HERITAGE IMPACT ASSESSMENT FOR THE PROPOSED NGONYE FALLS HYDROELECTRICITY POWER PROJECT

Cover Picture: Ngonye Falls, Sioma District

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Executive Summary

Western Power Company Limited intends to construct a Hydroelectric Power Station at the Ngonye Falls which will generate between 60 mega-watts and 80 mega-watts of electricity. The construction phase of the project is earmarked to start in 2015 and is expected to take 18 to 24 months to complete with the first electricity generation planned before the end of 2016.

In view of this and in accordance with section 29 of the Environmental Management Act No. 12 of 2011, a full Environmental and Social Impact Assessment (ESIA) has commenced and is being undertaken by DH Engineering Consultants on behalf of Western Power Company Limited. Through the Environmental Impact Statement (EIS), the findings of the ESIA will be presented in which both positive and negative impacts of the project will be identified together with recommendations to mitigate potential negative impacts and enhance the benefits.

As part of the scoping process prior to the full commencement of the ESIA study, it was established that the project area harbored known sites of cultural and natural heritage interest thus necessitating the undertaking of a Heritage Impact Assessment (HIA). This report presents the findings of a team of heritage professionals from the National Heritage Conservation Commission (NHCC) who carried out a HIA of the proposed Ngonye Falls Hydroelectricity Power Project on the heritage resources in the project area and the immediate surroundings.

The report identifies and describes sites of archaeological, historical, ecological and geomorphological interest in the study area and its environs and the potential impacts of the proposed project on these heritage resources. It outlines the possible mitigations for the negative impacts and suggests ways of enhancing the positive impacts of the project. Some recommendations have also been proffered to the developer to enhance the project's heritage and environmental sustainability.

Though there were some concerns raised, local communities and other stakeholders consulted were unanimously in favour of the proposed project. In the HIA, the major potential negative impacts of the project on the heritage resources in the study area were deemed to be the reduced water flow over the Ngonye Falls which will be pronounced in the dry season and the possible inundation, and associated effects, of some of the areas upstream of the proposed location of the barrage. The proposed project is also expected to have marginal impacts on the other heritage resources in the study area. However, sufficient mitigations for the potential negative impacts of the project are available.

It is thus recommended that the project proceeds with full implementation of the proposed mitigation and enhancement measures at all the project phases.

Acknowledgements

The NHCC study team that undertook the Heritage Impact Assessment is indebted to a number of individuals, institutions and other stakeholders for the roles that they played in ensuring that the mission to Sioma District and the Ngonye Falls was a successful one. The Acting District Commissioner for Sioma, Mr. M. Mukela was especially helpful in facilitating for the liaisons with local communities, the Barotse Royal Establishment and other stakeholders during the study period.

The study team would like to thank the Zambia Wildlife Authority (ZAWA) Park Ranger, Mr. J. Mubita for providing unlimited access to the Ngonye Falls Community Partnership Park Visitors Information Centre and through the institutional premises, to the river banks overlooking the Ngonye Falls. In a similar vein the team thanks Mr. L. Muyunda, the Gate Attendant at the Community Park Visitors Information Centre who served as a research assistant and guide in some of the excursions to the river front.

The team greatly benefited from the help and guidance of other field assistants during the fieldwork. Special mention should be made of Mr. Sitali Mubita and Mr. Mutukwa Mwauluka who served as the principal field assistants. At the Sioma Country Lodge, we would like to thank the Manager and Messrs Mubita, Sitali and Mukena for making our stay as comfortable and as healthy as practicable.

Many thanks are due to DH Engineering Consultants for the continued collaboration and the provision of some invaluable information about the proposed project. Without this input, the HIA would not have been undertaken. Finally, we wish to thank the many other individuals and institutions who assisted in one way or the other in the HIA process but whose names have not been mentioned here.

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1.0 Introduction

1.1 Background of the Project

Western Power Company Ltd (WPC) intends to construct a run-of-river hydroelectric power station on the east bank of the Zambezi River near the Ngonye waterfalls in the Sioma District of the Western Province of Zambia. According to the developer, the Project is estimated to cost around KR900million or (US$180million) and will generate between 60 and 80 mega-watts of electricity with an installed capacity of 370 – 435 GWh per year (WPC, 2013). The completed project is envisaged to generate a similar amount of energy to the existing Livingstone Hydroelectric Power Station. The project will also require the construction of a new power line from the power station to Sesheke.

According to Western Power Company Ltd, around 1km above the Ngonye falls; a low barrage will be built from the east bank of the river to the Sioma Island. This barrage will direct water into a 3km long open canal which will carry the water to the site of the power station on the bank of the river below the falls. The power station itself will be a concrete building mostly buried below the ground and containing the turbines which generate electricity. At the power station there will be control rooms and a substation.

In view of the proposed project, a Heritage Impact Assessment (HIA) was undertaken by the National Heritage Conservation Commission (NHCC) as part of the overall Environmental and Social Impact Assessment Process (ESIA) in June, 2014. The National Heritage Conservation Commission is a statutory body under the Ministry of Chiefs and Traditional Affairs which is empowered by the NHCC Act, Chapter 173 of the Laws of Zambia to conserve the country's cultural and natural heritage.

The HIA focused on identifying and describing the potential impacts that the proposed project would have on sites of archaeological, historical, ecological and geomorphological interest in the study area. While there were known sites of heritage significance such as the Litunga's Chanel and the Ngonye Falls, the study also aimed at identifying any other heritage resources within the study area. Thereafter, the potential impacts of the implementation of the proposed project on the heritage resources together with the mitigations and/or possible enhancements were established.

1.2 Project Location

The proposed Ngonye Falls Hydroelectric Power Station will be built on the east bank of the Zambezi River around the Ngonye waterfalls in the newly created Sioma District of the Western Province of Zambia. The Ngonye Falls are the third waterfalls on the Zambezi River (after the Chanda and the Chavuma Falls in Chavuma District) along the river's course from its source at Ikelenge,

Northwestern Zambia to the famous Victoria Falls in Livingstone, and ultimately to the Indian ocean. The Ngonye Falls are the second largest waterfalls on the Zambezi River and mark the southern boundary of the Barotse floodplains. The site is located about 300 kilometers upstream of the Victoria Falls along the Zambezi River.

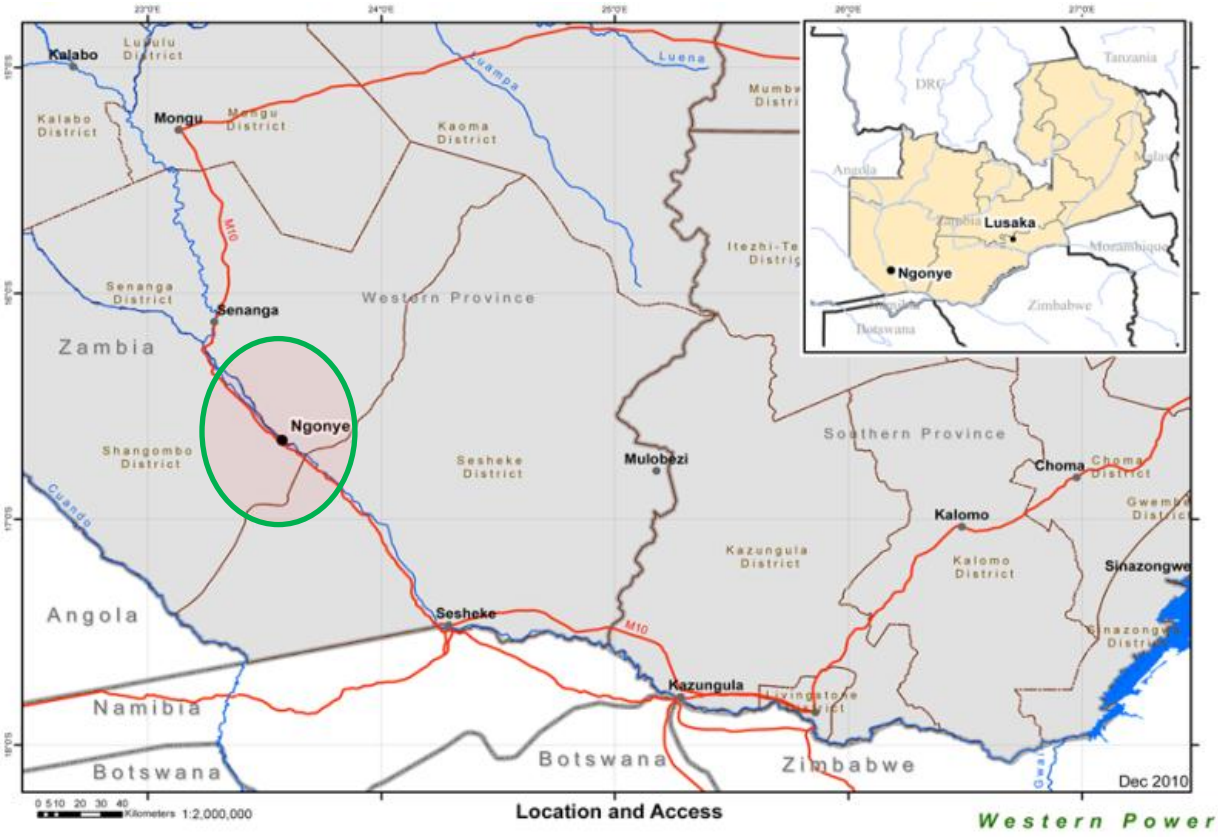

Figure 1: Map showing location of project area (source: WPC, 2012)

1.3 Project Description

The project is the construction of a run-of-river hydroelectric power station. Unlike the conventional Hydroelectric Power Station, a run-of-river power station has no dam or lake and depends on the diversion of water from the river into a canal or tunnel. The Zengamina Mini-Hydroelectric Power Station at the Zambezi Rapids in Ikelenge District of the North Western Province and the Livingstone Power Station at the Victoria Falls are examples of already existing run-of-river power stations on the Zambezi River.

The developer proposes to take water out of the Zambezi River above the Ngonye falls and return it to the river below the falls via a 3km long canal to the power station. The canal is planned to be around 23 meters wide and 8 meters deep. An access and maintenance road will run alongside the canal. The canal will be fenced to stop people and animals from accidentally falling into the water. To ensure that the community can continue to access lands on both sides of the canal,

a number of bridges will be provided for people, vehicles and animals (WPC, 2013).

1.4 Technical Summary

The project will involve the construction of a barrage across the main east bank river channel with radial gates for scouring and flood passing. Astride the barrage, will be located the 3km long rock-faced and lined or unlined canal which will pass through competent sandstone rock units as it diverts water from the river to the power station. The power station will house a pit type powerhouse which will be situated some 50m from the river bank which will contain three 25 mega-watts double regulated Kaplan turbine units (WPC, 2012). The maximum gross head is estimated at 23 m dropping up to 12 m at high water while a minimum intake of approximately 150 cumecs being 70% of the 213 cumecs minimum flow is projected.

1.5 Project Activities

The main project activities will be detailed in the Environmental and Social Impact Statement (ESIA) that will be presented by DH Engineering Consultants. Suffice to indicate that as in most projects, the activities may be broadly categorized into those pertaining to the construction and operation phases.

1.6 Project Timing

According to the developer, the construction of the power station is due to start in 2015 and is expected to take 18 to 24 months to complete. Barring any unforeseen circumstances, the first electricity is expected to be produced before the end of 2016.

2.0 Policy, Legal and Institutional Framework

The overall policy on environmental management in Zambia is largely based on the 1982 National Conservation Strategy Report and the 1992 National Environment Action Plan (NEAP). The National Conservation Strategy (NCS) was adopted as a policy document by the government in 1985 and led to the enactments of environmental legislation such as the Environmental Protection and Pollution Control Act (EPPCA) number 12 of 1990 and establishment of some institutions. The NCS was updated by the government through the NEAP with the overall objective of integrating environmental concerns into the social and economic development process of the country.

Thus in many ways, the NCS and the NEAP were pivotal in the drawing up of the National Policy on Environment (NPE) which was adopted in 2007 (and officially launched in 2009). The NPE outlines the environment and natural resources management policies needed to address current and future threats to the environment and to human livelihoods and provides policy guidelines for sustainable development.

