ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

FOR

THE ITEZHI TEZHI 120MW HYDROELECTRIC PROJECT, ZAMBIA

PREPARED BY

ITPC

July, 2013

EXECUTIVE SUMMARY

The Environmental and Social Management Plan (ESMP) for the Itezhi Tezhi Hydropower project is an important Project component providing a link between ESIA recommendations, legislative commitments and practical environmental and social outcomes. It also identifies the principles, approach, procedures and methods that will be used to control and minimize the environmental and social impacts of all construction and operational activities associated with the project. The ESMP will capture the ESIA commitments listed in the Environmental impacts and mitigation measures, of any conditions of approval issued by the Zambian Government, and any requirements of lending institutions associated with the project. The PESMP will also define the framework that contractors will be required to follow when preparing their more detailed construction and operations environmental and social management plans. Contractors working on the project will be contractually obliged to comply with the relevant environmental requirements, specifications and procedures set out in the ESMP.

In 2007, Government facilitated the incorporation of a special purpose vehicle, (SPV), called Itezhi Tezhi Power Corporation Limited, (ITPC), to implement the development of, and operate, the Itezhi Tezhi Hydropower plant. The SPV is a joint venture owned by Tata Africa Holdings (SA) Pty Limited and ZESCO Limited in a 50:50 share ownership.

The Itezhi Tezhi Hydro Electric (120MW) project is being developed in Itezhi Tezhi district approximately 350km from the capital city of Lusaka. The work site lies along the Kafue river system, some 300km from the confluence of the Kafue and the Zambezi rivers in Southern Zambia. The site already comprises an existing dam, which is operated and maintained by ZESCO. Originally constructed to provide storage capacity for Kafue Gorge power station which generates 900MW the Earth and Rock-fill dam was completed in 1978 and includes such ancillary facilities as the intakes, spillway gates, tunnels and the regulation gate.

The project's main environmental issues are related to the upstream and downstream impacts on water quality, hydrology, , fish and fisheries, wildlife, public health; the impact of construction work camps over the construction period; the impacts of auxiliary project components, including access roads and borrow pits; and indirect impacts on the area's natural resources and biodiversity.

The EMP will involve multiple institutions and responsibilities shared between ITPC, the Contractor, Regulators, Consultants and Local Authorities.

All management plans prepared will be implemented throughout the construction and operation phases of the project including plans relating to the following activities:

- Construction,
- Biodiversity protection,
- Reservoir clearing,
- Environmental and social issues;
- Safety issues affecting both workers and members of the community
- Physical Cultural Resources

- Additional Studies that may be required to provide more baseline information for the project; and
- Training and Capacity Building in all aspects of the ESMP.

All these will include the following general components;

- Identified issues and impacts;
- Performance targets;
- Mitigation and management measures;
- Monitoring requirements and activities;
- Implementation schedules; and
- Responsibilities and lines of communication.

Environmental and social supervision shall be conducted during project construction to ensure compliance of the Contractor with ESMP provisions and other Zambian regulatory requirements. Monitoring shall also be done during construction and operations to verify the success of mitigation measures and to conduct additional baseline sampling. The ESMP outlines reporting and communication procedures to ensure that ESMP provisions are communicated and reported at all levels of the project, including local communities.

A key component of ESMP success depends on effective capacity building and training of staff and all others involved in the ESMP. These efforts will also be assisted by the implementation of technical assistance by outside consultants.

The ESMP shall be considered a controlled document and should be updated annually, following a reportable incident or plan update.

A number of additional studies, complementary to the ESMP, are proposed including further monitoring, sampling and investigations of water quality as well as the implementation of a riverbank management system.

Initial start-up costs for implementing the ESMP are estimated to be US $ 400,000.00 at 10% of the total budget of the project.

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LIST OF ABBREVIATIONS AND ACRONYMS

AIDS	Acquired Immuno Deficiency Syndrome
CFRD	Concrete faced rock filled dam
ECO	Environmental Coordinator
ECZ	Environmental Council of Zambia
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and social Management Plan
EMS	Environmental Management System
ERB	Energy Regulation Board
GIS	Geographical Information Systems
HIV	Human Immune Virus
HSMP	Health and Safety Management Plan
ITPC	ItezhTezhi Power Corporation
Km	Kilometers
KW	Kilowatts
kV	Kilovolts
MMEWD	Ministry of Mines, Energy and Water Development
MW	Mega Watts
NHCC	National Heritage Conservation Commission
PAPs	Project Affected Persons
RAP	Resettlement Action Plan
PIU	Project Implementation Unit
PMU	Project Management Unit
RHC	Rural Health Centre
STIs	Sexually Transmitted Infections
ZAWA	Zambia Wildlife Authority
ZEMA	Zambia Environmental Management Agency

DEFINITION OF TERMS

Baseline: A description of the biophysical and socio-economic state of the environment at a given time, prior to development of a particular project.

Alternatives: The evaluation of alternatives to project development in ESIA (timing, location, technologies etc) including the no go, or no development option.

Biota: All living plants and animals in a given area.

Biodiversity: The variety of life on earth.

Biophysical: Pertaining to the natural environment.

Contamination: Pollution.

Conservation: The preservation of natural resources for use by future generations.

Consultation: A process of communication with those potentially affected by a project, policy, plan or program.

Cumulative effects: Changes to the environment that are caused by an action in combination with other past, present and future actions.

Endangered species: An animal or plant in danger of extinction**.**

Environment: the surroundings within which humans exist and that are made up of:

(i) the land, water and atmosphere of the earth;

(ii) micro-organisms, plant and animal life;

(iii) any part or combination of (i) and (ii) and the interrelationships among and between them; and

(iv) the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being;

Environmental aspect /issue: Elements of an organisation's activities, products or services which can interact with the environment.

Environmental audit: A systematic, documented verification process of objectively obtaining and evaluating audit evidence to determine whether specified environmental activities, events, conditions, management systems or information about these matters conform to audit criteria, and communicating the results of this process to the client.

Environmental impact: Any change to the environment, whether adverse or beneficial, wholly or partially resulting from activities, products or services.

Environmental and Social Impact Assessment (ESIA): An ESIA is the process of identifying, evaluating and mitigating all the relevant effects of development proposals including biophysical, social and others. It is an investigation and evaluation of the impacts of activities on the natural environment, socio-economic conditions and cultural heritage.

Environmental and Social Management Plan (ESMP): A Plan that seeks to achieve a required end state of the environment and describes how activities, that could have a negative impact, will be managed and monitored and how impacted areas will be rehabilitated.

Ecosystem: An interconnected and symbiotic grouping of microorganisms, fungi, plants and animals.

Environmental audit: An environmental management tool consisting of a periodic and objective evaluation of an organization and installations to assess compliance with regulatory and other requirements, as defined by audit criteria.

Fauna: Can refer to the animal life or classification of animals of a certain region, time period, or environment.

Flora: Can refer to a group of plants, a disquisition of a group of plants, as well as to bacteria

Groundwater: Water found beneath the Earth's surface.

Habitat: The home of a plant or animal.

Impact: The consequence of an action or activity on the human or natural environment. Impacts may be positive, negative or neutral.

Irreversible: A result whereby once occurred cannot be changed or reverted to its prior state.

Issue: A concern regarding an environmental impact, consequence or effect after an activity

Landfill: A disposal area for waste that is eventually covered with soil.

Magnitude: The size or degree of a predicted impact.

Mitigation: Prescribed actions taken to prevent, avoid, reduce or minimize the impacts, or potential adverse effects, of a project.

Monitoring: A combination of observation and measurement to assess the environmental and social performance of a project and its compliance with the ESIA/ ESMP, or other approval and regulatory conditions.

Natural habitats: Land and water areas where most of the indigenous plant and animal species are still present, and either are legally protected, officially proposed for protection, or unprotected but of known high conservation value.

Physical cultural resources: Important sources of valuable historical and scientific information, assets for economic and social development, and integral parts of a people's cultural identity and practices.

Protected Area: A clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of nature with associated ecosystem services and cultural values.

Reservoir: An artificial water body created and used for water storage for irrigation, flood control, flow regulation or power generation purposes.

Residual impact: Those impacts that remain after the application of mitigation measures.

Risk: The likelihood of occurrence of an adverse project effect.

Significance: The relative importance of an issue or impact to society.

Site: The extent of the area where the proposed power station and its auxiliary facilities will be located.

Social impact assessment: A component of EIA that assesses the impacts of a project, policy, plan or program on people and society.

Stakeholder: Someone who has an interest in the outcome of a project, or a decision affecting them.

Water quality: A measurement of the purity of water, or drinking water.

1.0 INTRODUCTION

1.1 Project Background

The Government of the Republic of Zambia through the Private-Partner initiative program has proposed the construction and operation of the 120MW Itezhi Tezhi hydroelectric power development on the Kafue River at the existing Itezhi Tezhi dam being operated and maintained by ZESCO in the central province in Zambia (hereafter referred to as the 'Project'). ITPC is the public-private partnership and a 50:50 joint venture agreement between the ZESCO and Tata Africa Holdings (TATA).

This is the Environmental and Social Management Plan (ESMP) for the Itezhi Tezhi Project, which describes measures that the authorities responsible for development of the ITT Project will take to mitigate potential negative impacts and capitalise on the positive outcomes of the project on the environment and on local communities. The measures in the ESMP are based on the assessment of potential impacts in the Environmental and Social Impact Assessment for the project, which forms companion volumes to this ESMP. The ESIA has been prepared incompliance with Zambian Environmental Impact Assessment Procedures, and in accordance with IFC performance standards, as reflected in the companys'policies, safeguard procedures, and guidance of the requirements of lending institutions associated with the project.

The Itezhi-Tezhi dam is located on the Kafue River, approximately 300km upstream of the confluence of the Kafue River with the Lower Zambezi River. The dam was built across the Kafue River near Itezhi-Tezhi in 1978 to provide seasonal regulation to the flow of the Kafue River and permit expansion of the downstream Kafue Gorge Hydroelectric Project (approximately 260km downstream of the Itezhi-Tezhi dam) (**Figure 1**). By storing water the dam is able to provide a constant flow of water to the Kafue Gorge Hydroelectric Project downstream in both wet and dry seasons.

