waste generated on site will be collected in bins that will be emptied on a regular basis into a waste collection truck managed by the Local Council and then transported to an approved disposal site. This will prevent the contamination of the soil.

The operation of the fuel facility and the design of the mechanical equipment ensure no leaks and spills from the tank. Fuel will be stored in corrosion free, leak proof aboveground fuel storage tanks. Each tank will sit on an impermeable floor in a concrete bunded area large enough to contain 110% volume of the tank in the bund, preventing the contamination of the water resource in case of tank failure. Fuel leaks in the piping system will be detected instantaneously and before petroleum has been discharged into the groundwater, these will then be worked on ensuring that no fuel seeps to the soil.

The floor around the whole depot is concreted and drainage from the tank farm and the whole fuel depot will be via a fuel interceptor to prevent fuel leaks into the environment. The fuel interceptor will be cleaned regularly by a company licensed to manage waste oil. This licensed company will also remove the waste oil from the site.

The interceptor is designed to prevent oil from escaping into the environment. As long as the interceptor works efficiently, there will be no traces of oil in the wastewater from the interceptor.

7.1.1.4 Waste Generation

Construction Phase

Due to the nature of the project, the rubble from the site cannot be re-used. The rubble will be treated as solid wastes. The removed tank shells will be cleaned on site and sold/given to steel scrap utilization companies.

Fuel waste including sludge from the tanks will be considered as hazardous waste and will be collected in a drum. This will be collected by a hazardous waste transporter and disposed of at a hazardous waste approved disposal site. The fuel interceptor will be cleaned regularly. The waste oil from the interceptor will be removed from site according to the Puma waste oil management procedure.

Sewage waste will be managed by the use of existing toilets connected to LWSC sewer system. Solid waste will be collected in bins at various locations on site and then collected by a local council approved waste collection company. At all phases of the project there shall be no burning of waste and the bins to be used for waste will be leak proof and contained preventing scatter of waste.

Operation Phase

Fuel waste including sludge from the tanks (from the regular cleaning of the tanks) will be considered as hazardous waste and will be collected in a drum. This will be collected by a hazardous waste transporter and disposed of at a hazardous waste approved disposal site. The fuel interceptor will be cleaned regularly. The waste oil from the interceptor will be removed from site according to the Puma waste oil management procedure.

Sewage waste will be managed by the use of existing toilets connected to LWSC sewer system. Solid waste will be collected in bins at various locations on site and then collected by a local council approved waste collection company. At all phases of the project there shall be no burning of waste and the bins to be used for waste will be leak proof and contained preventing scatter of waste. The proponent will not at any phase of the project import/export hazardous waste.

7.1.1.5 Impact on landscape and aesthetics

All Project Phases

The project's impact on landscape and aesthetics is minor because it fits within an already industrial environment. Also the new tanks will be a replacement of the old existing tanks. The developer will ensure that the installation is according to plan with careful monitoring of the project works.

7.1.2 Enhancement of Positive Socio-economic and Cultural Impacts

7.1.2.1 Increase in Employment Opportunities

All Project Phases

Workers will be employed based on merit and skills and not based on relationship with the developer, race, gender or tribe.

7.1.2.2 Capacity Building and Skills Development

All Project Phases

The developer will ensure that the people working on the site will have the knowledge on the technologies used on the site and the reasons why certain tasks are performed will be explained.

7.1.2.3 Public Revenue

All Project Phases

The developer will ensure that contributions for formally employed persons are made to NAPSA. The developer will also ensure that all relevant taxes are paid and all other contributions made to the relevant authorities.

7.1.2.4 Enhancement of Visual Appearance

The upgrade will enhance the visual appearance of the site by replacing older infrastructure with modern tanks, while construction-related impacts will be temporary and localized.

7.1.2.5 Convenience in the Supply of Fuel

The developer will ensure that the fuel tanks are always stocked to ensure adequate supply of fuel and thereby promoting convenience. The levels of fuel in the tanks will be monitored.

7.1.3 Mitigation of Negative Socio-economic and Cultural Impacts

7.1.3.1 Spread of HIV/AIDS & STIs

Construction Phase

HIV/AIDS awareness talks will be covered in the daily toolbox talks before work is done. Construction workers will be commuting to the site so there is less risk of interaction between workers.

Operation Phase

HIV/AIDS awareness talks will be covered during the induction of new employees.

7.1.3.2 Health and Safety Risks

All Project Phases

Puma Energy adheres to internationally recognized standards and holds certifications for ISO 9001 (Quality Management), ISO 14001 (Environmental Management), and ISO 45001 (Occupational Health and Safety Management), the latter being a recent addition. These certifications reflect the company's strong commitment to ensuring that every individual returns home safely after work. The HSSE Policy is to safeguard the health, safety, security, and well-being of the workforce, customers, and the communities Puma Energy interacts with.

All workers will be trained and reoriented in occupational health and safety. Applicable protocols will be firmly enforced. All workers will be provided with personal protective equipment. Only well qualified and experienced workers will be tasked to drive vehicles and operate machinery. The offloading and loading of fuel will be such that all fuel is contained and that no workers come into direct contact with the fuel.

The proposed site is designated as a restricted area; therefore, public access will be prohibited. At all phases of the project measures will be put in place to prevent the spread of Covid 19, cholera and other infectious diseases in line with the MOH guidelines.

7.1.3.3 Air Pollution

Construction Phase

Appropriate interventions will be applied to limit the level of air pollution from both point and fugitive dust/particulate emission sources as appropriate:

- Dust suppression by spraying water on exposed work sites, on active haulage routes and other areas with potential to generate dust;
- Timely rehabilitation of disturbed areas by ground stabilization and profiling, placement of top soil and re-vegetation were possible;
- The site will have designated stockpile areas, and packaged material will be kept in original packaging until the time of use (e.g. cement)
- Vehicles used on site will be properly maintained ensuring that the fumes released are minimal; and
- Monitoring of dust levels for corrective action will be done frequently.