National Heritage Conservation Commission Act, Cap 173 of 1989

The National Heritage Conservation Commission (NHCC) Act underpins this Heritage Impact Assessment because the Ngonye Falls is a natural heritage site which is automatically protected under the provisions of the Act. Broadly, the Act through its establishment of the National Heritage Conservation Commission provides for the conservation of ancient, cultural and natural heritage, relics and objects of aesthetic, historical, prehistoric, archaeological or scientific interest by preservation, restoration, rehabilitation, reconstruction, adaptive use and good management.

It is important to note that if a development is proposed at a Heritage Site, permission must be sought from the NHCC as outlined in sections 35 and 36 of the NHCC Act which states that 'any person who intends to destroy, demolish, alter or remove from its original Site any National Monument, Relic or Ancient Heritage shall apply to the Commission for permission.
The applicant shall state the nature and extent of the intended alteration, removal, destruction or demolition and locality of the area; supply diagrams or sketch plans and any other relevant information; and define the type of object, its age where possible, size and what material it is made of', (NHCC Act, 1989).

Further, should any new discoveries be made of items of historical or archaeological interest during implementation of the project, the provisions of the NHCC Act shall apply, and the required procedures for the reporting of such discoveries shall be followed. This requirement applies to both the pre and post construction stage, particularly for archaeological resources which might not have been established at the time of the study.

The following definitions are relevant to the foregoing and pursuant to Part 1 of the NHCC Act:

"Heritage" includes-
(a) any ancient heritage;
(b) any cultural heritage;
(c) any natural heritage;
(d) any national monument;
(e) any relic

"**Cultural heritage" means-**
(a) any area of land which is of archaeological, traditional or historical interest or contains objects of such interest;
(b) any old building or group of buildings of historical or architectural interest;
(c) any relic, national monument or ancient heritage;
(d) any other object constructed by man, other than a relic, of aesthetic, archaeological, historical or scientific value or interest;

"Natural heritage" means-
(a) any area of land which has distinctive beautiful scenery or has a distinctive geological formation; and includes any palaeontological area;
(b) any area of land containing rare distinctive or beautiful flora or fauna;
(c) any waterfall, cave, grotto, old tree or avenue of trees;
(d) any other natural object with aesthetic, or scientific value or interest;
(e) any natural relic and national monument;

"Relic" means-
(a) a fossil of any kind;
(b) any drawing, painting, petroglyph or carving on stone commonly believed to have been executed in Zambia before 1st January, 1924;
(c) any object of historical, scientific, anthropological, archaeological, aesthetic or cultural value made or used in Zambia before 1st January, 1924;
(d) any object of ethnological interest;
(e) any ethnographical material associated with traditional beliefs such as witchcraft, sorcery, exorcism, rituals or other rites;
(f) any object associated with a person or an event prominent in Zambian history;
(g) any product of archaeological excavation (whether regular or clandestine) or of archaeological discoveries;
(h) any anthropological, historical or archaeological contents of any ancient heritage; or
(i) any other object of historical, scientific, anthropological, archaeological, aesthetic or cultural value declared a relic by the Minister under section thirty-two.

Environmental Management Act, No. 12 of 2011

This Environmental Management Act (EMA) was signed into law in April 2011 thereby replacing and repealing the former Environmental Protection and Pollution Control Act (EPPCA) Cap 204 of 1990. The Act continues the existence of the Environmental Council of Zambia which it renames as the Zambia Environmental Management Agency (ZEMA).

Section 29 of the Environmental Management Act Number 12 of 2011 part 1 read together with the Statutory Instrument No. 28 of the EIA Regulations of the EPPCA of 1990 provides the framework for conducting and reviewing Environmental Impact Assessments. It states that, *'a developer shall not implement a project for which a project brief or environmental impact statement is required under these Regulations, unless the project brief or the environmental impact statement has been concluded in accordance with the foregoing section/regulations and the Zambia Environmental Management Agency has issued a decision letter'.*

The full Environmental and Social Impact Assessment for the proposed project is being undertaken by DH Engineering Consultants on behalf of the Western Power Company.

Water Resources Management act, 2011

This Act establishes the Water Resources Management Authority. It provides for, among others, the management, development, conservation, protection and preservation of the water resource and its ecosystems; provides for the equitable, reasonable and sustainable utilization of the water resource; ensures the right to draw or take water for domestic and non commercial purposes, and that the poor and vulnerable members of the society have an adequate and sustainable source of water free from any charges. Western Power Company will need to obtain water rights for diverting water from the Zambezi River to their power station.

Zambia Development Agency Act, 2006

The Act provides a legal framework for investment in Zambia and recognizes the role of other agencies, including those responsible for environmental protection in authorizing specific projects. In considering an application from an investor for a license, permit or certificate of registration, the Act stipulates that the Board shall have regard to the impact the proposed investment is likely to have on the environment and, where necessary, the measures proposed to deal with an adverse environmental consequence in accordance with the Environmental Management Act.

Local Government Act, Cap 281

The Act was enacted in 1991 following the repeal of the Local Administration Act of 1981. It provides for the functions of local authorities including the implementation of environmental protection and natural resources management

functions. Implementation and operation of the new development is subject to the procedures laid out by the local authorities (Sioma and Senanga District Councils). All applicable by-laws will need to be adhered to.

Town and Country Planning Act, Cap 283

This Act, which came into force in 1962, provides for the establishment of planning authorities and the preparation, approval and revocation of development plans. It further provides for the control of development in a district and the subdivision of land. The zoning and rezoning of areas must comply with the provisions of this Act. The development will need to proceed with town and country planning approval from the two local authorities of Sioma and Senanga District Councils.

Public Health Act, Cap 295

The Act provides for and regulates all matters connected with public health in the country under the local authority of each district as the enforcement agency**.** For the proposed development, this will cover such matters as solid waste management, levels of hygiene and the standards of the general working environment. The necessary licenses and permits will need to be obtained in accordance with the Act.

Energy Regulation Act, Cap 436

The Act of 1995 makes provision with respect to the production and distribution of energy in Zambia and establishes the Energy Regulation Board for purposes of control and licensing of energy undertakings. The Board shall, in conjunction with other Government agencies, formulate measures to minimize the environmental impact of the production and supply of energy and the production, transportation, storage and use of fuels and enforce such measures by the attachment of appropriate conditions to licenses held by undertakings.

Petroleum Act, Cap 439

The Act provides for the regulation of the importation, conveyance and storage of petroleum products and other inflammable oil and liquids (e.g. petrol and diesel) for the protection of the public and the environment. The project will store on-site a certain amount of diesel for construction and operational purposes. The on-site fuel storage facilities will need to be constructed and operated in accordance with regulations as set out in the Act.

The Forests Act, Cap 199

The Forests Act No. 7 of 1999 (CAP 199 of the laws of Zambia) repeals the Forest Act passed in 1973 (CAP 311). It provides for the establishment and management of National and Local forests, conservation and protection of forests and trees, and licensing and sale of forest products. The Act also provides for the protection of 6 tree species, namely *Entandrophragma caudatum*, *Khaya nyasica*, *Pterocarpus angolensis*, *Afzelia quanzensis*, *Faurea saligna* and *Baikiaea plurijuga* nationally whether in a protected area or outside it. Assessments of

whether these species are found in the project area and the quantities, if any, which will be lost as a consequence of the project, will need to be ascertained in conjunction with the Forestry department.

3.0 Scope of works

The scope of works was determined by the Terms of Reference (TORs) of the Heritage Impact Assessment for the Ngonye Falls Hydroelectric Project. The TORs were proposed by DH Engineering Consultants and approved by the NHCC study team which undertook the assessment.

3.1 Terms of Reference

The following were the specific Terms of Reference for the Heritage Impact Assessment

3.1.1 Clear Definition of the Study Area.

3.1.2 Survey the project area to identify and describe sites of archaeological, historical, cultural or Natural Heritage interest in the project area affected by the proposed Ngonye Falls Hydro Project. Known sites of Heritage interest in the project area that should be considered include:

- The Litunga's Channel and other sites associated with the canal
- Ngonye Falls as a Natural Heritage Site.

In addition identify any grave sites that may be affected by the development.

3.1.3 Produce a detailed technical HIA report describing the importance or significance of known Heritage resources and whether these resources need to be conserved/ protected.

3.1.4 Identify and describe potential impacts arising from the implementation of the proposed project on the Heritage resources of the study area.

3.1.5 Liaise with the local Communities and Stakeholders (if applicable) with regards to the impact of the development on the Heritage resources.

3.1.6 Describe in the HIA report the procedures for mitigation of sites where applicable to ensure their protection and conservation and provide an indication of time required.

3.1.7 The HIA report should also include a brief description of the Barotse Cultural Landscape/ Nomination of the Barotse Plains as a UNESCO World Heritage Site and any implications the project may have on the site.

3.1.8 Outline the methodology used to prepare the assessment.

3.1.9 The HIA report should include a description of relevant policy and Legal framework.

3.1.10 Document findings and recommendations, the HIA report should include:

- Maps of the affected area
- Documentation of Heritage resources using current photographs.
- Documentation of Public Consultation including minutes/ attendance list of meetings held.

- Bibliography listing of all sources used in preparing the HIA.

3.2 Methodology of the Heritage Impact Assessment

The assessment was undertaken using a number of methods as outlined below:

3.2.1 Literature Review

This method mainly involved desktop study and review of available background information about the project area, including the review of relevant pieces of legislation. Documents reviewed included the sensitization notes for the Ngonye Falls Hydroelectric Project and the power point presentation on the Ngonye Falls Hydroelectric Project by Western Power Company together with the associated maps. Topographical maps covering the study area and available relevant secondary data on the geomorphology, ecology, history, archaeology, geology, climate, and the socio-economy were also consulted.

3.2.2 Stakeholder Consultations

The public stakeholder meetings were organised by the study team in conjunction with the office of the District Commissioner for Sioma. Three meetings were held: At the Barotse Royal Establishment (BRE) at Kaunga-Mashi Palace under Senior Chief Lukama in Sioma district with Senior Indunas on 10th June, 2014 while another meeting was held at Sioma Secondary School at which the area District Commissioner, area Indunas, heads of Government Departments, representatives of Churches and Non-Governmental Organisations attended. The meeting was held on 11th June, 2014. The above two meetings were held on the western bank of the Zambezi river. The third consultative stakeholder meeting was held at Induna Ling'anga's village on the eastern bank of the Zambezi River on 12th June, 2014 (see minutes of these meetings in Appendix 1).

Figure 2: BRE stakeholder consultation at Kaunga Mashi Palace

Figure 3: Public consultative stakeholder meeting at Sioma Secondary School

Figure 4: A group photo after a stakeholder consultative meeting at Induna Ling'anga's village

The Consultative stakeholder meetings provided a rare opportunity for the heritage specialists to interact with various members of the community. The meetings were used to gather data on sites of Archeological, Historical, Cultural or Natural Heritage interest in the project area. This was in line with the terms of reference. The meetings were also used to liaise with stakeholders with regard to the potential impacts of the development on the Heritage resources in the area.

3.2.3 Oral Interviews

Oral interviews were undertaken in the project area. This method involved identifying and meeting key informants in order to get more detailed information about heritage resources in the area. This method proved to be particularly useful in the archaeological heritage assessment given that very little of the archaeology of the area was known.

3.2.4 Field Surveys

These were undertaken by four heritage specialists; a Historian, an Archaeologist, an Ecologist and a Geomorphologist over a period of eight days during the month of June, 2014. This method was utilized to identify (on the ground) and describe sites of archaeological, historical, ecological and geomorphological interest in the project area to be potentially affected by the proposed Ngonye Falls Hydroelectric Project. A number of field transects using purposeful sampling methods were made on both the western and eastern banks of the Zambezi River within and outside the fenced portion the site. Vehicles conveyed the study team to a number of sites of heritage interest. Using this method, known sites of heritage interest in the project area such as the Ngonye Falls themselves as well as the Litunga's Channel and other sites associated with it were assessed in relation to the proposed project. A number of field assistants accompanied the study team and provided invaluable information for the assessment.