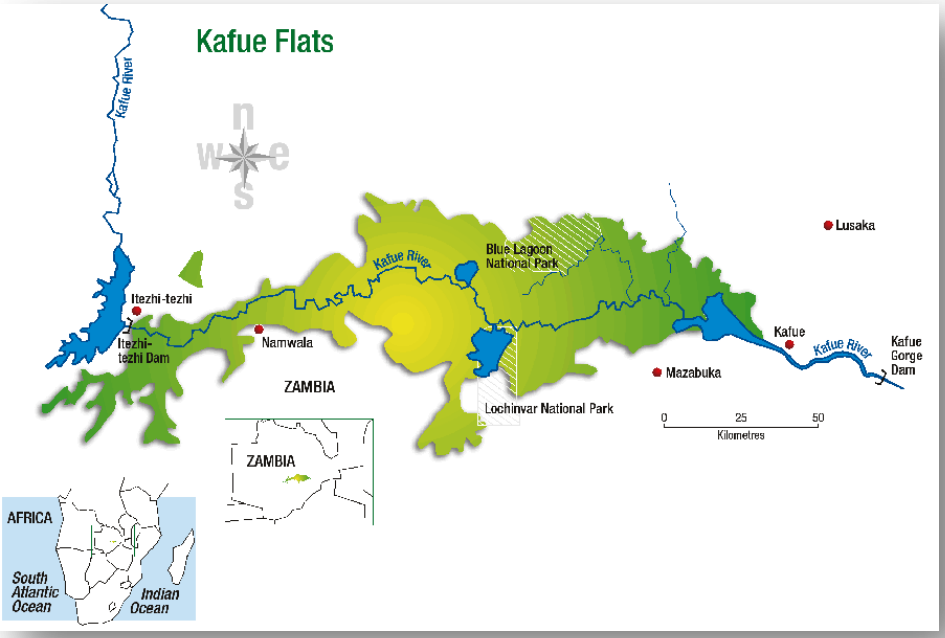

Figure 1: The Kafue Flats, Itezhi-Tezhi Dam and Kafue Gorge Hydroelectric Project

Source: ITT ESIA report, 2012

1.2 The ESMP Objectives

The proposed construction of the Itezhi Tezhi 120MW Hydropower station has potential environmental and social impacts associated with earth-moving, rock blasting, vegetation clearing, construction of access roads, establishment of residential camps for the workers, liquid and solid waste generated as well as with water diversions, abstractions and releases. Most of the impacts are likely to occur during the construction phase because of the intensity and extent of construction activities. It is anticipated that there will be minimal impacts during the operational phase of the project.

The ESIA report prepared for this project provides the project with specific information on the potential impacts identified and mitigation measures to be taken. This Environmental and Social Management Plan (ESMP), therefore, seeks to give a comprehensive plan on how the proposed mitigation measures will be implemented during construction and operation of the new power station. Therefore, the ESMP shall not be read in isolation, but together with the ESIA report.

This ESMP outlines the duties and responsibilities of the developer and the Contractor with respect to environmental management and protection during construction and operational phases of the power station. The requirements herein are based on the ESIA report which was prepared for the project, national environmental regulations and also takes into consideration the established international practices in project environmental management.

The ESMP defines that which the Contractor shall comply with all the requirements and the specific actions required roles and responsibilities for these actions, timetables for

implementation, and associated costs; as well as capacity building and training requirements for the implementation.

The Contractor shall carry out the specified environmental protection requirements to the approval of the Project Environmental Coordinator (ECO) or the Site Manager on behalf of ITPC (the employer). If so instructed by the ECO or the Site Manager, the Contractor shall implement additional mitigation measures payable under the applicable rates in the Work Schedule.

In this ESMP, environmental management activities and responsibilities are clearly outlined to ensure successful implementation, monitoring and subsequent audits of the project.

1.3 Limitations of the Management Plan

This ESMP relies on the information given in the ESIA report prepared by URS. The ESIA sites a number of limitations (Refer to the ITT ESIA report,2012 Section on Limitations as quoted below);

"The conclusions and recommendations contained in this Report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by URS has not been independently verified by URS, unless otherwise stated in the Report.

The methodology adopted and the sources of information used by URS in providing its services are outlined in this Report. The work described in this Report was undertaken between April 2012 and October 2012 and is based on the conditions encountered and the information available during the said period of time. The scope of this Report and the services are accordingly factually limited by these circumstances.

Where assessments of works or costs identified in this Report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

URS disclaim any undertaking or obligation to advise any person of any change in any matter affecting the Report, which may come or be brought to URS' attention after the date of the Report.

Certain statements made in the Report that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of the Report, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. URS specifically does not guarantee or warrant any estimate or projections contained in this Report".

1.4 Layout of the Management Plan

Environmental Management Plans will follow these specific environmental aspects are envisaged to be developed and incorporated as part of Construction and Operational management components of the ESMP:

- Water Quality Management Plan;

- Air Quality and Odour Management Plan;
- Waste Management Plan;
- Ecology Management Plan;
- Emergency Management Plan;
- Erosion and Sediment Control Plan;
- Traffic Management Plan;
- Health, Safety and Security Management Plan; and
- Archaeological and Cultural Management Plan (Chance-Find)

In addition, a Stakeholder Engagement Plan (**Appendix B of the ITT ESIA report 2012**) has been prepared as part of the ESIA development that outlines the processes used to engage and develop on-going relationships with Project stakeholders. This document will form a key part of the ESMP. Control of most environmental impacts is a function of correct operation and management of activities on site (ie. day-to-day environmental good practice on site). Successful application of environmental management plans relies on communication. It is essential that everyone on site is aware of the key issues, has the relevant information to deal with them, understands their responsibilities, and provides feedback to those in charge. Site personnel must know whom they can contact for advice in managing environmental issues and whom they can ask for training. Feedback is important for maintaining motivation and raising environmental awareness. All site personnel should receive site induction training including details of the site layout, site rules and emergency procedures before they start work on site. Training should be clear, brief and to the point. It is important to explain the reasons behind why an operative is required to follow a particular course of action. Personal responsibility/liability should be explained. Penalties for not observing the stated requirements, e.g. warnings and dismissal, should also be clearly stated. Topics relevant to the particular individual or group of individuals may, amongst others, include:

- Safe use of mobile and hand held equipment;
- Use of appropriate PPE (protective personal equipment) e.g. gloves, goggles, ear protectors;
- Environmental awareness, including soil/water protection measures;
- Ban on hunting or injury to wildlife on site;
- Pollution prevention (e.g. waste sorting, storage and disposal);
- Fire prevention;
- Safe driving practice (as applicable); and
- Ban on driving or operating equipment whilst under influence of alcohol or drugs.

All environmental management plans will provide detail as to the appropriate chain of notification and reporting requirements following the observation of an environmental or social incident. This will include recognition of any public, governmental and lender reporting requirements. The structure of management plans should, as practicable, follow the outline below;

Table 1: Structure of the Management Plans

Section	Contents
Introduction	• Background • Plan Objectives • Limitations of the Management Plan • Layout of the Management Plan
Project Description	• Project Details • Nature of Project • Location
Management Arrangements	• Roles and Responsibilities • Management Plan Distribution • Instruction and Training • Performance Indicators
Management Plan Arrangements	• Forecast Impacts / Management Actions • Record of Decisions Taken • Specific Management Actions • Opportunities for Waste Minimisation / Efficiency • Monitoring Arrangements

2.0 PROJECT DESCRIPTION

2.1 Project Scope

The Itezhi Tezhi Hydropower Project will establish a hydroelectric power plant on the existing Itezhi Tezhi Dam (ITT). The dam is located on the Kafue River, 295km upstream from its confluence with the Zambezi River. The ITT Dam was completed in 1978 to provide seasonal regulation to the flow of the Kafue River and expansion stable water supply to the Kafue Gorge Hydroelectric Project (currently in operation).

ITT is a rock fill dam with a maximum height of 51m, a crest length of approximately 1,400m and a total reservoir storage volume of 6,000Mm^3.

The flow of water over the dam is controlled by a gated spillway at the top of the dam wall. In addition to discharging through the main gates, during the original construction of the ITT, two river diversion tunnels (north and south tunnels) each with a gated intake were constructed in the southern dam abutment. Following completion of the dam, the southern diversion tunnel was closed to flow by a concrete seal plug. The northern diversion tunnel had a radial regulation gate installed in it to provide a Low Level Outlet for the reservoir.

The project involves the establishment of a 120MW hydroelectric power plant, immediately adjacent to the ITT, on the southern bank of the Kafue River (Figure 3-1). The southern diversion tunnel is proposed to be unplugged and the tunnel extended to connect to the plant.

After passing through the plants turbines, the flow will be discharged into the Kafue River, approximately 100m downstream of the northern diversion tunnel outlet. The power plant will be a base load system and, as such, the rate of discharge will be relatively constant over a 24 hour period. The increased discharge associated with the operation of the power plant will be coupled with an associated decrease in discharge through the main spillway to ensure overall flow patterns are not significantly altered by the Project.

Figure 2: Location of the Project

In addition to the power plant, the Project will also involve the development of a number of permanent ancillary facilities (Figure 3-2), including:

• A switchyard for the powerhouse;

• A construction workshop;

• An employee accommodation camp;

• A sewage treatment plant servicing the employee accommodation camp; and A water treatment plant (connect by pipeline to the reservoir) servicing employees and local residents.

During construction a range of temporary facilities will also be required, including:

• A construction workshop;

• A rock crushing site (excess rock to be sold to the local community);

• A explosives magazine; and

• A concrete batching plant.

Figure 3: Development locations of ancillary facilities for the Project

3.0 MANAGEMENT ARRANGEMENTS

3.1 Roles and Responsibilities

This section describes the organizational structure and responsibilities for implementation of the ESMP.

3.1.1 ITPC (The Employer)

The General responsibilities of ITPC will include:

- Assisting its contractors with the implementation of the ESMP;
- Monitoring and evaluating the operator's implementation of the ESMP;
- Monitoring key indicators of the Project's environmental impacts and performance;
- Reviewing plans, designs and strategies in relation to environmental, social and health considerations;
- Maintaining appropriate management systems and documentation;
- Preparing and submitting environmental and social documentation to government agencies and lenders as required;
- Following-up non-conformance situations to ensure they have been successfully addressed; and
- Adapting management policies and strategies through lessons learnt.