Operation Phase

The fuel delivery vehicles will be inspected to ensure that they are in good condition that is with reduced exhaust emissions. The offloading area will be well drained so as to not allow stagnant water which might result in bad odor.

All machinery will be regularly maintained to ensure that the same are as clean as possible. All waste will be adequately managed as outlined in section 7.1.1.4.

7.1.3.4 Noise and Vibrations

Construction Phase

Proposed mitigation measures will include:

- All vehicles and equipment will be regularly maintained to ensure that they are mechanically sound.
- Where workers are exposed to elevated sound levels, use of PPE such as ear muffs/plugs will be mandatory.
- Construction works will be limited to daytime.
- The site will have a clearly defined access route.

Operation Phase

All vehicles will be regularly maintained to ensure that they are as quiet as possible.

7.1.3.5 Impacts on Areas of Historical, Archaeological and Cultural Significance

All Project Phases

The developer will ensure that if anything is found on site that may be of historical, archaeological or cultural significance, the findings are reported to NHCC.

7.1.3.6 Influx of People to the Project Area

All Project Phases

The influx of people to the project area will be discouraged by giving priority in employment to local residents. The Contractor will also be encouraged to procure supplies from local sources to the maximum extent possible.

7.1.3.7 Impacts on Road Safety

All Project Phases

The proposed site is in an industrial area with carefully designed access roads allowing for vehicular circulation. The tanker drivers will be obliged to obey the speed limit signs. An alternative parking area has been designated for all Puma Energy trucks, ensuring that only the required number of trucks are called in as needed. RDA has been engaged on signage and speed humps but feedback has not yet been received. The truck turning lane issue will be revisited with RDA and a traffic risk assessment will be conducted to address any concerns.

7.1.3.8 Fire Risk

At all phases of the project, the Puma Lusaka depot will have an effective fire-fighting system. In addition the workers on site will be trained to prevent fire/what to do in case of a fire.

The tanks will be leak-proof vertical steel tanks. The tanks will be protected against impacts from vehicles and any other thing that may result in impact that may cause sparks and eventually fire risks. Warning signs will be put around the storage tank

areas to ensure that naked flames, smoking and use of cell phones around the tank areas is strictly prohibited. The tanks are designed to have top and side pourer system for cooling the tanks to protect the fuel tanks and also to prevent fires.

7.2 ESTIMATION OF EFFECTIVENESS OF MANAGEMENT COMMITMENTS

An estimation of the effectiveness of the mitigation measures is done in the table below:

The parameter that has been used to estimate the effectiveness is the significance parameter on a scale of low to high. Explained as follows:

- Low (i.e. where this impact would not have a direct influence on the decision to develop in the area)
- Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated)
- High (i.e. where the impact must have an influence on the decision process to develop in the area.

Table 23: Estimation of Effectiveness of Mitigation Measure

Potential Environmental Impact	Environmental Impact Characterization								
	Positive / Negative Impact	Intensity of Impact	Spatial Extent of Impact	Duration of Impact	Timing of Impact	Frequency of Impact	Likelihood of Impact Occurring	Significance of Impact	
								Before mitigation/enhancement	After mitigation/enhancement
Bio-Physical Environment									
Change of existing atmosphere due to the handling of fuel	Negative	Very high	Regional	Short term	Construction phase	Occasional	Improbable	Insignificant	
- Contamination of groundwater from accidental material spillages, material store areas, drainage channels and sewage waste. - Contamination from fuel handling and storage	Negative	Moderate	Local	Short – medium term	All project phases	Occasional	Probable	High	Low
Depletion of the water resource	Negative	Moderate	Local	Short term	Construction and operation phase	Occasional	Improbable	Insignificant	
Soil contamination due to fuel spills from machinery and from sewage waste	Negative	Low	Local	Short term	Construction and operation phase	Occasional	Probable	Low	Extremely low
Soil erosion	Negative	Moderate	Local	Short term	Construction and operation phase	Occasional	Probable	Insignificant	
Air pollution	Negative	Moderate	Local	Short term	Construction and operation phase	Occasional	Certain	Medium	Low
Aesthetics/visual impacts	Positive	Moderate	Local	Long term	All Project Phases	Continuous	Certain	Insignificant	
Non- hazardous waste nuisance	Negative	High	Local	Medium –	All project	Continuous	Certain	Medium	Insignifican

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				Long term	phases				t
Pollution from Hazardous waste generated	Negative	High	Localized Project Area	Medium – Long term	All project phases	Occasional	Certain	High	Low
Loud noises	Negative	Medium	Local	Short term	All Project Phases	Occasional	Certain	Low	Low
Impacts on Landscape and aesthetics	Positive	Medium	Local	Short – long term	All Project Phases	Continuous	Certain	Low	Low
Socio-economic and Cultural Environment									
Increase in employment opportunities	Positive	Moderate	Local-regional	Long term	All project phases	Continuous	Certain	Medium	Medium
Increase in Public Revenue	Positive	High	Regional	Long term	All project phases	Continuous	Certain	High	High
Capacity building and skills development	Positive	Moderate	Local	Long term	All project phases	Continuous	Certain	Medium	Medium
Convenience in the supply of fuel	Positive	High	Local	Long term	Operation phase	Continuous	Certain	High	Very High
Spread of STI's and HIV/AIDS	Negative	High	Regional	Long term	All project phases	Occasional	Certain	High	Low
Health & safety risks due to work activities, fire risk	Negative	High	Local	Short term	All project phases	Occasional	Probable	High	Low
Influx of people into the area	Negative	Moderate	Local	Medium term	All project phases	Frequent	Probable	Low	Insignificant
Dust nuisance	Negative	Moderate	Local	Short term	During construction	Frequent	Certain	Medium	Low
Disturbance of areas of historical, archaeological & cultural significance	Negative	Low	Local	Short term	During construction	Infrequent	Probable	Low	Low
Traffic and safety risks	Negative	High	Local	Short term	All project phases	Occasional	Probable	High	Low
Sensitivity of environment being impacted	Negative/Positive	Low	Local	Long term	All project phases	Continuous	Certain	Insignificant	

7.3 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

In this section, an Environmental and Social Management Plan (ESMP) has been prepared to cover construction and operation phases of the project. The ESMP combines both the environmental and social monitoring plan and the environmental and social management plan.