The proposed site for the location of the barrage across the Zambezi River and the associated landform characteristics such as the gradient of the river bank were assessed. Other natural heritage landscape features and processes such as deposition, sedimentation, weathering and fluvial erosion were examined in relation to the proposed project. Some soil samples were collected for further analysis. Recording of geo-referenced data using Geographic Positioning Systems (GPS) and digital photography was undertaken. The significance of the identified landforms was evaluated within a local, national or regional context.

For the archaeological and anthropological assessment, potential areas of interest were thoroughly combed for any chance surface finds of heritage importance. Where ever heritage artifacts were spotted, an extensive survey of that particular area was carried out to identify and document as much of heritage as possible. Further, keen interest was taken on valley like depressions, transitional zones between forests and plateau, mounds, cultivated land within vicinity of dambos and stream channels.

Further, various plant communities, habitat types and the species composition along the established transects were surveyed using random stratified methods. Plant species in the field were identified with the use of identification keys and other reference books. Photographs were taken of some of the plant species of interest while specimens of unidentified plants were collected in a field press. The identified species were then evaluated for significance in a local, national or regional context, especially rare and /or endangered species and those with a cultural significance. Data showing location of the sampled areas and some of the major features of ecological heritage interest were collected using a handheld GARMIN GPS 60 (Datum WGS 384).

3.3 Study Limitations

There were a number of limitations that affected the output of this study as outlined below;

3.3.1 Inadequate baseline information

The project area has had very little published research on the baseline conditions and even the various resources present. In addition, detailed information on the planned project activities such as the technical details and physical layout of infrastructure was not available. This resulted in the significant reliance on the summarized sensitization notes and the power point presentation document by Western Power Company Limited.

3.3.2 Limited accessibility to the Ngonye Falls

While the study team had unlimited access to the river banks overlooking the Ngonye Falls, they could only assess the falls from a distance due to the high water levels and the overgrown river environs. This hampered a close examination of the existing conditions and consequently a more accurate prediction of the potential impacts of the project on the geomorphic processes occurring at the lip of the waterfalls. Thus the traditional fishing crevices locally referred to as '*Mambelo'* which are reportedly sited in the rock crevices at the lip of the waterfalls could not be assessed.

3.3.3 Inaccessibility of the Islands

Information obtained from the stakeholder consultative meetings and the oral interviews suggested that some of the islands in the bowl of the project area such as Sioma and Simugumbuko, previously had human settlements and by extension, potential cultural heritage resources. However, none of the islands could be visited due to logistical and environmental constraints.

3.3.4 Limited time for fieldwork

The physical layout of the site and the fact that the team had to undertake field surveys on both sides of the Zambezi river using the pontoon crossing severely reduced the actual work hours per day. This limitation entailed that the entire study area could not be physically surveyed. Consequently some heritage sites that were mentioned in the stakeholder consultations could not be visited and physically verified on the ground. These sites include *Imamongo, Imakakata,* the Litunga's gum trees and *Mukwibi's Mafulo* shrine.

4.0 The Study Area

The core of the study area was the fenced portion around the Ngonye Falls encompassing both the east and west banks of the Zambezi River. It included the contiguous environs of the fenced area and extended, along the river, beyond the proposed power station site to the apparent location of the 'Imamongo' rock outcrop. The study area was thus located within longitudes 23˚ 34'E and 23˚ 36'E and latitude 16˚ -17˚ S and encompassed areas in both Sioma and Senanga Districts of the Western Province.

The eastern bank of the Zambezi River is in Senanga District under Senior Chieftainess Litunga la Mboela while the western bank is in Sioma District under

Chief Lukama. The Ngonye Falls and its environs have been recognized as a key economic feature for the Zambian component of the Kavango-Zambezi Trans frontier Conservation Area (KAZA TFCA). The fencing of the site was thus one of the consequent activities undertaken to facilitate the introduction of wild life to create the Ngonye Falls Community Park.

It is important to note that the project area of the proposed Ngonye Falls Hydroelectric Power Project lies outside the core area proposed for inscription as Barotse Cultural Landscape on the UNESCO world Heritage listing. The water falls are in the buffer zone and this means that the proposed hydroelectric power project has no implication for the proposed inscription of the Barotse Cultural Landscape.

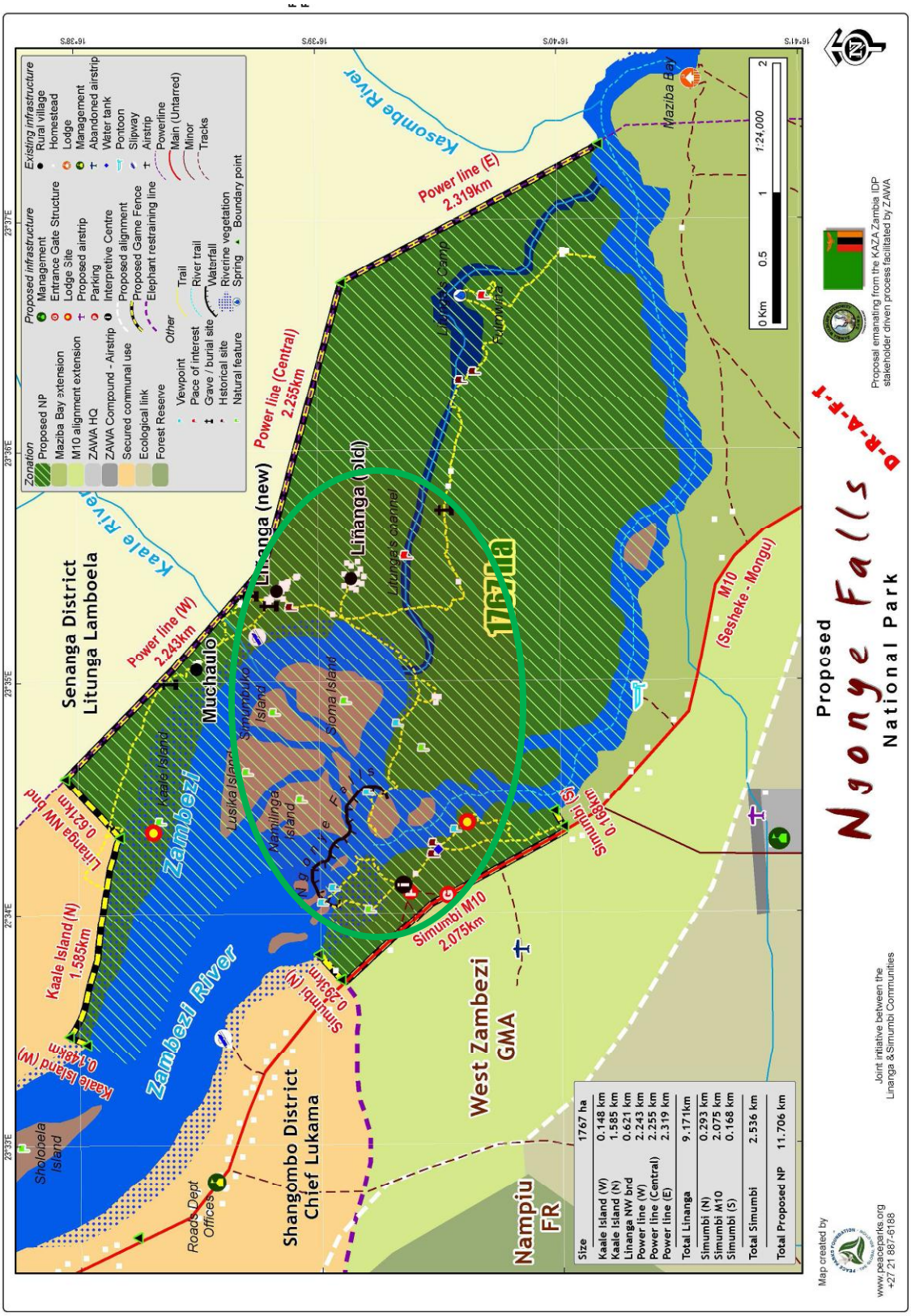

Figure 5: Map showing study area (circled); (Source: KAZA TFCA Zambian Component IDP, 2008)

4.1 Historical Setting and Socio-Economic Environment

4.1.1 Historical Setting

The History of the project area cannot be understood in isolation, but in the broader context of the history of the entire Western Province of Zambia, formerly known as Barotseland in Pre-colonial and Post-colonial era. Although it is not necessary to go into details in the history of Barotseland, it suffices to state that the Project area like the whole of Barotseland has since 1600 been settled by the various ethnic groups that are found in the area and who are now collectively known as the Lozi. These include the Luyi, Luyana, Totela, Chokwe, Luchanzi, Mbunda, Subiya, Shanjo, Nkoya, and Nyengo to mention but a few. Of these, the Luyi or Luyana who initially settled in the plain assumed political control and became rulers over many ethnic groups that settled in the region.

The Luyi Kings who are referred to as the Litungas developed a highly elaborate Traditional Governance system now called the Barotse Royal Establishment (BRE) under their successive rulers. Under the Litunga are several Chiefs in charge of specific areas and under those Chiefs are local subordinate Chiefs and Indunas in charge of villages.

4.1.2 Socio-Economic Environment

The local people within and around the project area are a diverse mix of ethnic groupings whose primary economic activities revolve around farming and fishing. They grow a variety of crops which include cassava, maize, rice, millet, sorghum among others. Gardening is another economic activity practiced by a few within and around the project area. The communities are also involved in livestock rearing especially cattle. Many also keep chickens and cattle. Some of the local people have found employment as skilled and unskilled labour, notably in different sectors of a budding tourism industry. Traditional subsistence fishing is also a very important economic activity for the people around the project area. The fishing economic activity is historical and is partly one of the reasons why the Luyi preferred to live in the plain.

Figure 6: A young fisher's catch

4.2 Biophysical Environment

The Barotse floodplain and the blanket of unconsolidated sand are arguably the two most characteristic features of the biophysical environment of the Western Province of Zambia. The project area in general and the Ngonye falls in particular mark the southerly termination zone of the floodplain. In fact, Timberlake and Childes (2004) suggest that tectonic uplift along the basement fault lines is responsible for the formation of the waterfalls themselves and that the resultant damming of the higher regions of the river initiated a senile system that led to the dumping of the sediment load and the formation of the Barotse floodplain. The faulting associated with the formation of the Ngonye Falls and consequently the initiating of the Barotse floodplain has been ascribed to the late Pleistocene epoch (Timberlake and Childes, 2004).

4.2.1 Climate

In the Western Province, four climatic seasons can be distinguished (Hein van Gils, 1988). The first is from April to June when a zone of high pressure builds up over Southern Africa and the dry season with cool nights begins. The second season starts in July when the province is dominated by high pressure, dry weather and cold nights. This continues through August. The third which occurs from September to November is a transitional period of dry and hot weather and day temperatures may reach 38.4 °C in Mongu (Hein van Gils, 1988). The fourth season is a low pressure period between December and March when most rain falls.

4.2.2 Rainfall

There is strong seasonality in rainfall in the Western Province. The rainy season usually starts in late November and ends in March/April. There is a gradient running from north to south. Lukulu district in the north receives an average

rainfall of 1021 mm per year while Sesheke in the south receives an average of 730 mm (Hein van Gils, 1988). More than 90% of the total rainfall in the province falls between November and March, with a peak between December and February. The wettest month is January. During the onset of the rains in November thunderstorms alternating with hot sunny weather are quite common while in the wetter months the cloud cover is more persistent.

4.2.3 Temperature and Wind

The mean maximum temperature around the study area is between 27° and 30°C and the mean minimum temperature ranges from 9° to 12°C (Vetter, 2001). Absolute monthly maxima are over 38˚ Celsius between September and January (Fanshawe, 2010). Often, incidences of frost occur in low-lying depressions during the winter months. The prevailing wind is from the south-east except during July–August when it blows from the south-west (Fanshawe, 2010).

4.2.3 Hydrology

The Zambezi River is at the heart of the hydrology of the study area. It enters the extensive Barotse floodplain just upstream from the point where it is joined by the west-bank Lungwebungu tributary. The floodplain within which the river flows extends southwards over a distance of some 180 km to terminate at the Ngonye Falls. This stretch of the river floods annually between January and June. It attains a width that in places exceeds 30 km, and links, via the Matebele-Mulonga plain, with the floodplain of the Cuando River of Angola (Timberlake and Childes, 2004). Within the Western Province and upstream of the Ngonye Falls, the Kabompo, Lungwebungu, Luanginga, Lui, Luena and the Lueti are the main tributaries of the Zambezi. Downstream of the falls, the main tributaries include the Lumbe, the Njoko and the Sichifulo rivers. An assessment of the drainage pattern of the tributaries of the Zambezi River suggests that it is induced by tectonics as may be deduced from their almost parallel directions and abrupt nick points in extremely flat areas. Within the study area, the orientation of the river flow was observed to be roughly north to south east.