3.1.2 Itezhi Tezhi Hydropower Project Implementation Unit (PIU)/ Project Management Team (PMT)

The Project Management team will be responsible for the following:

- Establishment of an environmental unit, headed by the Project Environmental Manager (ECO) to implement ESMP responsibilities;
- Management, implementation, monitoring and compliance of the ESMP, ESIA and any approval conditions, including construction supervision and performance of all Project staff, contractors and subcontractors;
- Review of ESMP performance and implementation of correction actions, or stop work procedures, in the event of breaches of EMP conditions, that may lead to serious impacts on local communities, or affect the reputation of the project;
- Ensure effective communication and dissemination of the content and requirements of the ESMP to contractors and subcontractors;
- Assisting the contractor with implementation of ESMP sub-plans;
- Monitoring of ESMP and ESIA performance;
- Ensuring compliance to all project social commitments, including implementation of the social management and resettlement plans
- Report environmental performance of the project directly to ZESCO Management
- Report on environmental performance also to ZEMA and other government regulators as required
- Prepare environmental reports summarizing project activities, as required
- Representing the project at community meetings
- Ensuring effective community liaison and fulfilling commitments to facilitate public consultation throughout the project cycle;
- Monitoring of downstream impacts and any reports downstream such as decreased fish yields

3.1.3 The Contractor

The ESMP shall be read as a whole and not in part, and shall be adhered to in totality

- Preparation and implementation of the Construction and Worker Camp Management Plan;
- Preparation and implementation of the Waste Management, House-keeping plan
- Preparation and implementation of the Health and Safety Management Plan (HSMP) during construction; Ensuring that all construction personnel and subcontractors are informed of the intent of the ESMP and are made aware of the required measures for environmental and social compliance and performance;
- During construction, maintaining traffic safety along access roads, with special emphasis on high trafficked areas.

3.1.4 Supervising Engineer

The Supervising Engineer will have the following roles under this ESMP:

- Preparation and implementation of the Environmental Supervision Plan during construction
- Preparation and implementation of the Environmental Monitoring Plan during construction
- Supervision of contractor performance of implementation of the Construction and Work Camp Management Plan
- Reporting any incidents or non-compliance with the ESMP to the PIU/PMT
- Ensuring adequate training and education of all staff involved in environmental supervision
- Making recommendations to the ITPC PIU/PMT regarding ESMP performance as part of an overall commitment to continuous improvement

3.1.5 Environmental Coordinator (ECO)

ITPC (ZESCO and TATA Holdings) "The Employer", shall appoint an Environmental Manager or Environmental Coordinator (ECO) to take care of environmental and social issues during construction and project implementation. The ECO will lead the PIU Environmental team and will report to the Project Manager. The ECO will participate in all project meetings and the day-to-day running of the project. The ECO will be responsible for organization and scheduling of Task Teams' environmental and health awareness campaigns, monitoring and audits for various environmental aspects of the project as outlined in the ESIA report. The ECO will also serve as the community liaison officer to receive any complaints from the communities in the project area. The ECO will direct all complaints to the Project Manager or other appropriate officers for action.

The ECO will be responsible for monitoring compliance to all the outlined mitigation measures in the ESIA. Environmental monitoring will mainly concentrate on the following aspects of preventative, mitigation or potential impacts minimization measures during construction:

- site establishment
- excavations
- blasting
- use of heavy duty machinery
- waste management
- safety
- soil erosion
- noise and dust nuisance
- water pollution
- disturbance of archaeological and cultural sites
- deforestation
- wildlife
- general pollution
- downstream effects
- disruption of the socio-economic state

- employment and other specified benefits to local communities
- Conflict resolution between the project and the local communities

The Contractor is required to appoint an officer(s) who will be responsible for the management of environmental issues on site. The Contractor's environmental officer(s) shall ensure the implementation of the ESMP guidelines, prepare Action Plans, maintain close liaison with the Employer's ECO and will have meetings regularly.

3.1.6 **Safety Officer**

The Employer shall appoint a Safety Officer to monitor health and safety issues during project implementation. The Safety Officer(s) will be on site on full-time basis to ensure that safety standards are followed in the daily operations of the Contractor and he/she will report to the Project Manager. The Safety Officer will participate in all project meetings and the day-to-day running of the project. The Safety Officer will be responsible for organizing and scheduling of safety awareness meetings for the workers and the local people. The Safety Officer will collaborate with the ECO on many aspects and may hold joint meeting from time to time.

The Contractor shall be required to appoint safety officers who will be responsible for handling safety issues on site. The Contractor's Safety Officers shall ensure the preparation and implementation of the Health and Safety Action Plan (HSAP) and will maintain close liaison with the Employer's Safety Officer.

3.1.7 **Worker Code of Conduct**

As the various works are undertaken by the Contractor(s), it is imperative that the Construction Supervisor ensures that all workers on site comply with all laid down environmental mitigation measures in the EIA report. Therefore the Contractor shall prepare a well-articulated Code of Conduct. All the workers on site should have access to and fully understand the Code of Conduct.

The Contractor shall also conform to the cultural norms and traditions of the local people in order to work in harmony with the local people. The Construction Supervisor shall ensure that disputes between the contractor and the workers as well as among the workers are quickly and amicably resolved to ensure that work is not disrupted. A good code of conduct can save the Employer and the Contractor from unnecessary litigations and loss of man-hours.

3.1.8 ESMP Implementation Organisation Structure

The diagram below shows the organization structure for the implementation of the ESMP on the Project:

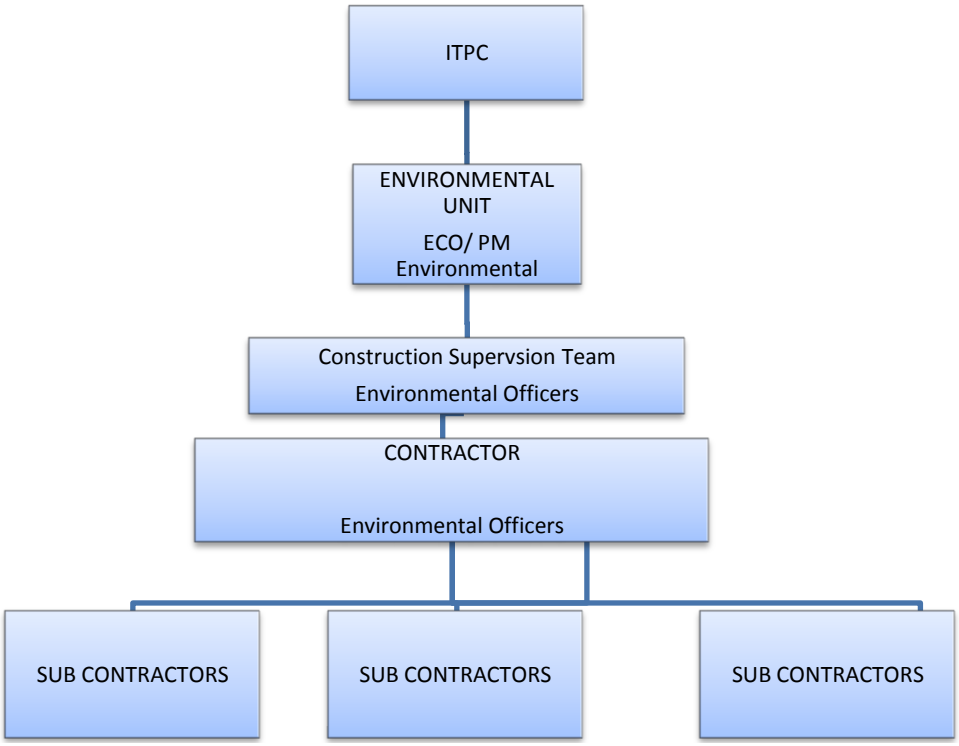

Figure 4: Organization Structure for ESMP implementation

3.2 Institutional and Legal Framework

ITPC carries the ultimate responsibility for ensuring that the Project and all supporting infrastructure are designed, constructed and operated in conformance with Zambian legislative requirements, IFC Performance Standards and General EHS Guidelines and industry best practice. Wherever available, Zambian standards will be adapted to the project, which will be supplemented by international standards and guidance as necessary.
In addition to the adopted policy, legislation, guidelines and standards, ITPC will be responsible for the implementation of appropriate environmental and social mitigation measures throughout the construction and operations stages of the project that will be documented in and activated through the PESMP.
Listed below are some of the institutions and Government offices that may be contacted whenever necessary to ensure successful implementation of the ESMP:

- Ministry of Mines, Energy and Water Development
    - Department of Water Affairs
    - Department of Energy
    - Water Board
    - The Energy Regulation Board
    - ZESCO Itezhi Tezhi dam
    - Mine Safety Department
- Ministry of Tourism and Arts
    - Zambia Wildlife Authority
    - National Heritage Conservation Commission
    - Ministry of Lands Natural Resources and Environmental Protection
    - Lands Department
    - Forestry Department
    - Zambia Environmental Management Agency
- Ministry of Labour and Social Security
    - Department of Occupational Health and Safety
- Local Government and Housing
    - National Water Supply and Sanitation Council
    - District Council – Itezhi Tezhi, Mumbwa, and Chibombo
    - District Commissioners – Itezhi Tezhi, Mumbwa, and Chibombo
    - Area Members of Parliament
    - Area Councillors
- Ministry of Education, Science and Vocational Training
- Ministry of Health
- Ministry of Works, Transport and Communication
    - Roads Department
- Traditional authorities (Chiefs and Headmen)

The Contractor shall comply with the provisions under the following legislation with respect to the Works under the Project:

(i) Environmental Management Act No12 of 2011 and its subsidiary legislations;
(ii) Natural Resources Conservation Act cap 315;
(iii) Zambia Wildlife Act No.12 of 1998
(iv) National heritage Conservation Act No 23 of 1989
(v) The Water Act;

(vi) The Lands Act;
(vii) The Forest Act No 7 of 1999;
(viii) The Fisheries Act
(ix) The Energy Regulation Act;
(x) The Electricity Act No 15
(xi) Town and Country Planning Act Cap 283;
(xii) Local Government Act;
(xiii) Mining and Explosives Regulations;
(xiv) The Factories Act Cap 441 and Cap 443; and
(xv) Any local and International legislation and procedures that may be applicable to the Project

4.0 IMPACT MANAGEMENT GUIDELINES

4.1 Water Quality and Management Plan

Water Quality Management Plan is an essential part of the project as the major resource in the ITPC hydropower generation project is water. In order to safeguard health / life of human, aquatic and riverine flora and fauna, water quality monitoring shall be paramount. The monitoring programme shall be set up, in which sampling sites, parameters to be analyzed and sampling frequency shall be clearly defined.