The purpose of the ESMP is to present a structured approach for optimizing beneficial impacts on the one hand while mitigating adverse impacts on the other. It has been prepared to render practical guidance to implementation of the proposed project in an environmentally friendly and socially acceptable manner. The construction contractor will thus assist the developer (Puma Energy Zambia Plc.) in implementing mitigation measures contained in the ESIA to ensure environmental protection.

In this regard, the Environmental and Social Management Plan (ESMP) is based on the Environmental Management Act (EMA) of 2011 and the Environmental Impact Assessment (EIA) Regulations of 1997. These frameworks outline the responsibilities of the developer, construction contractor, supervising consultant, Government of the Republic of Zambia (GRZ) agencies, non-governmental organizations (NGOs), and the affected community in safeguarding the environment in and around the project area. The measures taken will as a matter of principle seek to:

- Reduce the harmful characteristics of impact sources by devising less harmful ways of effecting project activities.
- Localise project impacts as much as possible by taking precautions in effecting project activities.
- Prevent fire.
- Explore ways and means of enhancing the resilience and regenerative/recovery capacity of impacted elements of the environment, and
- Streamline better management practices as an integral part of project implementation.

Monitoring of the project's environmental performance will be carried out as a routine part of project implementation to observe changes taking place in the environment and assess the effectiveness of the interventions put in place. This should help the timely administering of corrective management interventions to avoid occurrence of serious negative effects. The plan, indicated in table 7.2, specifies:-

- Environmental Aspect (What needs to be managed?)
- Environmental Management Objective (Why does it need to be managed?)
- Mitigation/enhancement measure (How should it be managed?)

Table 24: Environmental and Social Management Plan

Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW/Per Annum
Positive Impacts of the Project									
Construction works and operational activities at the Puma Depot	Employment Opportunities	To create employment opportunities for the communities within the project area	Competitive salaries, wages and contract terms will be offered to contractors and suppliers of goods and services. Workers will be employed based on merit and skills and not based on relationship with the developer, race, gender or tribe.	Project Manager / Puma Energy appointed person	<ul style="list-style-type: none"> Percentage of locals employed to carry out project works. 	<ul style="list-style-type: none"> Register of employees 	Monthly	Project Lifecycle (30 years+)	150,000
Construction works and operational activities at the Puma Depot	Contribution to public revenue	To ensure that the development makes a contribution to public revenue.	The developer will ensure that all relevant taxes are paid and all other contributions made to the relevant authorities.	Project Manager / Puma Energy appointed person	<ul style="list-style-type: none"> Number of employees with contributions to NAPSA Percentage of taxes paid 	<ul style="list-style-type: none"> File check for availability of proof of payments 	Monthly	Project lifecycle (30 years+)	150,000
Construction works and operational activities at the Puma Depot	Capacity Building and Skills Development	To build capacity and skills of workers	The developer will ensure that the people working on the site will have the knowledge on the technologies used on the site and the reasons why certain tasks are performed will be explained.	Project Manager / Puma Energy appointed person	<ul style="list-style-type: none"> Skilled workers available on site and transferring skills to semi-skilled and unskilled workers 	<ul style="list-style-type: none"> Certificates of trained personnel on site passing on the skills 	Monthly	Construction and Operation phase (30 years+)	250,000
Operation of the fuel depot	Enhancement of Visual Appearance	To enhance the visual appearance of the site	The upgrade will enhance the visual appearance of the site by replacing older infrastructure with modern tanks, while construction-related impacts will be temporary and localized. Maintenance activities to be regular	Puma Energy appointed person	<ul style="list-style-type: none"> Fuel depot aesthetically appealing Good housekeeping adhered too 	<ul style="list-style-type: none"> Visual observation 	Monthly	Operation Phase (30 years)	Covered in Project investment cost

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Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW/Per Annum
Operation of the fuel depot	Convenience in the Supply of Fuel	To ensure adequate fuel storage and adequate supply of fuel	The developer will ensure that the fuel tanks are always stocked to ensure adequate supply of fuel and thereby promoting convenience. The levels of fuel in the tanks will be monitored.	Puma Energy appointed person	<ul style="list-style-type: none"> Fuel tanks always stocked except when need for tank cleaning 	<ul style="list-style-type: none"> Automatic and manual fuel level checks 	Daily	Operation Phase (30 years)	Operational Cost
Negative Impacts Biophysical and Social Economic Environment									
Removal of old tanks and installation of new tanks	Climate change and disturbance of natural environment	To prevent climate change due to exhaust fumes from machinery.	All machinery to be used on site will be frequently serviced to ensure that the exhaust emissions are below the permissible limits.	Project Manager	<ul style="list-style-type: none"> Number of exceedances of relevant standards 	<ul style="list-style-type: none"> Site observation Air quality tests Machine maintenance records 	Weekly	Construction phase (9 months)	2,500, 000
Storage of fuel and loading and offloading of fuel	Disturbance to the area ecology	To prevent disturbance to the ecology of the project area	Only non-lead (unleaded) containing fuel will be stored. The fuel will be stored in leak proof fuel storage tanks which will be installed on an impermeable lining. The design is so that the fuel does not seep into the natural environment, thereby preventing negative impact on the ecosystem. This will mitigate the release of ozone that would come from leaded fuels. All machinery to be used on site will be frequently serviced to ensure that the exhaust emissions are below the permissible limits	Project Manager	<ul style="list-style-type: none"> Number of exceedances or pollution incidents 	<ul style="list-style-type: none"> Physical check of tank farm Water quality and soil test results Oil interceptor water tests Air quality tests Machine maintenance records 	Monthly	Operation phase (30 years)	