4.2.4 Geology and Soils

The Ngonye Falls and there immediate surroundings manifest elements of the exposed basaltic rock that underlie them. Basalt, the most common variety of volcanic rock, is composed almost entirely of dark, fine-grained silicate minerals, chiefly plagioclase feldspar and pyroxene, and magnetite. The extrusive equivalent of gabbro, it forms by the outpouring of lava all along the world's mid-ocean ridges, where sea-floor spreading continually adds new crust to counterbalance that lost by subduction (as in plate tectonics). Usually dark-grey in Colour, basalt often has a vesicular texture, preserving vestiges of bubbles produced by expanding steam as lava cools and solidifies.

In general, the geology of the Sioma and Senanga districts is masked by a blanket of Kalahari sand. However, it can be inferred that this is underlain by Karoo beds

including sandstones, chalcedony, gravels and clays (Fanshawe, 2010). According to the Geological Map of Zambia (Geological Survey [second edition] 1977) there is a single geological fault line running from north to south about 20 km east of the eastern sand scarp of the Bulozi Plain, and a geological boundary on the north side of the Luanginga River. Both these features are hidden by the overlying sand.

The Kalahari sands are the weathered product of the weak upper Karoo sandstone. These sands can be divided into the undifferentiated, whitish to golden coarse-grained sands of very low fertility and the transitional grey or brown, finer sands with a fertility just permitting maize cultivation. Peaty soils are found as fringes to the large circular pans in the central loose sand area and grey brown, fertile, silty clay loams cover most of the Barotse Plain (Fanshawe, 2010). The Kalahari sands, locally also known as Barotse sands, are the dominant soil material throughout Western Province.

4.2.5 Geomorphology and Topography

In the Western Province of Zambia, the land surface has an average elevation of 1000 m, with a gradual slope from 1200 m in the north, where the Congo-Zambezi divide runs from west to east, to 900 m in the south where the sand has been eroded away to expose the underlying basalt at the Ngonye Falls and above the Victoria Falls (Bingham, 2000). The general slope of the land from north to south determines the direction of flow of the major rivers, which have carved out broad, shallow basins in the sand plateau. Floodplains, flats and dambos largely define the grass-covered lowlands or wetlands which together with the wooded uplands or dry lands form the two main land units of the Western Province (Hein van Gils, 1988).

4.2.6 Vegetation

Observations within the study area resulted into a categorisation of vegetation spanning both the eastern and western banks of the river into four communities;

(i) *Mixed scrubland*; occurring away from the river and characterised by the species *Acacia nigrescens, Terminalia sericea, Combretum imberbe* and *Albizia versicolor, Afzelia quanzensis, Dalbegia melanoxylon,* and *occasional Lonchocarpus capassa.*

Figure 7: Mixed scrubland dominated by genus Terminalia within fenced portion on the western bank

(ii) Patches of *Kalahari woodland*, supporting *Guibortia coleosperma*, *Schnziophyton rautaneii, Baikiae plurijuga* and *Pterocarpus angolensis*.

(iii) *Riparian forest* represented by a narrow strip about a metre or so away from the river bank characterised by *Syzygium guinensee*, *Garcinia livingstonei* and on the outer edges supporting *Albizia versicolor* and a few other species. This vegetation type is also characteristic of the islands above the falls.

Figure 8: Narrow strip of Riparian forest -Western bank

(iv) *Impenetrable Swampy vegetation communities*; covered by Cyperaceae, *Phragmites mauritianus* and *Phoenix reclinata* particularly on the eastern side of the river where the terrain was gentler and less rocky, especially along drainage lines leading into the river channel.

Figure 9: Phragmites mauritianus and Cyperus papyrus in the background- Eastern bank

A short list of the most common tree species and those which emerged as being of interest to the local people is given in Appendix III of this report.

4.2.7 Wildlife

Despite the area's proximity to the Sioma Ngwezi National Park and the West Zambezi Lower Game Management Area which support a range of mammals of conservation interest and is also classified as an Important Bird area (IBA), the assessment of the potential impact of the project on wildlife populations did not form part of the Terms of Reference for this study.

5.0 Physical Descriptions and findings of surveyed sections of the Study Area

For purposes of this assessment, the study area was surveyed for historical, archaeological, ecological and geomorphological heritage resources. The findings from these focus issues are discussed in this section.

5.1 Geomorphological Resources, Topography and Hydrology

Within the study area, the geomorphology, topography and hydrology was defined by the interaction of the series of waterfalls, the basalts that host them and, almost alternately, a combination of Rocky River banks, sand scapes, small patches of thicket and grass-sedge areas along the banks of the Zambezi River. There was a marked but often gradual slope towards the river on both the east and

west banks. The main geomorphological sites in the study area are the Ngonye Falls themselves.

5.1.1 The Ngonye Falls and their Environs

The series of water falls that make up the Ngonye Falls are spread in a mini arc or crescent which is approximately a kilometer wide. Along the course of the Zambezi River, the falls mark a transition zone from the Kalahari sand dominated river bed to one defined largely by the underlying basaltic rock. As a waterfall, the Ngonye Falls are a natural heritage site and are automatically protected under the provisions of the National Heritage Conservation Commission Act. Below the falls, the Zambezi is hemmed in and essentially straddled within a relatively wide gorge incised in the underlying basalt. Upstream of the falls, the river is broader and shallower as it flows across the Kalahari sands

At the waterfalls and within their vicinity, the flow of the Zambezi River is effectively controlled in several places by basaltic rock which outcrops in the banks and presumably also in the river bed. These geological control points are believed to have the effect of maintaining grade by effectively limiting down cutting along intervening alluvial stretches and perhaps at the falls themselves (Nugent, 1990). This aspect may help explain the relative 'shallowness' of the gorge just downstream of the Ngonye Falls. One of the key attributes of the Ngonye Falls is their aesthetic effect.

Related to this, information obtained from the three stakeholder meetings suggested that the Ngonye Falls have over the years grown 'quieter'. If this observation is accurate, it could be attributed to a faster rate of lateral fluvial erosion compared to the vertical dimension of the process. In this case, the waterfalls may be widening faster than they are deepening thereby reducing the force of the water through a limited passage and the consequent 'noise'. Clearly, the waterfalls have undergone changes arising from numerous geomorphic processes that continue to shape them.

It is thus plausible that Alexandre Alberto da Rocha de Serpa Pinto (aka Major Serpa Pinto)'s observations in 1878 when he visited the site can not be totally reconciled with what is currently obtaining in terms of the height and extent of the waterfalls. In his 'Cataracts of Gonha', Major Serpa Pinto described the waterfalls as comprising three vertical cataracts and five rapids ranging in height from 10 feet (about 3 meters) to 66 feet (about 20 meters).[1] During the field survey, a series of about seven waterfalls could be discerned though many of them, including the main falls which is numbered 1 in the photo below, with difficulty due to the overgrowth and other physical barriers.

[1] See Display in the Ngonye Falls Community Partnership Park Visitors Information Centre.

Figure 10: An aerial view of the series of waterfalls that make up the Ngonye Falls. (Source: Bjørnåvold, 2009)

Seasonality also plays an important role in the changes in the water falls and their environs. The Ngonye Falls reach their peak flow between the months of March and June. This period coincided with the field survey for this assessment which was undertaken in June. When the water levels are too high, the falls essentially flatten out. The highest ever flow is reported to have occurred in the 1957/58 rain season when the water level rose so high that the Ngonye Falls could be crossed by boats (Sitali, 2014). This assertion tarries with the observation that the highest ever recorded flow at the Victoria Falls occurred in 1958. Apparently, the seasonal variation in the water flow is so marked such that the flow during the dry season is comparatively quite low. Normally this happens in the period from late October to December.

Within the study area the high distribution of Kalahari sands just downstream of the Sioma falls and amidst rock outcrops suggest that they are deposited by runoff and by the river especially when it is at high flow. At the time of the field survey, there was evidence of deposition of the river up to 53 meters from the river bed on the western bank (16˚ 39.442 S, 23˚ 34.275 E). Studies elsewhere in the Zambezi Basin have shown evidence of fluvial sediment transport of Kalahari sands (Moore and Dingle, 1998). This element, as will be discussed under potential impacts, is significant in view of the potential changes to the hydrology of the waterfalls themselves and the river upstream of the falls as a result of the proposed hydro electric power project.

5.1.2 Rock Outcrops and Characteristics

An assessment of the rock boulders on the banks of the Zambezi River on the western bank revealed that cracks that in many cases run parallel to one another on the same rock. This is possible evidence of faulting resulting from earth movements in the area. Of particular interest was the observation that the joints in the rock roughly followed the orientation of the layout of the series of waterfalls (see aerial view in figure 6). This is significant in as much as it adds credence to the theory that tectonic uplift along the basement fault lines is responsible for the formation of the Ngonye waterfalls.

Figure 11: Joints in the rocks on the western bank. Notice the developing fissure and that their orientation is similar to the layout of the waterfalls in figure 6.

Figure 12: Fissure in the rock. Notice the consistent crack orientation as with figure 7 (UTM 34K 0774125; 8156738)

The stakeholder consultations undertaken as part of this assessment indicated the existence of caves in the loci of the waterfalls and three unique rock outcrops namely, '*Mashete ya Mulimu', 'Imamongo' and 'Imakakata'* downstream of the waterfalls. The caves at the waterfalls could not be evaluated due to their inaccessibility. Of the three unique rock formations, only the *Mashete ya Mulimu* were identified with a total degree of confidence while uncertainty clouded the pointing out of the latter two whose structure can not consequently be discussed here. Notwithstanding this, all the three rock formations hold special significance to the local people. The *Imamongo* rock outcrop was reported to have been used as a navigational aid while *Imakakata* which is apparently just downstream of the former gained notoriety because of the whirlpools it allegedly hosts which have cost the lives of some of the local people.

Mashete ya Mulimu (translated as 'granaries of god') is the name given to about seven rock outcrops situated within a 60 meter stretch along the banks of the Zambezi River at least two kilometers downstream of the Visitor Information Centre for the Ngonye Falls Community Park. They are located on the western bank at around 16˚ 40.149' South and 23˚ 34.647' East. Though their formation was unclear, the coarse grained and loosely structured outcrops may be a type of the basalt dykes within the environs of the Ngonye falls.

Close examination of the rock outcrops suggested that the different banded colourations on them could have resulted from inundation at different water levels. It is perhaps worth noting that the location of both *Imamongo* and *Imakakata* is further downstream of *Mashete ya Mulimu.* The three rock formations are unlikely to be adversely impacted by the proposed project as they are located further downstream from the envisaged location of the power station and the point of re-release of the water into the Zambezi River.

Figure 13: 'Mashete Ya Mulimu' (translated as 'granaries of god')

5.2 Ecological Resources

Two major trees of historical importance located on the eastern bank are mentioned by the local people. These are Yeta's tree, a specimen of *Combretum imberbe* which is believed to have sprouted from a walking stick (staff) of a previous Litunga and a large *Brachystegia spiciformis* which is referred to as the District Commissioners (DC's) tree. This tree is close to the point where the DC's barge used to dock during colonial times, and where local court and trading sessions were held.

5.2.1 Flora of Conservation Significance

No species of special concern listed in the Zambian Chapter of the SABONET Red Data List (Bingham and Smith, 2002) were found in the study area during the fieldwork.

5.3 Archaeological/ Historical and Anthropological Resources

The project area has a number of cultural heritage sites. These are archaeological, historical as well as cultural sites of traditional or anthropological nature. These sites are significant in as far as they tell the history of the area and are part of the beliefs of the local people. The following heritage sites were documented:

5.3.1 The Litunga's Channel/ Canal

Constructed under Litunga Lewanika between 1908 and 1913, this 5km historic canal was intended to facilitate the passage of the royal barge and other boats over the Ngonye Falls to and from areas beyond the site. The idea of constructing this Canal was mooted by Lewanika following his visit to England in 1902 to attend the coronation of Edward VII. While in England Lewanika must have seen canals in the midlands being used to carry freight and coal on barges pulled by horses using tow paths.