The Water Quality Management plan shall be governed by the Zambia Environmental Management Act, of 2011, Effluent Discharge Regulation, in particular, and The Water Supply and Sanitation Act, No. 28 of 1977, for drinking water and effluent Regulations. It is, therefore, advised that the water quality monitoring programme be formulated in following NWASCO Regulation Tools.

Available at: http://www.nwasco.org.zm/water_legislation.php .

- **Sampling Sites**- Initial sampling sites, for both Water and Sediment sites were established.

  (a) Upstream of the dam

  - Kafue Hook Bridge (Department of Water Affairs (DWA)/ZESCO Hydrological Station)(14.945,25.915))
  - Magazine Fishing Camp (Adjacent to Settled/Fishing Area) (15.738,26.012)
  - Water Treatment Plant Intake 1(Current Sampling Point for Drinking Water Source)(15.743,26.007)
  - ZESCO Hydrological Station (Tunnel Inlet Gates – South Gates)(15.772,26.016)

  (b) Downstream

  - Namwala Hydrological Station (DWA Hydrological Station) (15.674,26.445)
  - MusungwaHabour(ZESCO Hydrological Gauging Point)(15.764,26.03)
  - Wastewater Treatment Plant Outflow Point (Discharge Point for Wastewater Effluent)(15.759,26.042)

- **Sampling Methods**
  - Refer to method or use qualified personnel to sample the water. (Especially for bacteriological samples)
  - Methods shall be American Standard Methods for Water and Waste water Analysis. If other methods are used, this should be clearly mentioned in the results.
- **Sample Labeling and Recording**

  - Site Name, Number and GPS point.
  - Time of Sampling
  - All samples shall be recorded in sampling register book
- **Laboratory Analysis**
  - Samples shall preferably be analyzed at the University of Zambia, Environmental Laboratory or any other nationally recognized or internationally accredited water quality laboratory.

- **Results Reporting**
  - All results shall include methods used
  - Units used shall be those in the national and or international guidelines that include; ZEMA, NWASCO and WHO guidelines respectively
  - Abnormal results shall be reported to Project Manager and ITPC for further implementation and communication to ZEMA and NWASCO.
  - Quarterly Reports, on water quality results shall be submitted to NWASCO (refer to NWASO Regulatory Tools on website above)
  - Effluent quality results shall be submitted to ZEMA yearly

Sampling Site;

- Each sampling sites shall be stated by "Name, Number and GPS point (system code)" (for easy location by any sampling officers).
  - Sampling sites shall be fixed and remain as they are until after decommissioning
  - Unless need arises, new sampling sites may be established or decommissioned. These shall be as stated in main bullet above (Name, Number and GPS point with system code).

Parameters to be analyzed;

The water sample shall be analyzed for Physico-Chemical, Bacteriological as well as Sediment load.

Physico – Chemical: Raw water and effluent samples shall be analyzed for the following parameters

- pH
- Temperature
- TSS
- TDS
- Conductivity
- Total Hardness
- Calcium
- Magnesium
- Alkalinity
- Nitrate
- Nitrite

- Total Phosphate
- Sulphates
- Iron
- COD
- BOD
- DO

Bacteriological Water Samples: shall be collected from domestic water supply and analyzed for the following parameters

- Total Coliforms
- Faecal Coliforms

Sediment Samples shall be analyzed for;
Metals (Cu, K, Pb, Zn)

Other Water Quality Analysis (Specialised)

- It shall be important that water samples are collected at several agreed depths (E.g intervals of 5m in order to get results of DO, H_2S, Temperature (Thermal cline))
- Water samples shall be collected immediately before, shut-down, during maintenance and after maintenance (Frequency of sampling during maintenance shall be agreed upon between ITPC and Contractor).
- Training of employees in Water Quality Management.

Table 2: Summary of Water Quality Management

ASPECT /IMPACT	MITIGATION	RESPONSIBLE PERSON	PERFOMANCE INDICATOR	PERFORMANCE TARGET	FREQUENCY OF MONITORING	INSTITUTION / TRAINING
Oil Spills and oil leakages - Contamination Pollution	Oil separation traps at vulnerable sites. Good Plant machinery maintenance, Encourage cleaner production.	Contractor, Fuel attendant, ITPC	Oil content in water	No traces of oil in water	Visual - everyday 1 water sample / Month for Laboratory	In house, housekeeping rules. In-situ oil content analysis. Field Equipment training.
Effluent – Pollution	Divert all effluent to stabilization ponds. Avoid overflows	Water TRT Plant Attendant, Contractor, ITPC	Nutrient Loading N and P, Eutrophication Noxious / invasive weed	Comply with NWASCO/ ZEMA guidelines on effluent discharge into the environment	Visual – everyday. 1 water sample / month N, P, COD, BOD	TRT Plant operations. Sample collection and storage. NWASCO and UNZA
Chemical and other foreign Substances – Contamination and pollution	Avoid spills. Work within confined areas. Good housekeeping of work areas Encourage cleaner production	Contractor, end user, ITPC,	Existence of polluting chemical	Comply with NWASCO/ ZEMA guidelines on effluent discharge into the environment	Visual – everyday,	In house. House keeping
Soil Erosion - Sediment Load	Design sedimentation troughs / tanks along drainages Plant appropriate indigenous grass	Contractor ITPC	TSS, TDS, Conductivity, Turbidity.	Comply with NWASCO/ ZEMA guidelines on effluent discharge into the environment	Visual - everyday	Training in sediment sampling

	or shrubs in steep slopes					

4.2 Air and Odour Management Plan

In accordance with the Environmental Management Act (EMA) of 2011, Air Quality and Odour Management is the responsibility of ITPC. This responsibility includes the characterisation of baseline air quality, the management and operation of ambient monitoring networks, and the development of emission reduction strategies. The main objective of the AQMP is the protection of the environment and human health, in a sustainable (economic, social and ecological) development framework, through reasonable control measures.

Air quality management involves pollution minimisation, management and prevention, improving air quality in areas where it is poor, and maintaining it where it is good. It is in this context that ITPC initiated the development of this Air Quality Management Plan (AQMP).

The purpose of developing an AQMP is to ensure that ITPC meets its obligations as required by the EMA. The AQMP will initiate best practices in air quality management and ensure cost-effective and equitable reduction of emissions. This will improve air quality and reduce environmental and health risks in the project area.

The main goals of this AQMP are to:

- Achieve and sustain acceptable air quality levels in the project area;
- Minimise the negative impacts of air pollution on people's health and well-being and on the environment;
- Promote the reduction of greenhouse gases in support of climate change protection programmes; and
- Reduce the extent of ozone-depleting substances in line with national and international requirements.

The specific objective of the AQMP is to promote cleaner production processes and continuously improve best practices relating to air pollution prevention and minimisation.

Scope

The AQMP is the management and performance monitoring tool for air quality control and provides the basis for assessing air quality. The assessment of various categories of air pollutants is included in the plan, for instance toxic and odoriferous substances, Green-house gases and ozone-depleting substances.

This AQMP includes: Targets and projections that are linked to the best abatement measures;

- A source inventory, which is a comprehensive, accurate and current account of air pollutant emissions and associated data from specific sources over a specific time period;
- An air quality management information system containing air quality data that are compatible with acceptable modeling requirements and management information system requirements;
- The investigation of the critical implications of the AQMP for human resources, training and costs in order to develop a practical and feasible AQM system.

A baseline assessment of Odour, air pollution concentrations and air quality management practices in the project area will be done, and an inventory of national and provincial requirements for AQMP development will be drawn up. The following will be taken into account:

- Operational and functional structure requirements;
- Air quality management system component requirements;
- Source identification and prioritisation;
- Implementable emission reduction measures ;
- Mechanisms for facilitating interdepartmental cooperation in the identification and implementation of emission reduction measures for certain sources; and
- Human resource development (training) requirements

The integration of technical evaluation and public issues was considered paramount in the AQMP development process to ensure that the project team did not function in isolation. The AQMP development process was divided into three components for planning and administrative purposes, namely a technical process, an advisory process and a consultation process. The technical process was the responsibility of the technical members of the project team, and comprised information syntheses, issue analyses and document drafting. The advisory process included cooperation between the project team and the Stakeholder Group. The consultation process included the dissemination of information, invitations for public participation, the organisation of discussion workshops, and the collection of comments for communication to the technical team.

Main pollutants and their sources

The first step in designing an ambient air quality monitoring network is to identify the main pollutants of concern and the priority areas potentially affected by the pollutants. The table 5-2 below provides a summary of the main pollutants and potential impacts. The table also shows the responsible persons, performance targets, performance indicators, the monitoring schedule and training requirements.