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Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW/Per Annum
Construction activities on site Storage of fuel on site	Aesthetic and visual impacts on humans	To mitigate aesthetic and visual impacts on humans	The new tanks will be a replacement of the old existing tanks. The developer will ensure that the installation is according to plan with careful monitoring of the project works.	Project Manager/ Puma Energy appointed person	<ul style="list-style-type: none"> Site aesthetically appealing 	<ul style="list-style-type: none"> Observation of project site 	Monthly	Project lifecycle (30+ years)	
Removal of old tanks and installation of new tanks	Ground water and soil contamination	To prevent soil and ground water contamination	All machinery that uses or requires oil will be checked for spillages and properly maintained before usage on this site.	Project Manager	<ul style="list-style-type: none"> Absence of leaks or spills from machinery 	<ul style="list-style-type: none"> Site observation. Machine maintenance records. 	Weekly	Construction phase (9 months)	150,000
Operation of the upgraded fuel depot	Soil and ground water contamination	To prevent soil and ground water contamination	Sewage waste will be managed by the use of existing toilets connected to LWSC sewer mains. Fuel will be stored in corrosion free, leak proof aboveground fuel storage tanks and drainage will be via a purpose designed oil interceptor. Each tank will sit on an impermeable floor in a concrete bunded area large enough to contain 110% volume of the tank in the bund, preventing contamination of the environment in case of tank failure. The floor around the whole depot is concreted.	Puma Energy appointed person	<ul style="list-style-type: none"> Number of exceedances of water quality standards Presence of hydrocarbons in the soil Number of complaints received 	<ul style="list-style-type: none"> Ground water quality analysis Soil analysis. Water flow monitoring 	Monthly	Operation phase (30 years)	750,000

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Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW/Per Annum
Construction and operation activities on site	Fire occurrence	To minimise potential risks due to fire	At all phases of the project, the Puma Lusaka depot will have an effective fire-fighting system. In addition the workers on site will be trained to prevent fire/what to do in case of a fire. The tanks will be leak-proof vertical steel tanks. The tanks will be protected against impacts from vehicles and any other thing that may result in impact that may cause sparks and eventually fire risks. Warning signs will be put around the storage tank areas to ensure that naked flames, smoking and use of cell phones around the tank areas is strictly prohibited. The tanks are designed to have top and side pourer system for cooling the tanks to protect the fuel tanks and also to prevent fires	Terminal Manager	<ul style="list-style-type: none"> • Zero fire occurrences • Presence of adequate fire-fighting system on site 	<ul style="list-style-type: none"> • Safety reports 	Monthly	Project Lifecycle (30+ years)	550,000

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Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW/Per Annum
Waste generation	Waste nuisance Soil and ground water contamination	To prevent waste nuisance and soil and ground water contamination	<p>Rubble will be treated as solid wastes. The removed tank shells will be cleaned on site and sold/given to steel scrap utilization companies.</p> <p>Fuel waste including sludge from the tanks will be considered as hazardous waste and will be collected in a drum. This will be collected by a hazardous waste transporter and disposed of at a hazardous waste approved disposal site. The fuel interceptor will be cleaned regularly. The waste oil from the interceptor will be removed from site according to the Puma waste oil management procedure.</p> <p>Sewage waste will be managed by the use of existing toilets connected to LWSC sewer system. Solid waste will be collected in bins at various locations on site and then collected by a local council approved waste collection company. At all phases of the project there shall be no burning of waste and the bins to be used for waste will be leak proof and contained preventing scatter of waste. The waste oil from the interceptor will be removed from site according to the Puma waste oil management procedure.</p>	Puma Energy appointed person	<ul style="list-style-type: none"> • Number of exceedances or soil contamination incidents • Number of leaks or spills recorded 	<ul style="list-style-type: none"> • Site inspection • Soil quality analysis • Audit of waste management plan. 	Quarterly	Construction and operation phase (30 years+)	150 000

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Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW/Per Annum
Presence of workers and visitors on site	Spread of Covid 19	To prevent the spread of Covid 19	The developer will put in strict measures in line with Ministry of Health guidelines.	Project Manager/ Puma Energy appointed person	<ul style="list-style-type: none"> Number of cases of Covid 19 and other disease cases on site 	<ul style="list-style-type: none"> Site health and safety report 	When need be	Construction and operation phases (30+ years)	Inc in above
Construction works. Handling of fine raw material	Air pollution	To prevent air pollution as a result of dust and exhaust fumes	<p>Dust suppression by spraying water on exposed work sites, on active haulage routes and other areas with potential to generate dust;</p> <p>The site will have designated stockpile areas, and packaged material will be kept in original packaging until the time of use (e.g. cement)</p> <p>Vehicles used on site will be properly maintained ensuring that the fumes released are minimal; and</p> <p>Monitoring of dust levels for corrective action will be done frequently.</p>	Project Manager	<ul style="list-style-type: none"> Number of exceedances of relevant standards Number of complaints received 	<ul style="list-style-type: none"> Site observation Air quality tests Inspection of material storage on site Machine maintenance records 	Weekly and when need be	Construction Phase (9 months)	1,500,000
Operation of the fuel depot	Air Pollution	To prevent air pollution as a result of vehicle emissions and from the fuel storage area	<p>The fuel delivery vehicles will be inspected to ensure that they are in good condition that is with reduced exhaust emissions. The offloading area will be well drained so as to not allow stagnant water which might result in bad odor.</p> <p>All machinery will be regularly maintained to ensure that the same are as clean as possible</p>	Puma Energy appointed person	<ul style="list-style-type: none"> Number of exceedances of relevant standards Number of complaints received 	<ul style="list-style-type: none"> Site observation Air quality tests Machine maintenance records 	When need be	Operation Phase (30 years)	100, 000