However, it should be pointed out that the Canal Construction was undertaken in the Barotse Plain long before Lewanika went to England. The deliberately diverted water channels are also memoirs of how close the Lozi people are with their rivers in general and with the Zambezi River in particular and how they have sought to adapt, manipulate and utilize them for their own needs. The Litunga's Canal has since been out of use. It is overgrown with grass and vegetation, silted and clogged in many areas. It will be important under the proposed hydroelectric project to rehabilitate the canal for adaptive use.

Figure 14: Sections of the overgrown Litunga's chanel at 16˚.39.313'S and 23˚.35.001'E

5.3.2 Liabwa la Twelufu

Apparently, Liabwa la Twelufu simply means 'canal of twelve'. It is a historic canal which was reportedly used to drain as well as to supply water for easy navigation during the reigns of King Lewanika in the 19th century. Each of the men was expected to dedicate 12 days each year to dislodge and clear the canal of weeds and unwanted debris. The site is located at 16˚.39.221'S and 23˚.35.201'E some 40 to 50m west of the point E 13 (16˚ 39.202' S and 23˚ 35.316' E) which is the proposed starting point of the embankment wall to the canal site.

It is also known as *Likamba la Loonji* because it was apparently mainly used by small engine boats which accompanied the picturesque royal barge as it wound its way into the Litunga's canal. During the survey, the historic *Liabwa la Twelufu* was found to be in a disused state and silted. It was overgrown with vegetation, especially in the area closer to the river. However the Induna Ling'anga stressed that the current Litunga, Imwiko II had previously sent word and ordered that the canals in the area should be maintained as historic heritage sites. This site's significance is thus related to the Litunga's canal.

5.3.3 Litunga's Mafulo

The Mafulo were historical temporal residences for the Litungas during their regular visits to the area. It was in the Mafulo where the Litungas held meetings with Indunas during their regular visits and inspections of the areas under their domain and they are thus spread all over the 'former' Barotseland. One of such Litunga's *Mafulo* site is located on the western bank of the Zambezi River approximately 200m east of the Ngonye Falls Community Park Visitor Information Centre. The site is located at coordinates; 16°39.465'S and 23° 34.273'E, perched on an upper talus.

The site was at the time of the field survey found with incomplete structures of what would have supposedly been the temporal *Kwandu* (king's house) and the *Kashandi* (king's visitors' shelter) as well as an incomplete fence of royal sharpened poles. Apparently, the current Litunga was supposed to have visited his people last year (but didn't) so as to, among other things, appreciate the aesthetics and natural beauty of his kingdom and in particular, the Ngonye waterfalls.

The site has been argued, by some, to be more like a shrine which is traditionally accepted and revered as a special resting place exclusively for the Litunga each time he makes a pilgrimage to Sioma or Ngonye falls. Therefore, the site has local significance to the people of Sioma and should be preserved from destruction. Most importantly however, the site is securely situated within the Community Park fence and its geographical location is such that it is unlikely to be negatively impacted upon by the proposed hydroelectric power project.

Figure 15: Structures at the Litunga's *Mafulo site adjacent to the visitor information center*

5.3.4 Mashete ya Mulimu

The site is located at coordinates 16˚ 40.149'S and 23˚ 34.647'E on the western bank of the Zambezi River. Its significance lies in its local anthropological importance. It is called *Mashete a Mulimu* to mean, literary god's granaries. The site comprises rock outcrops of loose material which seems to be gradually being lost thereby leaving behind attractive shapes. The local people believed that Mulimu (god) lived at the site and that before he vacated the place to go to heaven he left behind granaries that later transformed into rock. It was reported to the study team that previously, local people through their spiritual mediums used to carry out prayers and that food crops such as grain, beans, millet, sorghum and ground nuts would be left at the site to appease the ancestral spirits and ask for their providence and for a better harvest in the next season. However, the practice is no longer in effect and this suggests that the site has lost its original significance among the practitioners. Other rock features of local cultural significance, but which were not conclusively identified were *Imamongo and Imakakata.* These sites were assessed to not being potentially negatively impacted by the proposed hydroelectric power project.

Figure 16: *Mashete ya Mulimu*; loose structured Rock outcrops.

5.3.5 Mafulo ya Yeta

This site is located on the eastern bank of the Zambezi River at coordinates 16°. 38.548' S and 23°. 35.095' E. Beginning with Yeta I to Yeta III, this site was apparently used as an occasional campsite where the Litungas rested as they visited the Sioma area on their routine duties of visiting their subjects. Like the *Mafulo* site on the western bank, the site which is under Induna Ling'anga is held in reverence by the local people. No gardening or farming has been allowed at the site despite its suitability for agricultural activities. The anthropological site is along the KAZA TFCA/ZAWA–Community Park fence. It has no infrastructure and is essentially a bare and well elevated landmark/viewing point of the Zambezi River. This was indicated as one of the possible reasons for which Litunga Yeta had chosen it as his *Mafulo* (campsite). The significance of the site is local as it is a site associated with Litunga Yeta's visits to the area in the 19th and early 20th Centuries is therefore a memorabilia in situ. The visible sense of protectiveness of this site by the local people is indicative of the lofty reverence with which the Litungas are regarded in 'Barotseland'. The site will not be negatively impacted by the proposed project.


Figure 17: Litunga Yeta's *Mafulo*; A permanent Royal campsite

5.3.6 Induna Liyang'anga Muyendekwa's Gravesite

Induna Liyang'anga Muyendekwa also known as Ling'anga was reported to have been an Induna in the last quarter of the nineteenth century. His 'descendants' spoke greatly of him. His burial site is located under a tree locally known as *Muwawa* (*Strychnos pungens*) at coordinates 16°.38.553'S and 23°.35.122' E just

outside the KAZA TFCA/ ZAWA fence. It is also an important anthropological site which the local communities treat with respect. However, there are no other special inclinations that the locals associate the site with apart from respect for the dead and specifically, respect for a dead Induna who they is reported to have led a great life for his subjects. This site is unlikely to be negatively impacted by the proposed project as it lies outside the projected inundation zone.

Figure 18: Induna Liyang'anga's grave site along the KAZA TFC/ ZAWA

5.3.7 Mulamu wa Mulena Yeta Anthropological Site

The *Mulamu wa Mulena*, translated as the 'rod of the king' anthropological site is located at coordinates, 16°38.647'S' and E 23°35.193'E within the said KAZA TFCA/ ZAWA fence near the gate on the eastern bank of the Zambezi. The tree, known locally as a *Muzwili* (*Combretum emberbe*) is believed to have been Litunga Yeta's walking stick which he planted and it later mysteriously sprouted into a tree. Like a shrine, the tree is revered and respected as the 'rod of the King'. Recently, the Company working on the bridge along the Mongu- Sesheke road is reported to have attempted to mow down the tree in order to obtain gravel from its environs for the road works. Apparently, the tree survived because the local people were resolute in stopping the intended felling which was equated to desecration of the site. However, the original tree is being 'strangled' by parasitic figs. The location of the site is such that it may potentially be inundated if the river overflows the projected inundation zone. Its significance lies in the associated local beliefs and traditions and the landmark effect it plays in the environment.

Figure 19: *Mulamu wa Mulena Yeta; The original tree is under attack by parasitic figs*

5.3.8 Litunga's Historic Docking Site

The Litunga's docking site is a historic site located at coordinates 16°38.733'S and 23°35.201'E. It is located where the Zambezi River widens as it makes a bend towards the south, a place where the eastern bank of the river provides a clear view of the flow. Some 50m from the river's edge is a raised mound like talus where a huge ficus tree is said to have been situated which was used to shelter multitudes of people that are reported to have usually converged to watch and celebrate the Litunga's rare and triumphant arrival. It was also asserted that the site is closely associated with Litunga Yeta and Lewanika. It was used by many of the other Kings, except that perhaps the named two were the more popular. The local significance of the site was obvious as the traditionalists intimately recited and recounted its history and importance. Though it is outside the inundation zone, the site may potentially be inundated if the zonal water limits are exceeded.

Figure 20: Litunga's historic docking site

5.3.9 District Commissioner Coryndon's Docking Point

Close to the eastern boundary of the of the study area at coordinates 16°38.436'S and 23°34.948'E lay a historic site, a docking point for the District Commissioner Robert Coryndon who during the colonial era moved about in North-Western Rhodesia to create a firm imperial presence in the area. Coryndon was an administrator who entered North Western Rhodesia in 1897 from Southern Rhodesia and established the first colonial office at Mongu before he later moved to Kalomo. He is said to have been involved in extensive patrols throughout the early years to pacify the country. This site is serially located with the Litunga Yeta's *Mafulo* along the KAZA TFCA/ ZAWA fence on the eastern bank of the Zambezi River in Induna Ling'anga's village. The site is totally overgrown and is not in the core of the project area and therefore may not be directly adversely impacted by the project. However, using a 'project lens' it could be said that the proposed project should be concerned about the site as it could suffer from 'spilling effects' of the follow-on development as auxiliary activities may emerge in the area. Even then, the site has very low significance even among the local people.


Figure 21: Coryndon's docking point.

5.3.10 The Islands as Historical Sites

The islands on the immediate upstream of the Ngonye Falls are historic sites. These islands include the Sioma, Lusika, Simungumbuko, Kaale, Namilangu and Madunda Island. The islands were the historical residences of the Totela and other ethnic groups before they moved to settle where they are found today. The islands also contain burial sites of the earliest inhabitants of the region. Due to high water levels, we were unable to physically undertake assessment on the Islands. It is important that if there will be any burial sites found within the proposed project area which will be directly impacted by the project, such as through construction activities, they should be excavated for possible relocation.

6.0 Impact Assessment and Evaluation

In considering the potential impacts of the proposed project, the study team was guided by past experience, principles of best practice and case studies of similar projects, technical descriptions of the project provided and national heritage and environmental law in general. The impact assessment methodology therefore involved extensive literature review of relevant data. The 'Delphi' technique was used by the study team, using a range of objective and subjective value judgements.

This section details the potential impacts of the proposed project in general. Ideally, these potential impacts would have been divided into those pertaining to the construction and operational project phases. Due to the unavailability of a detailed description of the project activities in these two main project phases, a complete distinction of the time scale regarding the impacts is not made. However, in line with the terms of reference, an indication of the time when the

mitigations measures for the potential negative impacts should be implemented is suggested.

The potential negative impacts are discussed alongside the mitigation measures while the potential positive impacts are outlined in such a way that they contain the possible enhancement measures.

6.1 Potential Negative Impacts of the Project and Mitigations

6.1.1 Impacts on the Natural Heritage Resources and their Mitigations

(i) *Reduction of the water flow over the Ngonye falls*

The operation of the proposed hydroelectric power project will entail the diversion of water from the Zambezi River upstream of the Ngonye Falls and its release downstream of the falls. The diversion of the water will be done along the main river course and will have a direct impact on the integrity of the waterfalls. This will be most visible at the height of the dry season when the water flow over the falls is naturally low. This will have a negative effect on the aesthetic value of the site and could potentially lead to reduced tourist visitations.

Mitigation

This impact can not be completely mitigated. However, the developer will need to firmly commit that they will ensure that there is always water flowing across the falls especially in the dry season and that when the water levels are too low to support both the hydroelectric power generation and maintenance of the falls, the later will be prioritized even if this will mean temporarily halting power generation. It is worth noting that these measures were mentioned by representatives of Western Power Company and DH Engineering Consultants during a brief meeting with the NHCC study team in Sioma on 13th June 2014. This commitment should be done before the project construction phase and adhered to through out the project lifecycle.

(ii) *The Inundation of area upstream of the barrage*

There is a high likelihood that some areas upstream of the proposed barrage site will be inundated thereby adversely affecting some heritage resources and altering the landscape of the surrounding area. In addition, there is a potential risk of a resultant alteration of the aquatic ecosystem upstream of the waterfalls due to the build up and throwback of water created by construction of the barrage. This could potentially affect local flood regimes, such as increased siltation, and negatively affect animal and plant life in the long run.