Table 3: Summary of Air and Odour Management

No.	ASPECT/IMPACT	MITIGATION measures	RESPONSIBLE PERSON	PERFORMANCE TARGET	PERFORMANCE INDICATOR	FREQYUENCY OF MONITORING	TRAINING/ INSTRUCTIONS
1	Dust and particulate matter Produced during earthworks and stockpiling.	Work areas and stockpiles will be monitored for dust generation and stabilized using mats, grass or mulch. Stockpiles will be strategically located depending on wind direction and shall be covered. Wind breakers shall be provided in extreme situations. Excessive dust shall be mitigated by measures such as wetting the exposed surfaces)	Contractor	keep dust and particulate matter within acceptable parameters following ZEMA guidelines	Amount of dust emissions Number of complaints from the receiving environment Wind speed	During earth works and stockpiling	Specialised training in Air quality Mangement

		earthworks will be stop when					

		there are extremely high winds Two dust monitoring stations will belocated on strategic site boundaries close to sensitive receiving environments					
2	Dust and particulate matter generated by rock blasting and concrete crushing	Blasting sites shall be isolated. Blasting will be postponed during high wind periods. Blasting shall be undertaken at specific and agreed times. Develop a Blast Management System	Contractor ITPC	keep dust and particulate matter within acceptable parameters during blasting and concrete crushing following ZEMA guidelines Adherence to BMS Guidelines	Amount of dust emissions Number of complaints from the receiving environment Wind speed Blasting Report	During blasting and concrete crushing	

3	Dust and particulate matter generated by the removal of vegetation cover	Indiscriminate removal of vegetation cover will be prevented in order to minimise the loss of vegetation. Land reclamation and re-vegetation will be done after construction works Cleared vegetation will be used as Dust suppressors and for re-vegetation.	Contractor	keep dust and particulate matter within acceptable parameters during the removal of vegetation cover following ZEMA guidelines	Amount of dust emissions Indiscriminate removal of vegetation cover	During the removal of vegetation cover	
4	Dust and particulate matter generated by movement of construction vehicles. .	Vehicle movements will be controlled on site and restricted to designated road. Vehicles will be cleaned of mud on before they enter public roads to minimize dust Vehicle	Contractor	control dust and particulate matter emissions and traffic speed	Amount of dust emissions Mud on vehicle types Speed of vehicles	Daily	

		movements on site will be limited to 20km/hr. All movements of trucks carrying spoil will be Covered. Dust suppression methods such as Wetting unpaved roads during dry and windy Conditions.			Uncovered trucks carrying soil Dry unpaved roads during dry and windy Conditions.		

4.3 Waste Management Plan

During the construction and operational phases of the Hydropower plant, various waste types such as concrete, steel bars, bolts, nuts, cables, cable drums, waste oils, paper, plastics, woody vegetation and domestic waste will have adverse impacts on the environment. All waste (liquid and solid) arising from direct or indirect project activities will have to be managed in a proper manner under the charge of the ECO and Site Manager. In order to have a well-coordinated waste management system, a Waste Management Plan has been developed.

This Waste Management Plan specifies the procedure for the management, control and disposition of items designated as waste material resulting from the project activities. The following is a list of the different categories of materials that will be generated during the project:

a. Reusable Materials
b. Recyclable Materials
c. Waste/Refuse Materials

The procedures for the management, control and disposition of these items are described in subsequent sections of this plan. All contractors and subcontractors are required to identify, maintain proper control, and provide documentation for the disposition of materials described in this plan.

This Plan has been developed taking into account national legislation and international best practices. National legislation, namely the Waste Management (Licensing of Transporters of Waste and Waste Disposal Sites) Regulations, 1993 (SI No. 71 of 1993) requires that waste from all sources must be collected, gathered and treated in order to eliminate or reduce their adverse effects on health, natural resources and environmental quality.

Impacts can arise throughout the waste management supply chain and therefore generation, storage, collection/transport, reuse, recycling, recovery, treatment and disposal all require appropriate consideration. Wherever possible, wastes should be managed within the closest proximity to the site of production. The waste hierarchy approach was adopted in this waste management plan.

The main types of waste expected to arise from the construction and operation of the proposed hydroelectric scheme are described below.

4.3.1 Construction

The main construction works to be undertaken as part of the project will comprise:

- construction of above-ground infrastructure including tailrace, construction workshop, power house etc.;
- construction of permanent accommodation camp and associated potable water supply system and sewage treatment plant;
- tunneling to form the new head race and surge shaft;
- Dredging of sediments from an area adjacent to the SDT intake.

The main waste generating activities will be those associated with excavation of rock for the foundation of the new power house, dredging of sediments and general construction waste.

4.3.1.1 General Construction Waste

The construction activities will require the use of a range of plant and equipment that will require maintenance, refueling and storage when not in use. Typical waste streams are likely to include general wastes, discarded equipment, batteries, oily wastes, oil contaminated wastes, fuel and spill response waste. Such activities will generate relatively small quantities of waste although some streams may require specialised handling.

The construction activities will generate waste in the form construction material packaging; damaged surplus or off-specification materials; and general waste from site offices and workforce amenity areas.

During construction, 500 workers are expected to be on site. Although it is anticipated that the workers will not live on site, site offices, rest rooms and welfare facilities are expected to be provided. Domestic waste will be produced by the on-site workers, comprising food waste and miscellaneous waste from welfare facilities, offices etc. This is assumed to be around 1 kg per person per day, which equates to 0.5 tonnes per day across the site. Small quantities of hazardous waste and clinical wastes are also expected, which will require special handling arrangements.

Waste generated from any accommodation camp will be dealt with in the same manner as the on-site waste.

4.3.1.2 Waste from Dredging

The dredging of sediment from the lake-bed is likely to give rise to significant quantities of waste requiring disposal.

4.3.1.3 Excavation Waste

Excavation in rock will be for the new headrace tunnel, surge shaft, penstocks and power house foundation.
The quantity of excavated rock is anticipated to be approximately 140,000 m^3.

4.3.2 **Operation**

Impacts during operation are likely to be limited to:

- waste generated from routine maintenance of the power house and associated generation and transmission plant;
- routine maintenance of vehicles and other electromechanical equipment off the power plant and general waste from offices including waste packaging materials
- trash removed from inlet screens;
- domestic waste from the accommodation camp; and
- Sewage sludge from the STP.

Table 4: Summary of Waste Management Plan

Aspect/Impacts	Mitigation Measures	Responsible persons	Performance target	Performance indicator	Frequency of monitoring	Instruction/ Training
Contamination of soil and water by hazardous waste/contaminants (e.g used oil, PCBs)	Used oil to be collected in UN Certified drums and stored in designated well bunded sites	ITPC/ Contractor	All used oil to be collected in UN Certified drums and put away at designated site for final disposal	Record of quantities of used oil collected in drums temporarily stored and disposed of. as per ZEMA guidlines	Throughout Project Construction and operation phases	Training in hazardous waste management
	Ensure that machinery and equipment are kept in good working condition.	ITPC/Contractor/ Sub contractor	All machinery and equipment kept in good working condition	A record of machinery and equipment kept in good working condition as per ZEMA guidlines	Throughout project Construction and operation phases	
	Ensure that repairs and maintenance works are carried out in designated workshops with well-maintained concrete floors	ITPC Contractor/ Sub contractor	All repair and maintenance works are carried out in designated workshops	Record of number of repair and maintenance works carried out in the designated workshop as per ZEMA guidelines	Throughout project Construction and operation phases	
	All spillages to be treated as emergency and reported	ITPC/Contractor/ Sub contractor	No spillages of hazardous waste	Record of spillages of hazardous waste and methods of treatment as per ZEMA guidelines	Throughout project Construction and operation phases	
	Hazardous waste to be collected and treated by suitably qualified	ITPC/Contractor/ Sub contractor	Hazardous waste treated/ appropriately disposed	Record indicating methods of treatment/disposal as per ZEMA	Throughout project Construction and operation	

	persons.			guidelines	phases	
	Ensure that all new equipment to be installed are PCB free	ITPC/Contractor	All equipment installed to be PCB free,	Manufacturer's specifications/ PCB test results as per ZEMA guidelines	Throughout project Construction and operation phases	
	Dredged material to be disposed of in confined sites	ITPC/Contractor	Dredged material confined and tested	Test Result for dredged material	During construction phase	
	Develop Hazardous waste management guidelines	ITPC	Adherence/ compliance to developed hazardous waste management guidelines	Hazardous waste management guidelines/ compliance level to waste management guidelines	Compliance monitoring during construction and operation phases	
Decomposition and foul smell from Domestic waste.	The contractor to provide receptacles/bins and ensure that all litter is disposed of in the bins	ITPC/ Contractor	All domestic waste disposed of in appropriate receptacles	Waste not disposed of appropriately in receptacles/bins	Throughout project Construction and operation phases	
	Disposal of waste at designated site approved by the local authority	ITPC/ Contractor	All waste disposed of at approved site	Signed Waste disposal log sheet	Throughout project Construction and operation phases	
	provide waterborne toilets for use by all the project construction staff. As a temporary measure mobile toilets and	ITPC/ Contractor	All work sites to have VIP/ waterborne toilets for construction and other staff	Number of Toilets constructed and used at each work site	Throughout project Construction and operation phases	

	Ventilated Improved Pit latrines (VIPs) can be used while permanent water borne toilets are being constructed. Separate toilets should be provided.					
	Develop waste management guidelines	ITPC	Adherence/ compliance to developed waste management guidelines	waste management guidelines/ compliance level to wastemanagement guidelines	Throughout project Construction and operation phases	In house training in waste management
Littering from on-site waste	Segregation of waste material according to waste streams	ITPC/ Contractor	All waste sorted and segregated	Record of types/a\quantities of waste streams	Throughout project Construction and operation phases	
	Reuse/ recycling of certain waste material (e.g metal off cuts, nuts and bolts, and empty bag and packaging materials). No burning of waste to be allowed	ITPC	Re use/ recycling and recovery of some waste material	Record of reuse/recycled and recovered waste material	Throughout project Construction and operation phases	
Accumulation of excavated waste (Rubble)	Segregation of rubble according to type and size	Contractor/ Sub contractor	Excavated materials sorted	Record of quantities of excavated materials sorted	Throughout construction phase of the project	

	Stockpile at appropriate site near the crusher for crushing into assorted aggregate for construction	Contractor/ Sub Contractor	30% of excavated materials to be re used	Record of quantities of material stockpiled	Throughout construction phase of the project	
	All rubble not required to be disposed of at approved site (e.g Decommissioned quarry)	Contractor/ Sub Contractor	All rubble not required disposed of at approved site	Signed Waste disposal log sheet	Throughout construction phase of the project	
Contamination of soil/water by sewage sludge	Ensure proper treatment of sewage	ITPC	Ensure appropriate treatment of sewage sluge before final disposal	Record indicating quantities, methods of treatment/disposal	Throughout the operation phase of the project	Training in sewage treatment

4.4 Ecological Management Plan

The project will have a number of impacts on the ecological system of the area. Destruction of the vegetation around the project site is one of the obvious impacts of the project. However, destruction of individuals of plant species and other herbaceous species will not have any significant impacts on their local population levels as these species are widely distributed throughout the Miombo ecoregion. Clearing of vegetation may also induce soil erosion from runoff rain water considering that the power house will be located at the foot of the hill. This may increase the sediment load and siltation downstream, thereby affecting the riverine ecosystem and the aquatic life. However, the impact is not expected to be severe as the riverine ecosystem is well re-vegetated and therefore will provide for soil erosion prevention.