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Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW/Per Annum
Use of machinery/tools to carry out works on site Other activities on site	Noise Pollution	To minimize noise nuisance from construction activities	All vehicles and equipment will be regularly maintained to ensure that they are mechanically sound. Where workers are exposed to elevated sound levels, use of PPE such as ear muffs/plugs will be mandatory. Construction works will be limited to daytime. The site will have a clearly defined access route.	Project Manager	<ul style="list-style-type: none"> • Number of exceedances of relevant standards • Number of complaints received 	<ul style="list-style-type: none"> • Site observation • Noise level sampling 	Weekly	Construction Phase (9months)	Incl above
Operation of the fuel depot	Noise Pollution	To minimize noise nuisance from depot operation activities	All vehicles will be regularly maintained to ensure that the same are as quiet as possible.	Puma Energy appointed person	<ul style="list-style-type: none"> • Number of complaints received 	<ul style="list-style-type: none"> • Site observation • Noise level sampling 	Weekly	Operation Phase (30 years)	Incl in above
Movement of construction machinery, vehicles and workers on the site and off site	Traffic and Road safety risks	To ensure safety on public access roads and to avoid loss of human life	The proposed site is in an industrial area with carefully designed access roads allowing for vehicular circulation. The tanker drivers will be obliged to obey the speed limit signs. An alternative parking area has been designated for all Puma Energy trucks, ensuring that only the required number of trucks are called in as needed. RDA has been engaged on signage and speed humps but feedback has not yet been received. The truck turning lane issue will be revisited with RDA and a traffic risk assessment will be conducted to address any concerns.	Project Manager/ Puma Energy appointed person	<ul style="list-style-type: none"> • Number of traffic incidents • Number of injuries and fatalities • Number of driver infringements 	<ul style="list-style-type: none"> • Visual observation • Traffic count 	Weekly	Project Lifecycle (30+ years)	550,000

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Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW/Per Annum
Replacement of fuel storage tanks	Disturbance/ devaluing of areas of historical, archaeological and cultural significance	To ensure that the development does not destroy or devalue areas of historical, archaeological and cultural significance	The developer will ensure that if anything is found on site that may be of historical, archaeological or cultural significance, the findings are reported to NHCC.	Project Manager/ Puma Energy appointed person	<ul style="list-style-type: none"> • Number of archaeological items found • Number of complaints received • 	<ul style="list-style-type: none"> • Observation and record of archaeological items reported to NHCC 	Monthly	Project Lifecycle (30+ years)	150,000
Presence of workers on site	Spread of the HIV/AIDS pandemic	To prevent the spread of the HIV/AIDS pandemic	<p>HIV/AIDS awareness talks will be covered in the daily toolbox talks before work is done. Construction workers will be commuting to the site so there is less risk of interaction between workers.</p> <p>HIV/AIDS awareness talks will be covered during the induction of new employees.</p>	Project Manager	<ul style="list-style-type: none"> • Increase in number of HIV/AIDS cases in the project area 	<ul style="list-style-type: none"> • Employment register • Signed toolbox talks on HIV/AIDS awareness 	Monthly	Project Lifecycle (30+ years)	500,000

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Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW/Per Annum
Construction and operation activities on site	Injury and accidents to workers and members of the public	To prevent injury and accidents to workers and members of the public	<p>Puma Energy adheres to internationally recognized standards and holds certifications for ISO 9001 (Quality Management), ISO 14001 (Environmental Management), and ISO 45001 (Occupational Health and Safety Management), the latter being a recent addition. These certifications reflect the company's strong commitment to ensuring that every individual returns home safely after work. The HSSE Policy is to safeguard the health, safety, security, and well-being of the workforce, customers, and the communities Puma Energy interacts with.</p> <p>All workers will be trained and reoriented in occupational health and safety. Applicable protocols will be firmly enforced. All workers will be provided with personal protective equipment. Only well qualified and experienced workers will be tasked to drive vehicles and operate machinery. The offloading and loading of fuel will be such that all fuel is contained and that no workers come into direct contact with the fuel. The proposed site is designated as a restricted area; therefore, public access will be prohibited.</p>	Project Manager/ Puma Energy appointed person	<ul style="list-style-type: none"> • Number of near misses • Number of incidents • Number of workers without adequate PPE • Site access restricted 	<ul style="list-style-type: none"> • Health and safety inspection by safety officer • Site health and safety report 	Daily (safety officer) Monthly (HSE auditor)	Construction and operation phases (30+ years)	550 000

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Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW/Per Annum
Presence of workers and job seekers on site	Influx of people into project area	To reduce on population boom and unemployment levels	Priority in employment to local residents. The Contractor will also be encouraged to procure supplies from local sources to the maximum extent possible.	Project Manager/ Puma Energy appointed person	<ul style="list-style-type: none"> • Number of Local members of the community employed 	<ul style="list-style-type: none"> • Record of employees 	Monthly	Project Lifecycle (30+ years)	150,000