Mitigation

The project design must be based on sound modeling and prediction of the flow regimes including potential flooding from higher than normal rainfall in the Zambezi River's catchment. This is notwithstanding the fact that the barrage would be over topped by the water if it is closed at high river levels. In essence, the developer should ensure that the envisaged 'inundation zone' is not

completely overflowed at normal river conditions and that the water regulation mechanism at the barrage simulates as much as possible the normal flow of the river.

(iii) *Increased sedimentation around the waterfalls and at the barrage site*

The Zambezi River is likely to be carrying a lot of sediments either as suspended load or through traction. As indicated earlier, there is evidence of river depositions downstream of the waterfalls. The river relies on a strong current to transport its load and once this flow regime is altered by the barrage and water diversion into the canal, there may result in sediment deposition at around the falls thereby negatively impacting their physical integrity. This will also likely be the case at the entrance to the canal especially if it will have a mechanism that will be aimed at preventing debris from entering the canal.

Mitigation

The project design will need to carefully take these aspects into consideration. Mechanical methods of sediment control may also need to be implemented. Issues related to increased siltation and sedimentation have been documented elsewhere within the Zambezi Basin such as at the Khuwa barrage along the Shire River in Malawi (Shela, 2000). In order to prevent debris and sediment carried by the incoming water from entering the canal, several objects can be incorporated with the intake such as trash racks, skimmers or a settling basin (Bjørnåvold, 2009). In addition, in order to reduce impacts related to sedimentation, the barrage should be situated along a relatively straight section of the river as opposed to near river bends where the water flow is naturally slower.

(iv) *Visual pollution*

The canal and the other hydroelectric power project related infrastructure can potentially present a visual intrusion in relation to the natural environment surrounding it. Some of the materials that will be used in the project infrastructure such as concrete and steel may not blend with the site's environs thereby resulting in visual pollution.

Mitigation

The developer should ensure that efforts are made in the project design to mesh and incorporate the infrastructure as much as is practical into the surrounding environment. This means that some of the project infrastructure may need to be located below the ground surface in the construction and implementation phases.

(v) *Increased soil erosion in some sections of the project area*

This is most likely to occur in the areas where vegetation has to be removed thereby destabilizing the soil, for instance to pave way for infrastructural works. Furthermore, assessment of the gradient at the proposed intake site suggested that it could be susceptible to erosion

Mitigation

The developer should ensure that the nature of the river bed and the gradient at the proposed intake site are controlled to minimize erosion. Low height vegetation cover should be retained through out the project, where possible, so as to minimize the soil degradation.

(vi) *Loss of forest cover and habitat for fauna due to clearing for the project infrastructure*

The construction of the canal and other infrastructural works shall lead to disturbance of habitats and disruption of ecological processes at the micro scale. For instance, the project will occasion the removal of vegetation above and around the proposed 23x8m canal running 3km from upstream of the waterfalls to the underground power station. This impact will be exacerbated by the permanent access roads which will run alongside the canal and from the power station to the new Senanga-Sesheke road as well as the planned bridges for people, vehicles and animals that will cross the canal

Mitigation

The developer should ensure that vegetation clearing especially in the construction phase is restricted and no indiscriminate opening up of the project area is allowed. All temporary access routes to the canal and other project infrastructure should be planned for and well mapped. They should be used for the whole period of the construction phase and should revert to permanent and well maintained service routes for the canal and other project infrastructure during the operational phase. The biomass removed from the cleared sites should be allowed to dry and later offered to members of the local community to use as firewood should any trees be of calorific value.

(vii) *Compaction of the ground*

This is expected to occur along the canal route and in all associated work and accommodation areas such as access roads, camping sites and material storage areas. It will increase the land's susceptibility to erosion and invasion from alien plants and affect other micro organic life.

Mitigation

The location of administration and accommodation camps, storage of materials and movement of plant and machinery should be well planned. This should be incorporated into the project design even before the construction phase. A well designed system shall regulate widespread compaction of the grounds and facilitate site rehabilitation where necessary at a later stage.

(viii) *Reduced accessibility for local people to and from across the canal*

The construction of the canal will essentially act as a physical barrier for people and perhaps animals to move from one side of the canal to the other. Presently,

local people are able to access lands unencumbered from both sides of the proposed canal location.

Mitigation

The developer should, prior to construction, engage with the local people so that the number of bridges across the canal and their locations are agreed upon. This will ensure that ready access to both sides of the canal is assured for people, animals and perhaps, vehicles. In general, it is imperative that the developer ensures that access to the waterfalls, to the Islands and to all the cultural sites by the locals is assured.

(ix) *Effect on traditional fishing practices for local fishermen*

This was a much talked about impact by the local people both on the eastern and western banks of the Zambezi River. They held that due to the seasonal flooding and strong water currents, they can only exploit a short period during the year when they lay fish traps ('*Mambelo*' in Silozi) on the basaltic crevices of the falls for their catch. It was feared that the construction of the barrage across the river will lead to the loss of this traditional fishing method on the eastern side, leading to the loss of fishing related income.

Mitigation

This matter needs a follow up with the local communities on either side of the river. The extent to which the weir will affect the traditional fishing methods has to be reliably established during the ESIA process and clearly communicated to the local people so as to assuage this concern.

6.1.2 Impacts on the Cultural Heritage Resources and their Mitigations

(i) *Possible inundation of grave sites on the Islands and exposure/destruction of unknown subterranean and chance surface archaeological finds during the construction phase of the Ngonye hydroelectric power project.*

The occurrence of gravesites on the Sioma and Simugumbuko Islands and the chance finds of surface archaeological artifacts in the project area are distinct possibilities. Thus the developer should be alive to the possibility of unearthing or stumbling upon ancient fossils or other prehistoric archaeological materials. These heritage resources may be inundated or destroyed during the construction phase of the proposed project.

Mitigation

In an event that grave sites, archaeological or ancient prehistoric materials are discovered within the project area, the developer should contact the South West Regional Headquarters of National Heritage Conservation Commission (NHCC) for professional advice and rescue excavations and artifacts rescue. The Sioma Island is said to possess grave sites and prehistoric artifacts

(ii) *Destruction/disturbance of some Cultural Heritage Sites: The Litunga's canal, Litunga's gum trees, Litunga Yeta's walk stick (Mulamu wa Mulena) and Liabwa La Twelufu can potentially be disturbed, during the construction phase or possibly inundated during the implementation phase.*
These cultural heritage resources should be preserved for history and posterity. In addition, if these sites are not well handled, it could lead to misunderstandings between the traditional leadership, the local communities and the developer. This may lead to a stalemate and hence an unnecessary delay on the project's progress.

Mitigation
It will be important that right from the inception stage and through the construction and operational phases, the developer should work very closely with the local leadership and local people within the project area who intimately know these sites. The developer should consider including a small information exhibition center within their infrastructure plan to be located on the eastern bank of the Zambezi River. This can be used to display information on the heritage resources and other information about the project area (such as the hydroelectric power generation scheme). The information centre can then be operational in the project implementation phase.

In an event that archaeological findings are found during the construction and operation phases of the Hydroelectric Power Project, the National Heritage Conservation Commission (NHCC)-South West Regional Office, currently based in Livingstone, should be contacted as a matter of urgency for specialist advice and intervention. Heritage artifacts require careful archaeological excavation, treatment and exhibition for purposes of scientific research, education and tourism/ recreation

6.2 Potential Positive Impacts of the Project and Enhancements

The proposed Ngonye Falls Hydroelectric Power Project has potential positive impacts in both the construction and operational phases as discussed below:

(i) Increased visibility of and accessibility to the Ngonye Falls Heritage Site

The Ngonye Falls have been referred to as a 'hidden gem' owing to their limited accessibility and promotion. The proposed hydroelectricity project will potentially increase the visibility of the site thereby increasing site visitation. The development of the proposed project should incorporate an improvement of the presentation of the heritage and tourism value of the site.

(ii) Rehabilitation of the Litunga's Channel

The rehabilitation of the Litunga's Channel represents its adaptive use and once this is done, the local people can use it for irrigation and provision for water for animals. The Litunga's channel can also be an integral part of the 'heritage trail' of the project area which can be supervised by the local people.

(iii) Employment and Training Opportunities

The project shall provide a number of employment and training opportunities during the design, construction and upon commissioning, the operational phase. This will translate into marked socio-economic benefits among the local communities thereby increasing their standards of living.

Through the concept of demand management, there is expected to be a multiplier effect on the benefits accruing from the project on the communities around the project area. In this regard, Western Power Company Limited are implored to prioritise capacity building in the people from the communities around the project area in their employment and training programs so as to give them a competitive edge in the labour market thereby enhancing their appreciation and 'ownership' of the project.

(iv) Follow-On Development Benefits

The project shall contribute to increased rural electrification and spur the potential development of such things as irrigation, commercial industry, health and development. This being the first hydroelectric power scheme in the Western Province of Zambia, it will be a flagship project around which many others can be anchored. The project represents a significant investment by the private sector and should aim at enhancing the indigenous technical capacity

(v) Extension of national grid

The project will effectively extend the national grid through the construction of a new power line from the power station to Sesheke. There will thus be increased capacity on the national grid which will result in the stabilization of the power network in the Western Province. In addition, this project is envisaged to reduce the power flows/loss from Southern Province while increasing the national power export capacity.

(vi) Contribution towards Zambia's carbon goals

This potential impact mainly rides on the expectation that the project will include the supply of electricity at a voltage suitable for delivery directly to the local communities thereby potentially reducing the deforestation related to energy needs.

(vii) Electricity supply to local communities

The local communities in the vicinity of the project area do not have electricity supply. The commitment by Western Power Company that, through collaboration with ZESCO and the Rural Electrification Authority, the project will include electricity supply at a voltage suitable for delivery directly to the surrounding community must be followed through. This will tremendously increase the appreciation of the project in the region.

(viii) Opportunities for implementation of community projects

The pledge by the developer to 'donate a percentage of the project revenue to the community through a Community Support Fund project', (WPC, 2013), represents an opportunity for the implementation of local people driven social and economic development projects. This will ensure that the local communities around the project site obtain tangible and direct support for their own initiated projects. Apparently, 'the selection and funding of community projects through the Community Support Fund will be driven by a Community Trust but may include electricity purchase, health and education facilities and small business support through tourism or agriculture', (WPC, 2013).

(ix) Opportunities for improved inter institutional collaboration

The location of the project within the environs of the Ngonye Falls Heritage Site will change the site's management regime. This offers an opportunity for inter-institutional collaboration amongst NHCC, Western Power Company Limited, Zambia Wildlife Authority (ZAWA) and several other stakeholders. This can potentially have the effect of enhancing the conservation status of the site.

7.0 Environmental Management and Monitoring Plans

The Environmental Management and Monitoring Plans (EMMP) which will be drawn up by the Environmental Consultant for the full ESIA will outline the overall mitigation and management measures to be undertaken during the different phases of the proposed project. It is cardinal that the EMMP that will be adopted should encompass monitoring and evaluation systems that support adaptive management so as to deal with potentially variable environmental and socio-economic conditions during the project life cycle.

8.0 Environmental Auditing Plans

The auditing plans for the proposed project should have a multidisciplinary approach that encourages the participation of various stakeholders. Ideally, an Environmental Liaison Committee (ELC) should be established to facilitate the participation of institutions such as NHCC, ZAWA, Western Power Company, the Forest Department, Local authorities and the traditional leadership in the post construction period. The environmental mitigation, management and auditing budgets should be borne by the developer.

9.0 Recommendations

In order to ensure that the Western Power Hydroelectricity Power Project at Sioma is implemented in a sustainable manner, there is need to undertake further activities, both in the short and long term. Some of this proposed future work is discussed below:

- The developer should construct a small information exhibition center within their infrastructure plan to be located on the eastern bank of the Zambezi River. This can be used to display information on the heritage resources and other information (such as the hydroelectric power generation scheme) in the project area. Photographic records of the construction work should be included, and subsequent activities and hallmarks added to the exhibition as information becomes available. The Center can be run by the local communities in consultation with the National Heritage Conservation Commission. This will serve as a compensatory mitigation for the reduced aesthetic value of the waterfalls on the eastern bank.