As for the fauna, the impact of the project will vary from species to species. This is because these animals will be affected differently by the project. For example, some will be affected by noise pollution (e.g. *Loxodonta africana*) while others will be affected through habitat destruction (e.g. *Procavia* spp). Generally, excessive noise affects all wild animals as they are always alert guarding against predators and enemies. In addition to noise impacts, the probable influx of people at the hydro construction site may affect wildlife through illegal hunting/capture of game animals and further degradation of the habitat. The project is likely to affect the animals that often traverse around the project site namely; Rock Hyrax, Elephant, Buffalo, Waterbuck, Puku and Impala. Human and animal conflict already exists as highlighted in the ESIA.
.
This section applies to all works that may cause risks or impacts to the ecological system, or natural resources in the project area. Possible sources of impacts include:

- Vegetation clearance;
- Pollution of water, air and soil;
- Hunting or fishing;
- Earth movements and excavations; and
- Noise.

The objective of this management plan is to prevent, minimize, or mitigate adverse impacts to natural resources and ecosystems, (including flora and fauna) that are related to project activities in the area of influence, including:

- Climate and Soils;
- Vegetation-Woodlands and grasslands dominating the vegetation of Itezhi-Tezhi District; and
- Fauna- The project site is very close to Kafue National Park and is within the Nkala Game Management Area

The project site is very close to Kafue National Park and is within the Nkala Game Management Area (GMA). Nkala GMA was established to provide for the sustainable use of wildlife resources through effective management of their habitats. Additionally, the GMA was designed to benefit both the local communities and wildlife through joint wildlife management between the local communities and ZAWA.

Table 5: Summary of Ecological Plan

Impact/ Issue	Mitigation Measures	Responsible persons	Performance targets	Performance indicators	Frequency of monitoring/ Timing	Instruction /Training
Woodland destruction due to clearing for construction	Only areas needed for civil works will have trees cuts - ecological restoration	contractor	Vegetation preservation	Method of clearance	During site preparation	Awareness campaigns and induction programmes.
Habitat destruction for species like Rock Hyrax due to vegetation clearing	Excavation will be restricted to only the project site to leave enough habitat for associated animals	Contractor	Habitat preservation	Method of clearance	During construction	Awareness campaigns and induction programmes
Heavy duty clearing and construction equipment will cause local noise disturbance on biodiversity ¤	- Machines and equipment to have noise control device -construction equipment maintained in good working condition - Speed limits - Scheduled blasting	Contractor	Noise reduction	Noise levels standards	During Construction	Awareness campaigns and induction programmes

Soil erosion due to Excavation and other civil works on the project site	-Land clearing and excavation will be carried out in the dry season	Contractor	Maintain soil structure	Land degradation	During construction	
Contamination of water due to accidental spillage of oils & lubricants	Storage of oil and diesel in designated places fitted with separation traps	ITPC/ Contractor	Avoid spillages and leakages	Visual spills	During construction and operation phase	Training all workers in oil & lubricant handling
Clearing of vegetation and excavation may have an effect on both terrestrial & aquatic biodiversity	Only areas needed for civil works will be cleared	Contractor	Preserve biodiversity	Specific area cleared	During Construction	
Injury/indiscriminate killing of wildlife. Migration and reduction of wildlife populations	Only ZAWA guided and authorized hunting to be allowed Signage indicating the prohibition of fishing and/or hunting prohibition should be	Contractor	Preserve wildlife	Level of poaching	During construction and operation	

	installed.					
Over fishing increased demand for fish/ Depletion of fisheries resources	Only Department of Fisheries guided and authorized fishing to be allowed	Contractor/ITPC	Preserve fish stock	Level of fishing activities	During construction and Operational phase	

4.5 Traffic Management Plan

The scope of this Transport Management Plan includes the provision for the safe movement of vehicular and pedestrian traffic, the protection of workers from passing traffic, the provision for access to properties located within the limits of the construction site, the design, construction, maintenance and removal of any necessary temporary roadways and detours, the provision of traffic controllers, the installation of temporary signs, road markings, lighting and safety barriers.

It also covers maintenance of the existing road corridor, including the existing road and road shoulder that may be used for the temporary diversion of traffic, over the duration of the construction works. Sections of this Plan include the following:

- Details of traffic routes used by construction vehicles.
- The number and type of vehicles to be used in the construction of the project, and their movements to, from and within the site per day.
- Minimum requirements for vehicle maintenance to address noise and exhaust emissions.
- Speed limits to be observed along routes to and from the site.
- Behaviour requirements for vehicle drivers to and from the site and within the site.

Vehicles will be required to access the site both during the construction and operational phases of the project, affecting the existing traffic and transport conditions. The Project is not anticipated to impact upon any existing air or water-based transport systems. As such the plan will only focus on road transport system.

During the construction phase a combination of goods and materials transfer will need to be brought to site to aid development. Materials will be transported via road, primarily from Lusaka. It is not anticipated that any goods would be flown in to local airports or that employees would come to the site via aeroplane.

The range of construction vehicles required across the various project sites includes:

- bulldozers;
- graders;
- loaders;
- compactors;
- excavators;
- fuel Tankers;
- cranes (number of sizes);
- forklift trucks (number of sizes);
- water tankers;
- trucks/trailers (including Heavy Goods Vehicles);
- cars; and

- buses.

The larger heavy-construction associated vehicles are likely to be limited to use at the power plant / switching yard site. Smaller construction sites (e.g. the upgrade of the water treatment plant) are likely to require use of lighter construction vehicles (e.g. trucks, cars). The majority of these vehicles (particularly heavy construction vehicles), once present on the construction site, will be securely stored on-site until the end of the construction phase, and are unlikely to significantly impact local traffic levels.

In contrast, transport of construction goods and materials on-site and off-site (e.g. disposal of excess rock material following rock breaking) will be on-going throughout construction, as will the daily transportation of workers. Transport of goods and materials (e.g. concrete, steel, piping) is likely to be done by Heavy Goods Vehicles (HGVs). Peak weekly transport levels of heavy vehicles from Lusaka to Itezhi-Tezhi is anticipated to be a two vehicle trips per week, over the 3.5 years proposed construction timeframe. This peak volume is considered to be relatively low and is unlikely to significantly affect traffic flow conditions and rates. However, given the condition of the local roads, and the number of pedestrians utilising the roads, any traffic of HGVs is considered to pose a risk to communities that live adjacent to these roads.

Construction works will require daily ingress of workers to and from the construction sites. Unskilled workers employed from the surrounding local communities (approximately 420 employees) will be picked-up and dropped off by bus. This will require at most six bus trips per day. Semi-skilled/skilled and project management staff (approximately 80 employees) will reside either in ITPC / ZESCO owned properties within Itezhi-Tezhi town or within the proposed operational workers camps once its construction is complete. These employees will access the site via bus or car.

During operation, Project vehicles movements will be limited to:

- daily employee access to the power plant from the worker camp in Itezhi-Tezhi town;
- occasional maintenance trips to ancillary facilities; and
- transport to and from Lusaka as required.

Table 6: Summary of Traffic Management Plan

Aspect/Impacts	Mitigation Measures	Responsible persons	Performance target	Performance indicator	Frequency of monitoring	Instruction/ Training
Increased traffic congestion on public roads	Development of a Traffic Management Plan detailing appropriate vehicle movement procedures and driver training.	ITPC/ Contractor	Controlled traffic congestion on public roads	Well-articulated Traffic Management Plan which is followed	Throughout project construction and operation phases	In house training and staff induction on requirements of the TMP
	Drivers shall follow approved haulage routes and not deviate except in the case of emergency	ITPC/ Contractor	All Heavy Goods Vehicle follow approved haulage routes	Number of inspection conducted	During Construction phase	In house training and staff induction on requirements of the TMP
	Controlled movements where construction vehicles exit/enter public roads.	RATSA/ITPC/Contractor	All construction vehicles enter/ exit public roads at designated points	Number of inspection conducted	During Construction phase	Induction of staff on requirements of the TMP
	Minimise off-site traffic movements, particularly during peak traffic periods	ITPC/Contractor	Minimize off site traffic movement during peak traffic period	Recorded number of vehicles on the roads during peak traffic period	During Construction phase	Induction of staff on requirements of the TMP

	(i.e. around school times).					
	Buses provided to transport worker to and from construction sites/worker camps/villages	Contractor	Minimize congestion on public roads	Number of construction workers transported by buses to and from construction site/worker camp/villages	During Construction phase	Induction of staff during induction
Increased accidents as a result of Project vehicles movements	All construction vehicles shall be maintained in good working order (e.g. brakes, tyres and indicators).	Contractor.	Maintain all Construction vehicles in a good working condition	Service record for each construction vehicle	During Construction phase	
	All drivers of construction vehicles to be fully trained and qualified to operate and maintain the vehicles they drive and ensure safe driving practice.	ITPC/Contractor	Ensure that all drivers of construction vehicles are qualified	Certification for all construction vehicle drivers	During construction phase	Specialized training in operating certain equipment
	Prohibit useof Alcohol/drug by drivers and operators of	ITPC/ Contractor	Prohibit use of alchohol/drugs by drivers and operators of	Results of alcohol/ drug test on the driversand	During construction	In house awareness campaigns on dangers

	construction vehicles.		construction vehicles	operators of construction vehicles		of drunken driving and use of drugs by drivers
	Develop an Emergency Response detailing the roles and responsibilities of individuals in the event of an accident.	ITPC/Contractor	Ensure all emergencies are responded to appropriately in the shortest possible time	Record of emergency responses	During construction and operation phase	Training in first Aid
	Sensitization oflocal community about anticipated increased traffic levels and the duration of works.	ITPC	Sensitized local community operation of the contractor	Reports on sensitization campaigns	During construction phase	Awareness campaigns
	Schools to be sensitized on road and site safety	ITPC/RATSA	Sensitized schools on road and site safety	Reports on sensitization campaigns	During construction phase	Awareness campaigns
	Drivers will follow approved haulage routes and not deviate unless in the case of emergency.	Contractor	All Heavy Goods Vehicle follow approved haulage routes	Number of inspection conducted	During constructionphase	In house training and staff induction on requirements of the TMP