Table 25: Additional Stakeholders in Environmental Monitoring: Operational Phase

Responsible	Parameters To Be Monitored	Output
ZEMA	Overall environmental performance of the project	<ul style="list-style-type: none"> • Discussions • Inspections and testing • Annual audits • Issuing of licenses and permits
Developer	<ol style="list-style-type: none"> 1. Implementation of mitigation measure 2. Occupational health and safety 3. Traffic and worksite 4. Environmental performance of equipment 5. Air quality 	<ul style="list-style-type: none"> • Maintenance records • Accident record/reports • Mitigating actions
Traffic Police	Traffic accidents Traffic nuisance Traffic safety measures	Police reports and instructions to Developer and Project Management Team
Local Authorities	Negative social and environmental impacts	Complaints to Developer and Project Management Team.
Factories Inspectorate (If required)	Working conditions Condition of equipment	<ul style="list-style-type: none"> • Discussions • Inspections of installations • Inspections and Certification of equipment • Inspection of records • Issuing of licenses and permits
Utility Providers (e.g. ZESCO)	Routine monitoring of electrical distribution	Maintenance records
Local Council Public Health and Fire Departments	Public health Hygiene Fire equipment and preparedness	Inspections, surveys and results
Traffic Police/Road Traffic	<ol style="list-style-type: none"> 1. Traffic accidents 2. Traffic nuisance 3. Traffic safety measures 	Police reports

8.0 DECOMMISSIONING AND REHABILITATION PLAN

8.1 Introduction

This is a decommissioning plan that Puma Energy Zambia PLC will undertake at the decommissioning of the Puma Lusaka Depot on plot no.1710 along Mungwi Road, Heavy Industrial Area in Lusaka District, Lusaka Province, Zambia. In line with the ERB, ZABS, NCC and ZEMA guidelines, the works will be undertaken as per the plan outlined below.

8.1.1 Legislative Requirements

The Zambia Environmental Management Agency is mandated to ensure compliance to environmental protection laws and guidelines. The National Council of Construction (NCC) is responsible for the administration, inspection and enforcement of legislation regarding decommissioning activities. The decommissioning and demolition of buildings has to be undertaken according to the stipulations of the NCC Act. The Energy Regulation Board (ERB) is responsible for the administration, inspection and enforcement of legislation regarding petroleum storage tank systems as well as decommissioning activities.

The removal of tanks has to be undertaken as regards the Zambia Bureau of Standards, ZS 385 part 1. Prior to the decommissioning exercise, the relevant permits i.e. Environmental Project Brief, will be obtained by the company.

8.1.2 Licensed Technical Personnel

The dismantling and removal of the petroleum tanks will be done by petroleum technicians under the supervision of Engineers registered in Zambia. The knock down and demolition of buildings and all other project infrastructure will be done under the supervision of an Engineering Institute of Zambia registered civil engineer.

8.1.3 Application for Permit

Prior to undertaking the demolition activities, the relevant permits will be obtained by the company.

8.1.4 Demolition Safety Precautions

Demolition of the structures and fuel tanks at the Puma Depot will be done with the utmost caution. In case any site contamination is identified, it will be cleaned up by licensed environmental cleaning service providers. Furthermore, the contractor once on site will submit a safety plan to ensure procedures are followed to prevent injury to people and the environment.

8.2 Impacts arising from the Decommissioning Phase

8.2.1 Loss of employment

The decommissioning and closure of the project will bring to an end the source of income for the permanent employees working at the depot. This may lead to various outcomes, including breaking up of homes, suicides, forced change of lifestyle, and increased theft due to loss of income source.

8.2.2 Loss of Revenue

Multiplier effects resulting from reduced employment at closure of the project will include reduced public revenues such as taxes (PAYE to ZRA, VAT) and contributions to NAPSA from formally employed persons and from the payment of land rates.

8.2.3 Environmental Visual impact

Inappropriate decommissioning and closure may leave the site significantly altered and may also contribute to the modification of the site environs.

8.2.4 Loss of Fuel Supply

Decommissioning of the fuel tanks may result in the depot stocking less fuel which may result in refuelling challenges for Puma service stations and consumer installations.

8.3 Environmental Management Commitments

8.3.1 Loss of Employment

The manager of the development will therefore put in place a mechanism to prepare employees for life beyond the project. Employees will be prepared by teaching them other income generating avenues. The employees on contractual basis will get their accumulated gratuity and those at retirement age will get their pensions from NAPSA plus their benefits from the company.

8.3.2 Loss of Revenue

The developer will ensure that there is a gradual closure & exit plan. The developer will avoid abrupt stoppage to give time for economic adjustment. A percentage of the profits will be allocated before closure to a transition fund to support employment programs.

8.3.3 Physical Visual Impact

The proponent will ensure appropriate decommissioning and closure practices, which includes site reclamation and rehabilitation of the area upon cessation of the project activities; so that the area will as much as possible compliment the land use in the area.

8.3.4 Loss of Fuel Supply

The proponent will avoid abrupt closure but will ensure that there is another source of fuel for the Puma service stations and consumer sites before decommissioning of the fuel depot.

8.3.5 Decommissioning and Closure procedures

The table below shows the demolition program and estimated costs.