- It is proposed that the exhibition on the western bank of the river be enhanced, showcasing the falls prior to construction of the Hydroelectric Power Station and highlighting the proposed development and its socio economic benefits to the area.

- The developer should ensure that access to the waterfalls, to the Islands and to all the cultural heritage sites by tourists and the local people is assured. This will ensure that hydroelectricity power generation, heritage conservation, tourism and local people's economic activities continue to co-exist in the project area.

- It is recommended that Western Power Company facilitate a tour to the ZESCO run Victoria Falls Power Station in Livingstone. This will provide a learning opportunity for the local leaders in Sioma District to have a better understanding of the operations and possible mitigations of an Hydroelectricity Power facility by offering them insights through an already existing power station.

- The hydroelectricity scheme should ensure the availability of electricity to power the infrastructure that will be constructed as a result of this project within the local communities in the vicinity of the project area.

- In an event that archaeological findings are found during the construction and operation phases of the Hydroelectric Power Project, the National Heritage Conservation Commission (NHCC)-South West Regional Office, currently based in Livingstone, should be contacted as a matter of urgency for specialist advice and intervention.

10.0 Conclusion

The proposed construction of the Ngonye Falls Hydroelectricity Power Project will have both negative and positive impacts on the environment in general and on the heritage resources in particular within the study area. As outlined in this document, there are sufficient mitigations available which, if carefully implemented, will result in the significant reduction of the effects of the negative impacts. Similarly, there are mechanisms and opportunities that can be utilised to enhance the positive impacts of the project in general.

In terms of natural heritage resources, the main potential negative impacts of the proposed project will be the reduced water flows over the falls especially at the height of the dry season and the projected inundation of some areas upstream of the proposed barrage site. The reduction of the amount of water over the falls will negatively affect the aesthetic value of the site while the projected inundation may result in alterations of the aquatic environment such as through increased sedimentation and in changes in the natural river flow regimes upstream of the waterfalls. In terms of cultural heritage resources, the main potential negative impacts largely involve the possible disturbance of the identified resources during the various project activities.

Notwithstanding the foregoing, the proposed project has tremendous potential positive impacts which, if implemented, would ensure multiple benefits from the site for all the major stakeholders. Primarily, the positive impacts that will emanate from the project should be enhanced in order to result in sustainable socio-economic development for the rural communities around the project area. Continued collaboration between Western Power Company Limited, NHCC, the local communities and other stakeholders will ensure that the proposed Ngonye Falls Hydroelectricity Development really serves as the flagship project of the Province.

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12.0 APPENDICES

12.1 APPENDIX 1: Minutes of the Stakeholder Consultative Meetings

First Stakeholder Consultative Meeting

Minutes of the Stakeholder Consultative Meeting between National Heritage Conservation Commission (NHCC) Officials and Chief Lukama's Court of the Barotse Royal Establishment (BRE) held on 10/06/14 at Kaungamashi Royal Palace.

PRESENT

1. Induna Mutundwalo (Chief Lukama's Prime Minister)
2. Induna In'anduko
3. Induna Ino'mba
4. Induna Amusa
5. Induna Unumekule
6. Induna Indowana
7. Mr. M. Mukela-Acting Sioma District Commissioner
8. Mr. O.H. Kandyata -NHCC Director SWR (Historian)
9. Mr. M. Nangalelwa -NHCC Ecologist
10. Mr. V. Syatyoka-NHCC (Archeologist)
11. Mr. B. Simakole-NHCC (Geomorphologist)
12. Mr. S. Lukonga –NHCC Barotse cultural landscape site manager.

DELIBERATIONS

- The acting Sioma District Commissioner (D.C) introduced the NHCC team to Chief Lukama's Council of Elders.
- The acting D.C informed the council that the NHCC team was in the area to conduct a Heritage Impact Assessment (HIA) for Ngonye Falls with regard to the proposed Hydro Electric Power Station (HEPS) at the waterfalls.
- The NHCC team explained their different specializations in relation to the HIA for Ngonye Falls and that the research was a lawful pre-requisite Vis–a-Vis the potential impacts of any major development in the country.
- The NHCC director also informed the Council that the team would hold consultative meetings with stakeholders on either side of the Ngonye Falls and that selected locals would be contracted to help scour the falls environs for heritage resources that could be impacted by the HEPS development.
- Induna In'anduko welcomed the NHCC Officials and said the team's mission was in tandem with the courts aspirations as regards the power project and the HIA would benefit the province and the country as a whole and that Senior Chief Lukama and the BRE at Lealui would be informed about the team's mission.

- An interactive session then followed during which the Council of Elders partly narrated the history of Sioma and the Litunga's royal canal that circumvents the waterfalls. The aesthetic value of the falls was also highlighted.
- The Indunas showered praises on the NHCC team for consulting and paying a courtesy call on the traditional authority and that all developers must emulate the gesture as it is in line with the Norms of the BRE.
- Finally the Indunas requested the NHCC team to avail a final copy of their findings and recommendations to the Kaungamashi court and wished the research group success in their endeavors.
- The acting D.C paid tribute to the Royal Establishment for hosting the team and assured the council that the government would ensure that the HEPS development benefits the people.

Lukonga Stanley
Meeting Secretary

Second Stakeholder Consultative Meeting

Minutes of the Public Stakeholders Meeting held at Sioma Secondary School on 11/06/14 regarding the Ngonye Falls Heritage Impact Assessment (HIA)

ATTENDANCE

1. Mr. J. Mubita
2. Mr M. Mweemba
3. Mr. H. Sikota
4. Mr. M. Mukela
5. Mr. E. Mumbula
6. Mr. M. Sitali
7. Mr. B. Muyunda
8. Mrs. Mutendena
9. Mr. M. Mwauluka
10. Mr. I. Mashwafela
11. Mr. C. Liwakala
12. Mr B. Musekalumwi
13. Mrs. M. Kweleka
14. Mr. C. Phiri
15. Mr. S. Simasiku
16. Fr .Kayombo
17. Mrs. T. Siameja
18. Mr. M. Mukena
19. Mr F. Timba
20. Mrs. F. Kalangula
21. Mrs. G. Kapulu
22. Sr .C. Lungu
23. Mr M. Mulumba
24. Ms. C. Temwachi
25. Mr. O.H. Kandyata
26. Mr. M. Nangalelwa
27. Mr. V. Syatyoka
28. Mr. B. Simakole
29. Mr. S. Lukonga
30. Mr. C. Mweemba
31. Mr. S. Musupi
32. Mr .M. Siyanga

AGENDA

- Prayer-Introductions

- HIA objectives
- Interactive session
- Closing remarks

DELIBERATIONS

- The Head teacher of the host school welcomed the participants and called upon the acting District Commissioner (D.C) to open the meeting.
- The acting D.C thanked the school administration for providing the venue. He briefly explained the purpose of the NHCC Officials' visit to Sioma and urged the participants to freely contribute to the meeting deliberations.
- The NHCC director invited the NHCC experts to spell out their areas of interest in the research. He explained that the meeting was basically interactive in which the team wanted to learn from the locals about the cultural and natural heritage resources around the falls and how these could be impacted by the proposed Hydro Electric Power Station (HEPS) development.
- The third aspect would be to determine how these heritage resources could be protected so that the HEPS developers would mitigate potential damage. Thus the recommendations from the meeting would be a key component to the development.
- The NHCC director then invited his team of experts to interact with the meeting participants as regards their mission.
- The meeting participants were all unanimously in favour of the project. They provided the study team with some possible heritage resources in the study area such as Imamongo, Imakakata, the Litunga's channel, and how the Ngonye falls have become quieter over the years. They expressed concern over whether the project will prevent people from their fishing grounds. They indicated that there were former settlements on the islands near the Ngonye Falls and that some of them had graves of their occupiers. The participants also provided information on the vegetation of the study area and some of the local uses of the trees.
- After deliberations lasting over two hours, the meeting came to an epilogue with closing remarks being given by the acting District Commissioner. He thanked the Area Indunas, the Church, Local Villagers and the District heads of government departments and the other stakeholders for their attendance and valuable contributions during the meeting. To crown it all, he invited NHCC study team to revisit the Sioma area so as to document the other heritage resources which were abundant in the district.

Lukonga Stanley
Meeting Secretary

Third Stakeholder Consultative Meeting

Minutes of the Stakeholders Meeting held at Induna Linanga's residence on 12/ 06/14 between NHCC Study Team and the local community.

ATTENDANCE

1. Induna Linanga kalemba
2. Muwana Muluba
3. Silumesi Simasiku
4. Mabuku Muyendekwa
5. M. Sitali
6. Mutukwa Munalula
7. S. Simasiku
8. M. Mweemba
9. T. Chisala
10. M. Mwanangombe
11. M. Linanga
12. O.H. Kandyata
13. C. Mweemba
14 .B. Simasiku
15. V. Syatyoka
16. M. Mukela
17. S. Musupi
18. M. Siyanga
19. M. Simasiku
20. P. Liwena
21. S. Munalula
22. S. Lukonga

AGENDA

- Introductions
- HIA objectives
- Interactive session
- Closing remarks

DELIBERATIONS

- The acting District Commissioner (DC) opened the meeting and explained the purpose of the visit. Thereafter, he invited the NHCC director to address the gathering.
- The NHCC director informed the meeting that his team wanted to get the views of the locals regarding the natural and cultural heritage resources on the Western Bank of the Ngonye Falls.

- He told the participants that these heritage resources were to be documented so as to recommend mitigation measures as regards the HEPS development. The NHCC professionals were then requested to share their objectives.
- The local community indicated that they were in favour of the proposed project and provided the study team with information on a number of heritage resources that were found in the area.
- They had some concerns though about the proposed project. Some of the concerns from the locals were that; the water abstraction would alter the aesthetic value of the falls; their traditional fishing grounds would be destroyed; the restrained water flow over the falls would encourage plant growth thus eventually blocking the waterfalls; the canal could lead to flooding thereby affecting their traditional farming grounds and; that they were skeptical over the project because of the sad experiences they had had with KAZA TFCA over the Ngonye Game Park.
- In view of the KAZA TFCA saga and their limited capabilities, the villagers requested that it would be educative for the HEPS developer to organize a study tour for stakeholders on either side of the falls to have a firsthand feel of what obtains at a similar site e.g. at Victoria Falls.
- Other fears expressed included the possible cutting off of water supply for people and animals by the HEPS canal, the negative effect on other cultural resources e.g. the magical Litunga's Tree, docking points for colonial masters and the Litunga's barge and the potential demise of man made canals (Liabwa La Twelufu and Litunga's channel)
- Additionally the villagers felt that the proposed canal would terminate their links with their colleagues on the other side of the river as it would be fenced.
- A select group of villagers was then chosen to accompany the NHCC team so as to survey the falls environs.
- In his closing remarks, the acting D.C assured the meeting their concerns would be tabled before the developers and that the proposed project would help bring development to the area.

Lukonga Stanley
Meeting Secretary

12.2 APPENDIX II: Prehistoric Archaeology in Zambia

1. INTRODUCTION

The earliest known inhabitants of Zambia were mobile Stone Age hunter-gatherers whose subsistence economy depended on hunting and gathering of a wide variety of animal, plant, and freshwater resources. The most common form of tool technology used by these early humans was flaked stone, wood and bone. These raw materials were fashioned in simple but effective tools. The majority of stone tools used were made on a number of rock materials, including quartz, quartzite, sandstone, chalcedony, chert and silicates. The period of occupation has not yet been precisely determined due largely to lack of intensive archaeological research and suitable dating materials However, on the basis of materials recovered from a number of sites which have been investigated, we know that the period of early human occupation of Zambia extends to circa 3.0 million years ago (hereinafter "m y a These hunter-gatherers continued to live in the territory until 2 000 years ago (hereinafter 'y.a), when Iron Age peoples with some knowledge of farming, animal husbandry, and metallurgy colonized the territory. Since the last 2 000 years, the economy of the area changed from one which was dependent on hunting and gathering of food resources to that which emphasized farming, animal husbandry, mining, commodity exchange, and seasonal procurement of plant and animal resources. Transformations in the economy were accompanied by changes in technology, settlement patterns, and trade relations.