	Construction vehicles adhere to agreed speed limits both on-site (40km/hr) and off-site	ITPC/ Contractor	Construction vehicles adhere to agreed speed limits both on-site (40km/hr) and off-site	Inspection report	During construction phase	In house training and staff induction on requirements of the TMP
	All heavy vehicles entering and leaving the site that are carrying loads will be covered	ITPC/ Contractor	All heavy vehicles entering and leaving the site that are carrying loads will be covered	Inspection reports	During construction phase	In house training and staff induction on requirements of the TMP
	Traffic entering the site will be directed to the appropriate area for example staff and visitors to the car park by appropriate signage or traffic control.	ITPC/Contractor	Ensure traffic control protocols are followed	Inspection report	During construction	In house training and staff induction on requirements of the TMP
Increase noise, vibration and disturbance associated with increased traffic levels	Construction vehicles will be maintained in good working order in accordance with	Contractor	All construction vehicles maintained in good working order in accordance	Service record for each construction vehicle	During construction phase	In house training and staff induction on requirements of the TMP

	manufacturer's requirements to minimise noise		with manufacturer's requirements to minimize noise			
	All reasonable and practicable, noise controls (e.g. low-noise mufflers) will be installed and maintained on construction vehicles and equipment	contractor	Where practicable, all construction vehicles installed with noise controls	Number of construction vehicles installed with noise controls	During construction	
Alteration to existing road networks or temporary diversions leading to increased risk of accident or delays	Provision of sufficient road warnings, speed limits, and detour signage on public roads in close proximity to construction works	ITPC/Contractor	Ensure sufficient road warnings, speed limits, and detour signage on public roads in close proximity to construction works	Inspection reports	During construction	
	Adequate road side signage / safety markers shall be provided warning drivers of speed limits, detoursand the	ITPC/Contractor	Ensure Adequate road side signage / safety markers shall be provided warning drivers of	Road inspection report	During construction	

	presence of road works.		speed limits, detoursand the presence of road works.			

4.6 Cultural and Archaeological Management Plan

Archaeological and Paleontological materials (artifacts) are very important as they give an insight into Zambia's ancient past. Artifacts may be in form of:

- Rock paintings or engravings
- Pottery
- Ironworks, slag or other metal-craft
- Beads, bangles or other personal adornments
- Stone implements
- Human bones
- Fossils
- Or any other thing that seems to be records of the past life.

The National Heritage Conservation Commission (NHCC) is responsible for the identification, recovery and/ preservation of both movable and immovable heritage sites and objects in accordance with the local and International conventions that Zambia is party to on Cultural Heritage resources protection. Any artifacts that may be discovered during excavation works shall be brought to the attention of NHCC.

During the ESIA study undertaken by URS, a desktop review of cultural heritage resources found in the project area was undertaken. The purpose of the study was to document cultural heritage resources that have been identified already from the studies done in the past and to determine the likelihood of heritage resources occurring in the project area for purposes of conservation, management, preservation and sustainable development of the power plant.

The desktop study revealed that the Itezhi-tezhi area had a fairly detailed archeological and cultural heritage surveys conducted prior and during the Dam construction phases in the 1970s. These studies provide a comprehensive and complete history and archeology of the area in relation to the development of mankind, tool making cultures such as the culture, agriculture, diet and settlement patterns, political and socio-economic dynamics over several thousands of years.

The desktop study also revealed that the anthropologists, archeologists and historians discovered a lot of archaeological, prehistoric and other relic/ fossil materials which included human bones, ancient settlements, stone tools, beads, potsherds, iron tools and copper implements dating over 700 years ago. A total of 153 Late Stone Age, Middle Iron Age and Recent Iron Age archaeological sites were documented.

The desktop study, however, pointed out that all the documented archaeological/ cultural heritage sites are over 1000m from the area where the Itezhi-Tezhi power plant will be constructed. This is due to the fact that the area in question is was seriously disturbed during the construction of the Itezhi-tezhi Dam in 1973-6, within which period the cultural and archaeological heritage researches were on the ground.

However, it is considered that perhaps some material of archaeological or cultural heritage significance could by chance be present beneath the earth of the project site. During excavation works, there is a possibility, though slim, that some cultural heritage

materials could be found. Hence, appropriate chance-find management plans need to be put in place.

4.6.1 Objectives of the Cultural Heritage Management Plan

The main objective of this Cultural Heritage Management Plan is to outline how best to document, conserve, preserve, present and manage Cultural Heritage resources, should they be found during the development of the project, to ensure the cultural heritage of Itezhi Tezhi and the country as a whole present for the benefit of both present and future generations.

4.6.2 Potential Impacts of the Project on Cultural Heritage Resources

Although there were no sites with heritage resources found in the immediate project area during the studies undertaken in the past, there is still a possibility that some heritage resources could be found during project implementation. Excavation works at the proposed power station site and other sites in the project area may lead to the discovery and/or destruction of heritages resources that could have been buried underground over the years. This may include archaeological, prehistoric and other relic/ fossil materials including human bones, ancient settlements, stone tools, beads, potsherds, iron tools and copper implements.

Other objects of cultural importance which may be impacted upon by the project activities are the graveyards or cemeteries (burial site). Although there are no know burial sites in the immediate project area, care should be taken to ensure that burial sites are not disturbed in anyway. Local people should be consulted as they know the locations of the current and past burial sites.

To ensure the preservation of the cultural heritage in the project area, the following guidelines shall apply during construction:

(a) In carrying out the Works, the construction team shall comply with the provisions of Zambian law on cultural and national heritage (National Heritage Conservation Commission Act);

(b) The Contractor shall ensure that key members of his staff are familiar with archaeological and paleontological materials likely to be found in the project area;

(c) Should the construction team expose any archaeological artifacts during excavation, work shall cease immediately and the Site Manager or ECO notified as soon as possible. The Site Manager shall liaise with the NHCC for advice on how to preserve or transfer the artifact. Under no circumstances shall archaeological artifacts be removed, destroyed or interfered with by the construction team.

(d) Workers should be sensitized on the need to preserve any heritage resources which they may come across in the course of their work.

An officer from the NHCC may be required to visit the project site during major excavation works to ensure the recovery of any such items that may be present in the project area.

The project site is located in a rural set-up, hence, there is need for the Contractor to respect the cultural norms, beliefs and property right of the local community.

With respect to social and cultural values, the following guidelines and rules shall apply:

(a) The construction team shall conduct their operations in a manner that will not upset the social, cultural and religious order of communities in the project area. Local traditional beliefs shall be respected;

(b) In the interest of harmony and good public relations, the Construction Supervisor in collaboration with the Site Manager and the ECO is strongly encouraged to develop rapport with local chiefs and traditional leaders through regular consultations and communications;

(c) Graveyards, cemeteries, burial sites, human remains may not be intruded upon during construction;

(d) The construction team is prohibited from entering places considered to be sacred, such as traditional shrines.

Table 7: Summary of Cultural and Archeological management plan

No.	ASPECT/IMPACT	MITIGATION measures	RESPONSIBLE PERSON	PERFORMANCE TARGET	PERFORMANCE INDICATOR	FREQUENCY OF MONITORING	TRAINING/ INSTRUCTIONS
1	Disturbance to archaeological & heritage sites.	Contractor should carryout all the works in compliance with the provisions of National Heritage Conservation Commission Act; Contractor shall ensure that key members of his staff are familiar with archaeological and paleontological materials likely to be found in the project area; If any archaeological artifacts are exposed during excavation, work shall cease immediately and Site Manager or	Contractor Contractor Contractor	All the cultural heritage artifacts preserved.	Number of infringements/ disturbances to cultural heritage sites.	During major excavation works	Workers should be sensitized on the need to preserve any heritage resources which they may come across in the course of their work.

		ECO notified. The Site Manager shall liaise with NHCC for advice on how to preserve or transfer the artifact. Under no circumstances shall archaeological artifacts be removed, destroyed or interfered with by the construction team.					
		Workers should be sensitized on the need to preserve any heritage resources which they may come across in the course of their work.	Contractor / ECO				
		NHCC officers to visit project site during major excavation works to ensure the	ECO				

		recovery of any such items artifacts that may be found.					
2	Disturbance to burial sites and shrines	Construction team shall conduct their operations in a manner that will not upset the social, cultural and religious order of communities in the project area. Local traditional beliefs shall be respected; Graveyards, cemeteries, burial sites, human remains may not be intruded upon during construction; If any human remains are found, work shall cease immediately and	Contractor Contractor Contractor	keep dust and particulate matter within acceptable parameters during blasting and concrete crushing	Amount of dust emissions Number of complaints from the receiving environment Wind speed	During blasting and concrete crushing	

		Site Manager or ECO notified. The Site Manager shall liaise with NHCC for advice on how to preserve or transfer the artifact. Under no circumstances shall human remains be removed, destroyed or interfered with by the construction team. The construction team is prohibited from entering places considered to be sacred, such as traditional shrines.	Contractor / ECO				

4.7 Erosion and Sediment Control Plan

Soil erosion and sediment management is the responsibility of the developer. This responsibility includes the characterisation of baseline condition, the monitoring of erosion and sedimentation, and the development of mitigation strategies. To fulfill these responsibilities, ITPC is required to develop an erosion and sedimentation plan as part of their integrated implementation plans. The main objective of the plan is to protect the integrity of the environment and human wellbeing and to ensure sustainable development.
Erosion and sediment management involves prevention, mitigation and management in areas where it is poor, and maintaining and enhancing where it is good. It is in this background that ITPC initiated the development of this Management Plan.

The purpose of this plan is to ensure that ITPC meets its obligations as required by the EMA. The plan will encourage best practices in quality management and ensure environmental and ecological sustainability.

The main goals of the plan are to:

- Achieve and sustain quality erosion and sediment management in the project area;
- Minimise the negative impact of erosion on people's well-being and on the rivers ecological system;
- Promote the reduction of sediments in order to maintain good water flows downstream; and
- Prevent and reduce run off of environmentally unfriendly substances as per national and international requirements.

The specific objective of the plan is to promote sustainable development and to maintain the integrity of the ecological system of the project area.