Table 26: Decommissioning and Closure Phase

Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW
Knock down of structures on site , removal of fuel tanks and restoring of site to close to natural state	Soil and ground water contamination	To prevent soil and ground water contamination	Localizing all wastes and confining them in designated storage areas for appropriate disposal; Proper management of fuel run machinery Maintenance of equipment will be done at designated workshops offsite. Adequate sanitation facilities provided. Bins will be provided on site for disposal of waste. The tanks will be carefully decommissioned preventing product leaks	Project Manager	<ul style="list-style-type: none"> Number of exceedances or pollution incidents 	<ul style="list-style-type: none"> Physical check of sanitation facilities Water quality test results Soil tests 	Weekly	3 weeks	1,000,000
Knock down of structures on site , removal of fuel tanks and restoring of site to close to natural state	Air pollution	To prevent air pollution as a result of dust	Dust suppression by spraying water on exposed work sites, Enforcement of speed limits to 20 km/h to minimize on traffic induced dust emissions; Vehicles used on site will be properly maintained ensuring that the fumes released are minimal.	Project Manager	<ul style="list-style-type: none"> Number of exceedances of relevant standards (for dust $PM_{10} < 70\mu g/m^3$) Number of complaints received 	Monitoring of dust levels for corrective action will be done frequently. Site observation	Weekly and when need be	3 weeks	Incl above

Environmental and Social Impact Statement – Puma Lusaka Depot Upgrade

Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW
Use of machinery/tools to carry out works on site	Noise Pollution	To minimize noise nuisance from demolition activities	Where workers exposed to elevated sound levels, provided with personal protective equipment such as ear muffs/plugs Limiting demolition activities to daytime only and no night-time construction using heavy machinery; Good maintenance and proper operation of machinery to minimize noise generation	Project Manager	<ul style="list-style-type: none"> Number of times the noise level exceeds the prescribed maximum 	Site audit records Observation	Weekly	3 weeks	Incl above
Waste generation from activities on site	Waste nuisance	To prevent waste nuisance	Localizing all debris and other wastes and confining them in designated storage areas for appropriate disposal; Hazardous waste including sludge from fuel tanks collected by an approved hazardous waste collection agency for further treatment or disposal. Excess excavated material disposed of within the designated area. Material and equipment that can be re-used moved to other sites or sold to interested parties. Adequate sanitation facilities provided. Good house-keeping practices strictly adhered to.	Project Manager	<ul style="list-style-type: none"> Number of exceedances or pollution incidents 	<ul style="list-style-type: none"> Site observation Audit of waste management plan 	Weekly	3 weeks	Incl above
Presence of workers on site	Spread of the HIV/AIDS pandemic	To prevent the spread of the HIV/AIDS pandemic	HIV/AIDS awareness talks will be covered in the toolbox talks. Workers will be commuting to site and priority employment will be given to the local people.	Project Manager	<ul style="list-style-type: none"> Percentage of local people employed on site 	<ul style="list-style-type: none"> Employment register check 	Weekly	3 weeks	Incl above
Demolition activities on site	Injury, accidents to workers and members of the public	To prevent injury, accidents to workers and members of the public	Strict adherence to Puma health and safety policy.	Project Manager	<ul style="list-style-type: none"> Number of incidences involving members of the public 	<ul style="list-style-type: none"> Site environmental health and safety audit 	Weekly	3 weeks	Incl above

Environmental and Social Impact Statement – Puma Lusaka Depot Upgrade

Aspects	Impacts	Objective	Mitigation Measures/Enhancement Measure	Responsible Person	Performance Indicator	Means of Verification	Frequency of Monitoring	Time frame	Cost ZMW
Closure of development	Loss of employment	To mitigate for the loss of employment	Employees will be prepared by teaching them other income generating avenues. The employees on contractual basis will get their accumulated gratuity and those at retirement age will get their pensions from NAPSA plus their benefits from the company.	Project Manager	<ul style="list-style-type: none"> Percentage of workers given their benefits 	-	-	3 months before decommissioning	Cost of training and sensitizing workers
Movement of demolition machinery, vehicles and workers on the site and off site	Traffic and Road safety risks	To ensure safety on public access roads and to avoid loss of life	A traffic management plan to implement measures for ensuring safe passage of traffic around and through the work sites will be implemented at all times.	Project Manager	<ul style="list-style-type: none"> Number of traffic incidents Number of injuries and fatalities Number of driver infringements 	<ul style="list-style-type: none"> Site health and safety audit 	Weekly	3 weeks	Incl above
Closure of development	Loss of a source Public Revenue	To ensure that relevant institutions that would be affected by this loss of revenue are informed of the closure of the project	The proponent will avoid abrupt closure but will ensure that a notice is given to all concerned and affected parties that would be affected by the closure before this phase is implemented to prepare all for the loss of revenue.	Human Resource Manager	<ul style="list-style-type: none"> Number of parties given notices 	<ul style="list-style-type: none"> Notice of closure put up 	Once (3 months before decommissioning)	3 months before decommissioning	Incl above
Closure of development	Physical Visual Impact	To ensure that the site compliments the land use in the area as much as possible	The proponent will ensure appropriate decommissioning and closure practices, which includes site reclamation and rehabilitation of the area upon cessation of the project activities; so that the area will as much as possible compliment the land use in the area	Project Engineer	<ul style="list-style-type: none"> Percentage of site complimenting the land use in the area Number of complaints received 	<ul style="list-style-type: none"> Observation 	weekly	3 weeks	Incl above

9.0 AREAS AND ISSUES WHERE THERE WERE LIMITATIONS AND SCIENTIFIC UNCERTAINTY

Limited Community Participation

While public consultations were held with adverts that ran in the public newspapers and invitation letters sent to some stakeholders, participation from certain stakeholder groups (e.g., vulnerable communities, government institutions or informal traders) may have been limited. This could affect the completeness of social impact analysis and the identification of potential concerns.

Short Duration of Field Assessments

Due to time constraints and project scheduling, field assessments such as air quality, noise levels, and groundwater sampling were conducted over a limited period. As a result, the data collected may not capture seasonal variations or occasional environmental fluctuations.