While the Stone Age peoples depended largely on stone, wood, and bone for their regular tool kit and art, the Iron Age peoples incorporated ceramic and metal objects in their tool kit and craft making production activities, and in commodity exchange relations Archaeological evidence further attest to the nature of prehistoric settlement of the territory. The commonest type of settlement for the Stone Age peoples was an open-air site, presumably protected by organic material structure. A number of rock shelter and cave sites have also been found along the fringes of grasslands, woodlands, and valleys near water sources. Most Iron Age and early historic settlements have been found on mounds in open woodlands and nearer water sources, attested by elaborate hut and furnace foundations.

With the advent of Iron Age sedentary farming lifestyle, the concept of permanent settlement emerged with well-defined villages, which eventually aggregated into larger villages in fertile crescents near perennial water systems. At the same time, mining and processing of iron and copper ore into finished goods grew into a specialized industry, with emphasis on increased production of standardized wares, and augmentation of industrial guilds ("secret societies") to protect and monopolize production.

2. OVERVIEW OF THE ARCHAEOLOGICAL PERIODS

Below is an overview of the archaeological periods and their associated cultural developments in Zambia during the Pleistocene and Holocene geological epochs:

2.1 EARLY STONE AGE (LOWER - MIDDLE PLEISTOCENE)

Archaeological evidence has shown that the earliest forms of humans to appear in Zambia belong to the genus Australopithecus. Though there are yet no fossil bone remains of these hominids in Zambia, the remains of Australopithecus in Africa were first recovered in South Africa in the 1920s and 1930s, later at Olduvai Gorge in Tanzania, and at several lake and riverside sites in Kenya and Ethiopia. The only fossil hominid bones found in association with stone tools in Zambia are those of the Kabwe Man (Broken Hill Man) the Homo sapiens [rhodesiensis] - recovered in Kabwe (former Broken Hill), central' Zambian 1921.

These and other non-fossil remains recovered elsewhere in the country are sufficient evidence to prove the long antiquity of humans in Zambia. The recovery of tool assemblages associated with the early forms of humans at a number of sites in Zambia whose antiquity is already known elsewhere in the Africa is an indication that these early hominids, in their pyretic order of physical (biological) development, have been present in Zambia as early as circa 3.0 m.y.a. In general, however, Zambia has been unfortunate as it has not yet produced direct evidence of fossil hominid bones of the earlier forms of humans - Australopithecus, Homo Habilis, and Homo erectus, or the later forms - Homo sapiens - that evolved after the Homo sapiens or Kabwe Man.

Large assemblages of the Oldowan stone tools (after Olduvai Gorge) associated with the early hominid groups have been recovered at such sites as Mosi oa tunya (Victoria Falls) on the fringes of the Zambezi River in southern Zambia, whereas the later **Acheulian** stone tools have been found at the famous site of Kalambo Falls in northern Zambia. The stone tools of the Oldowan and the later Acheulian industries of the Early Stone Age (ESA) appear to have continued throughout the period of the Middle Pleistocene as sites of the Oldowan and later Acheulian traditions, often situated in close proximity to water sources - dambo, stream, river, or lakeside - have evidently shown. On the basis of stone tools recovered from these sites and other firm lines of evidence on the development of hominid culture in Zambia, we can safely argue that the territory has equally a long record of human presence dating back to the earliest epoch of cultural development.
Oldowan industry in the lower Pleistocene is characterized by choppers and other simple but effective heavy duty tools made on flakes from cobbles of various forms of stone material. At Olduvai Gorge in Tanzania and Lake Turkana area of Kenya where evidence of fossil hominid bones and Oldowan stone tools have been recovered in association with Australopithecus and Homo Habilis, the stone tool making technology has been attributed to the Homo Habilis who possessed a larger and more complex brain.
The Oldowan industry was gradually replaced by the Acheulian industry which lasted up to circa 200 000 y.a. The Acheulian industry consists mainly of hand axes, cleavers, and several types of flakes and scrapers. The period is characterized by the development of specialized manufacture and use of large and well-made tools. Early humans of this

cultural epoch had begun to attain appreciable level of standardization in tool manufacture as can be discerned from the hand axes and cleavers that were fashioned from varied forms of raw stone material. Homo erectus has been associated with the **Acheulian** industry, which shows a much more widespread occurrence and is better known in the world than the earlier Oldowan.

As earlier indicated, the famous site of Kalambo Falls in northern Zambia has provided the only known excellent example of Zambian sites which have yielded classic, specialized **tools of Acheulian tradition in** association with evidence of fire - charcoals and charred wood.

2.2 MIDDLE STONE AGE (UPPER PLEISTOCENE)

Toward the closing years of the Acheulian, which in Africa is dated to between 1.8 m.y.a. and 200 000 y.a., there is evidence of the population which appear closely similar to the upper Pleistocene fossil hominid remains of the Kabwe Man with his **Middle Stone Age (MSA) tool kit found in the Cave of No.1** Kopje at Kabwe Mine in central Zambia in 1921. Again at Kalambo Falls site several stone tools in association with evidence of fire "and which are directly related to the MSA has been found.

2.3 LATER STONE AGE (LSA)

Throughout Zambia and its neighbors, the LSA is characterized by fully developed micro lithic flaked stone industries with which are associated certain larger tools and items of equipment. In north-central Zambia the earliest of these LSA micro lithic industries are dated to circa 20 000 y.a. In general, however, these industries in Zambia fall in the time period between 12 000 and 2 000 y.a.

Some of the sites and localities in the country which have yielded dated LSA tool assemblages and associated food residues are Nachikufu, and Mwela Rocks, in Northern Province. Characteristic tool types of this cultural stage include crescents segments), flakes, blades, bladelets, and scrapers. These are often made on quartz, though other forms of rock material were also preferred. The diversity of the tool kit appears to have initiated new types of activities such as use of bone and wood in art work**.** Rock paintings depicting LSA lifestyle first emerged and became widespread, especially in northern and north – central Zambia.

The LSA people did not practice metallurgy nor food production, though they achieved an efficient level of socio-economic integration. The hunter-gatherer mode of production which first emerged in the lower Pleistocene continued and still remained a viable cultural formation in the middle Holocene. Where not severely disrupted by the Iron Age peoples, the LSA lifestyle continued into the historic era. The case of hunter-gatherer groups in Botswana and Namibia in Southern Africa is a classic example.

Like earlier sites of the ESA and MSA during the lower through the upper Pleistocene, most LSA sites in Zambia and sub-Saharan Africa have been found on the edge of dambos (seasonally waterlogged plains or valleys), along stream and river banks, or wooded areas overlooking stream margins. In most cases, the spread of occupation in relation to Early Iron Age sites shows that these sites were usually small and temporary or seasonal camp sites of few individuals or small family groups. The life of the LSA hunter-gatherers of the Northern area of Zambia would have been comparable in many

respects to the rest of the territorial groups. They were equally optimum, with family groups organized on a basis of regular seasonal transhumance and exploitation of food and tool resources between differing but complementary ecological zones.

2.4 IRON AGE (UPPER HOLOCENE)

At 2 000 y.a. Zambia, like others in central-southern Africa, was occupied by early agro-pastoral farmers who practiced food production, animal husbandry, and metallurgy. Some sites in Zambia show evidence of an early but gradual displacement of the LSA population groups by Early Iron Age (ESA) peoples. This appears to have resulted largely from the competing strategies employed in the exploitation of food and tool resources. Iron Age economy implied intensive land use, which effectively modified the environment by clearing vegetation and using land for both farming and cattle grazing. Through time it would appear that contact between the two varying cultures tended to lead to the absorption of the earlier established LSA people. By circa 1 500 y.a. the region was occupied solely by Iron Age agro-pastoral farmers and metal workers.

The Iron Age seems to have evolved with the domestication of food plants and animals, and introduction of iron and copper working technology, which also revolutionized agriculture through the use of hoes and axes. Common forms of material evidence found at most Iron Age archaeological sites in the country are pottery, iron slags, tuyer (clay pipe) fragments, house and furnace dagga, iron products - i.e. arrow and spearheads, hoe, axe, knife, and bodkins, copper wire-spools, ingots (crosses), bars, and ornaments. In less acidic and good preservation soils, as the case is at most Iron Age sites in southern Zambia, organic residues (wood, plant seed, bones) have also been recovered in appreciable quantities.

The cultural complexity and efficiency that was attained during the Iron Age triggered a mass movement of people from their original settlement in search of land, water, peace, and other resources. It was largely this momentum for a rapid flow of the peoples in this region that may have brought the ancestors of the present ethnic groups in Zambia. The Western area of Zambia is no exception to the occupation of early Iron Age colonists. The indigenous Lozi, Kwamashi, Kwangwa, Mbukushu and Totela speaking people of the area may have descended from these early Iron Age colonists. As the case may have been elsewhere, the introduction of metallurgy in Zambia acted as a catalyst to the rapid and widespread movement and resettlement of people associated with early Iron Age culture.

Archaeological evidence in general attests to the simultaneous establishment of sedentary form of settlement of the territory. Once sedentism and productive economic systems were established, the inhabitants engaged into a wide variety of crafts, including pottery-making, mining and processing of metal ores, and fabrication of metal artifacts. A number of stone, wood, and bone tools or implements were also produced, although only a few artifacts of organic matter have survived in the archaeological record, especially in such areas as the Western loose sands avail much like North western where rainfall and soil acidity are relatively high.

While the Iron Age farmers in Zambia may initially have lived in small and widely dispersed village settlements, their descendants had by 1 500 y.a. began to occupy larger villages. Evidence from Liang'anga's Sioma Island Iron Age Settlements and those across Zambezi River show that the Totela villages like other groups were large and permanently sited along the fringes of dambos, streams, or rivers. These perennial water systems became central to the economic systems of the Iron Age peoples, for not only were gardens planted along their edges, but water was throughout the year drawn from wells dug into their margins for both seasonal farming and domestic purposes. Water was equally necessary in the processing of iron and copper ores into final products, and hence the siting of smelting furnaces along edges of dambos and/or streams on the Northern Province. However, due to the sandy soil types in the project area, no debit age of iron smelting were found.

By 1 000 y.a. a variety of wares of iron, copper, ivory, salt, and animal skins had become common items of local and external trade, and for augmenting socio-political relations. Throughout this era, the Northern region played a central role in long-distance trade involving exchange of copper, ivory, skins, salt, and later slaves for Arab and European trade goods from the east and west coasts, respectively. Guns, beads, cloth, sea-shell, and glass assumed prominence in the African interior, especially when slave trade reached its peak in the 18th through the 19th Centuries. Several copper ingots, bars and bangles, beads and shells recovered at most Iron Age and early historic sites attest to the widespread commodity exchange networks obtaining in prehistoric Zambia.

3.0 RESEARCHING THE ARCHAEOLOGICAL RECORD

All these and other prehistoric activities have through time created; accumulations of archaeological debris, which we now seek to recover, analyze, and interpret as material evidence necessary to reconstruct a number of human adaptive mechanisms, including processes of tool use and tool making, resource exploitation strategies, settlement and subsistence patterns and, commodity production and exchange.

12.3 APPENDIX III: Common Tree Species in the Study Area

(*Significance represents mentioned values of the species to members of the local community as presented in discussions)*

Species	**Significance**
Terminalia sericea	
Combretum imberbe	
Baphia mussaiensis	
Acacia nigrescens	
Albizia harveyi	
Dalbergia melanoxylon	
Diospyros mespiliformis	Fruit eaten by locals
Phoenix reclinata	Fruit eaten by locals, esp in times of drought
Piliostigma thoningii	
Albizia versicolor	
Acacia sieberana	
Garcinia livingstonei	Fruit eaten by locals
Ficus syacamorus	
Afzelia quanzensis	
Phyllanthus sp	
Guibortia coleosperma	Timber and fruit eaten by locals
Schnziophyton rautaneii	Timber for curving of canoes
Combretum zeyheri	
Parinari curatellifolia	Fruit eaten by locals
Pterocarpus angolensis	Timber
Terminalia prunoides	

Jasminum fluminense	
Musilu (Silozi)	
Mwaala/Lwaala (Silozi)	
Vangueriopsis lanciflora	
Combretum mossambicensis	
Parinari suffrutice	
Pterocarpus antunesii	
Cyperus papyrus	
Phragmites mauritianus	Making of traditional handicrafts