Reliance on Secondary Data

Some aspects of the study, such as socio-economic and historical land use data, were based on secondary sources and stakeholder interviews, which may not fully reflect recent developments or undocumented changes in the area.

Ongoing Urban and Industrial Development

The surrounding area is undergoing continued industrialization and urban expansion, which introduces external environmental pressures that are difficult to isolate from the impacts directly caused by the proposed project.

Assumption of Effective Implementation

Many mitigation measures outlined in the Environmental and Social Management Plan (ESMP) are based on the assumption that they will be fully implemented as planned. The EIA does not account for potential non-compliance or delays in enforcement.

Scientific Uncertainty

Assessment of Sensitivity of Receivers and the Magnitude of Change as a result of project works are inherently subjective.

Temporal Considerations

Assessing long-term impacts, such as those related to climate change or ecosystem dynamics is challenging due to uncertainties in future conditions and changes over time.

Predictive Uncertainty

It was challenging to accurately predict the full extent and severity of environmental impacts, especially for complex or long-term effects due to the uncertainty in modelling techniques and assumptions.

Cumulative Effects

Assessing cumulative impacts from multiple projects or activities in the same area proved to be complex, as interactions between different stressors may amplify or attenuate environmental effects.

10.0 CONCLUSION AND RECCOMENDATIONS

Puma Energy Zambia Plc. proposes to replace and upgrade the fuel storage tanks at the Puma Lusaka Depot, plot no.1710, Mungwi Road, Heavy Industrial Area, Lusaka District, Lusaka Province. The total area of the Puma Plot is approximately 40,679m² and the depot area covers a total area of 35,800m². The proposed project will take up a total area of approximately 3,150m².

The replacement and upgrade will take place in the northeastern part of the plot, which is currently occupied by six old tanks. These old tanks will be removed and replaced with four modernized fuel storage tanks, each with a capacity of 2,500 m³, at the same location. The new tanks will be used for storing diesel and petrol.

This upgrade will enhance storage capacity, safety, and efficiency, resulting in a total additional capacity of 10,000 m³. The proposed upgrade (10,000 m³) combined with the recently approved capacity (7,000 m³) will increase the depot's total storage capacity from 7,100 m³ to 17,000 m³.

This upgrade will modernize the depot, enhance operational efficiency, and ensure long-term regulatory compliance, reinforcing Puma Energy Zambia Plc.'s commitment to safe and sustainable fuel storage operations.

Generally, major activities of this project will include:

- Decommissioning of the existing tanks and pipes in the north eastern part of the depot
- Construction of four new bunded areas
- Installation of 4 x 2,500m³ fuel storage tanks in separate bunded areas
- Installation of new pipes to connect the new tanks to existing infrastructure (rail and truck offloading/loading facilities)

Existing oil interceptors will be retained to manage drainage from the tank farm, directing runoff through a fuel interceptor to prevent fuel leaks into the environment. The components of the project will be designed to comply with the relevant Zambian standards and regulations.

The project rationale is to replace and upgrade the aging storage tanks in the north eastern part of the depot, which have reached the end of their design life and pose environmental contamination risks. The company aims to enhance the depot's storage capacity, safety, and operational efficiency through this upgrade. The project involves replacing six old tanks with four modernized tanks with a larger capacity, thereby increasing the total fuel storage capacity.

The project will be undertaken in three phases that is preparation, construction and operation phase. During these phases of the project, there will be negative impacts on the biophysical and socio-economic environment. The negative impacts anticipated include air and noise pollution, potential ground water pollution, soil contamination, and occupational health and

safety risks. The developer has proposed measures to mitigate the negative impacts that this project is likely to have on the environment.

The project also has significant positive impacts such as employment opportunities, economic revenue (i.e. taxes to the country) that the development will bring, capacity building, and convenience in the supply of fuel and a better-looking facility.

Recommendations

1. The developer should strictly adhere to the Environmental and Social Management Plan (ESMP) to ensure that potential negative impacts of the project are effectively mitigated.
2. A robust monitoring system should be established to regularly assess environmental conditions and worker safety in line with the project's environmental commitments and approved plans. Key parameters to be monitored include:
 - Water quality
 - Solid waste management
 - Fire preparedness and maintenance of firefighting equipment
 - Occupational and public health and safety
 - Site security
 - Soil quality
3. Equipment that produces heat, sparks, or open flames must be prohibited near the fuel storage area to prevent ignition of fuel vapors.
4. The site should enforce a strict no-smoking policy near fuel storage tanks and designate specific vehicle routes and parking areas to reduce fire hazards.
5. Access to the site must be controlled and restricted to authorized personnel only.
6. Fire suppression systems, spill containment structures, and zoning requirements must be regularly inspected and maintained to ensure they function effectively in reducing safety and environmental risks.

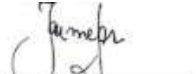
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12.0 DECLARATION OF AUTHENTICITY

We trust that the information described in this Environmental and Social Impact Statement provides adequate information to satisfy the laws and regulations of Zambia regarding the proposed replacement and upgrade of fuel storage tanks at the Puma Lusaka Depot, plot no.1710, Mungwi Road, Heavy Industrial Area, Lusaka District, Lusaka Province by Puma Energy Zambia Plc

To the best of our knowledge the contents of the document are factual and are authentic as provided by sources consulted.



Director

Puma Energy Zambia Plc

ANNEXES

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SATELLITE MAP AND SITE PHOTOS

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SPECIALIST REPORTS AND WATER SAMPLE RESULTS

APPENDIX VI

LETTER OF APPROVAL OF TORS

APPENDIX VII

**APPROVED TORS WITH SCOPING REPORT, MEETING MINUTES AND TEAM
CVS**

APPENDIX VIII

PUBLIC DISCLOSURE MEETING AND ADVERTS