The plan is a management and performance monitoring tool for erosion and sediment prevention and control and provides the basis for assessments. The main objectives of the comprehensiveness of the plan are the inclusion of :
Targets and projections; a financial plan (short, medium and long term) that are linked to the best reduction measures.

This plan was developed in detail for instructive purposes. The administration of this erosion and sedimentation control plan must take into account:

- The construction schedule;
- The maintenance plan;
- The vicinity map;
- The site topographic map including soil survey information;
- The site development plan;
- The erosion and sedimentation control plan drawing; and
- The vegetative plan

4.7.1 Main pollutants and their sources

The first step in designing an erosion and sedimentation monitoring system is to identify the main concerns sources and the priority areas potentially affected. Table 5-7 provides a summary of the main aspects and potential impacts. The table also shows the responsible persons, performance targets, performance indicators, the monitoring schedule and training requirements.

Table 8: Summary of Erosion and Sedimentation Management Plan

No.	ASPECT/IMPACT	MITIGATION MEASURES	RESPONSIBLE PERSON	PERFORMANCE TARGET	PERFORMANCE INDICATOR	FREQYUENCY OF MONITORING	TRAINING/ INSTRUCTIONS
1	Soil erosion from excavations	Stockpile the soil in strategic areas to prevent water and wind erosion Use the stockpiled soils for land reclamation and top soil for landscaping Containment of water run of around the stockpile areas Develop an erosion monitoring system	contractor	Minimise soil erosion	Amount of dust around the stockpile Amount of water run off from the stockpile Reliability of monitoring system	Daily during excavation	Necessary training in sediment and erosion control
2	Soil erosion from removal of vegetation	Prevent indiscriminate removal of vegetation Use efficient vegetation removal techniques Containment of water run of on cleared areas Plant more trees and grass around the site to prevent water and wind erosion Develop vegetation monitoring system	contractor	Minimise soil erosion	Indiscriminate cutting of trees Method of vegetation removal Amount of run off on cleared site Amount of dust in cleared areas	Daily during vegetation removal	
3	Soil erosion due to dust caused by construction	Limiting speed of vehicles to 20Km/h on site Trucks carrying soil will not overload to	contractor	Minimise soil erosion	The speed of the vehicles	Daily during construction	

	vehicles and machinery	prevent dust and wind erosion			Amount of dust		
4	Soil erosion from grading to level the project area site	Limiting speed of grader Wetting the land while grading in windy conditions or prevent grading when windy. Leveling in such a way that will prevent water run off(topography balancing design or slope modification) Compacting the ground after grading	contractor	Minimise soil erosion	The speed of the grader Dust levels The landscape design sloping towards the river Amount of loose soil on the site	Daily during grading on site	
5	Sedimentation due to soil erosion	Prevent soil erosion Establish a river bank monitoring and stabilization system up and down stream Develop a sedimentation monitoring system	ECO/ contractor	Minimise sedimentation	Change in river bank morphology Water quality and quantity	Periodically	

5.0 MONITORING AND AUDIT FRAMEWORK

5.1 Monitoring Programme

A monitoring program will be carried out by the Environmental Coordinator under the Project Implementation Unit (PIU), Environmental Officer and Safety Officers will be stationed on site throughout the implementation period of the project. A monitoring regime will begin at the earliest convenience, preferably before construction to allow a baseline to be established against which changes during construction, and on into operation, can be assessed. Some of this can be included in the ongoing activities of government agencies already active in the project area; some will be the responsibility of the contractors; and some should be carried out by ITPC responsible for development and operation of the project or organizations appointed by them.

A schedule of environmental activities will be developed at the beginning of the project as part of the overall project implementation programme. Monitoring will ensure that the project is implemented in a safe and environmentally sound manner. Within this context the monitoring programme includes the following:

(a) monitoring of design to ensure environmental programs described in the EIA and the EMP are included in the design and construction schedules and engineering design meet the intent of environmental objectives;

(b) monitoring of construction activities to ensure that construction meets specifications and environmental management plan;

(c) monitoring and modification to meet changes which develop over the course of the program implementation; and,

(d) Liaison with various government agencies to ensure all requirements associated with the project initiatives and environmental mitigation measures are met.

(e) Regular (preferably continuous) flow monitoring downstream of dam; Surface water quality, including sediment loading and N and P concentrations, downstream of main construction sites and in locations in the reservoir;

(f) Groundwater quality and quantity, to assess any impacts from construction activities and to establish the baseline for the subset of wells which may be affected by altered water table post-inundation;

(g) Develop and implement long-term wildlife and vegetation monitoring programme as part of the ESMP In the Nkala game management area , including ‘nuisance’ plant monitoring programme as part of the development and implementation of ITPC project ;

(h) Monitoring of disease vectors and incidence of vector-borne diseases; Health status (of communities and workforce); and

(i) Collection of standard climate/meteorological data at the ZESCO meteorological station and other stations in the immediate vicinity of the reservoir (to monitor changes in micro-climate caused by the reservoir).

(j) Monitoring of the implementation, and performance, of the construction management plan, employment and workforce policies, and the community support programme, and the reporting of monitoring parameters on a regular basis will also be included in the contractual arrangements with the design and build contractor, and the community support NGO.

5.2 Feedback and Audit

The monitoring programme will also establish effective feedback mechanisms so that the performance and effectiveness of the various elements of the ESMP can be evaluated, and if necessary corrective actions can be implemented.
The ITPC ESMP Team has a clear responsibility to report at regular intervals to the PIU. For this function, it will be required to draw on the monitoring and reporting of the contractor /operator, the community supports, and the Zambia Wildlife Authority.

5.3 Corrective Actions and Disciplinary Procedures

Corrective actions and disciplinary procedures will be set out, and where possible, included in contractual agreements (i.e with the contractor, operator, and community support contractor). Without fixed disciplinary action there is a risk that environmental management measures will not be implemented.

5.3.1 Design and Build Contractor / Operator: Direct Impacts

Where the Environmental PIU team finds that the contractor or operator has violated the environmental measures set out in their contractual agreement(s), corrective action, and *in extremis*, disciplinary action will be taken;

1. If a violation is detected during a site visit, the site manager will be notified of the verification, and the means of rectification, verbally. The PIU Team staff will discuss with the site manager a realistic deadline for rectifying the violation.
2. If the violation is reported to the PIU team by some other entity, the team will conduct a site visit and, similarly, issue the verbal warning and deadline.
3. The verbal warning will be confirmed in writing to the contractor within 5 working days.
4. The ITPC, PIU, ESMP team will return to the site on the deadline, and if the violation is still occurring, the team will notify the contractor in writing of the continuing violation, informing them of the disciplinary action to be taken. The ESMP team will inform the in writing of the situation, and copy correspondence to the necessary authority e.g Mines and Safety department and ITPC Steering Group.
5. If after 2 months the violation has not been rectified, the higher authorities will instigate disciplinary procedures.

5.3.2 Adherence to ESMP measures

Many of the measures in the ESMP concern actions to be taken in order to prevent environmental or social impacts, or to enhance positive impacts. In these cases, it will not be possible to monitor for 'violations' of the ESMP. A system of reporting and audit of the ESMP commitments is required. This will apply to: the design and build contractor; Management, and to the ITPC ESMP team itself. Each of these organisations will provide quarterly reports on the actions taken in the previous quarter to fulfill the ESMP. The ITPC ESMP Team will be able to draw on the reports it receives from the contractor etc, augmenting these reports with a report its own performance. At random intervals, the ITPC ESMP Team will be required to verify whether the actual performance of the contractor etc is honestly reflected in these progress reports. The legal inspection authorities will be required to randomly verify the actual performance of the ITPC ESMP Team. A formal annual audit of environmental and social performance will be carried out by an independent entity.

Table 9: Summary of the Monitoring Management Plan

Impacts	Mitigation Measures	Responsible persons	Performance target	Performance indicators	Frequency of monitoring/ Timing	Instruction /Training
Overall; monitoring regime should begin preferably before construction to allow a baseline to be established against which changes during construction, and on into operation, can be assessed	Design of overall monitoring programme, based on the draft in this ESMP.	ITPC	Regular flow monitoring	Necessary Reports and results	Before construction, and upgrading during implementation	Capacity-Building and training of ITPC ESMP Team
	Measurement of baseline.	ITPC	Regular flow monitoring	Necessary Reports and results	Before construction, and upgrading during implementation	
	Implementation of monitoring programme, and Annual review/ adjustment of programme	ITPC	Regular flow monitoring	Necessary Reports and results	Throughout construction and operation	
	Ongoing reporting and auditing of ESMP implementation and	ITPC and Steering Group	Regular flow monitoring	Necessary Reports and results	Throughout construction and operation	

	environmental and social performance.					
During operation, flow regulation will create an unseasonal flow (and hence water level) regime in the river downstream, with generally increased low (base) flows and reduced flood flows. Rapid variation in flows and levels may also occur with sluice gate operation.	Identify appropriate locations for flow monitoring, and appropriate equipment for monitoring.	ITPC	Regular (preferably continuous) flow monitoring downstream of dam.	Necessary Reports and results	Year 1, prior to diversion.	
	Install monitoring equipment.			Necessary Reports and results	Year 1, prior to diversion.	
	Prepare monthly reports on flow levels.				Ongoing	
Localised dewatering for foundation construction and/or water	Regular monitoring of borehole yields in any adjacent	ITPC	Identify representative sample of boreholes for sampling.	Necessary Reports and results	Year 1, prior to any construction	

supply boreholes for construction camps may place temporary stress on local groundwater resources. Following inundation, raised water table around reservoir (and possibly downstream) could result in chemicals leaching into groundwater (and hence affected community supplies) from the soil.	community wells.					
	Monitor groundwater chemistry in representative selection of community wells (eg manganese, iron, calcium and sodium levels).		Monitor, and prepare monthly reports on Groundwater quality.	Necessary Reports and results	Ongoing	
Biodiversity Monitoring	The Project is required to implement the biodiversity monitoring activities contained in the approved EIA	ITPC	Statistics from ZAWA on the biodiversity	Reports from ZAWA	ongoing	

6.0 CAPACITY-BUILDING REQUIREMENTS

6.1 Recommended Additional Studies

In order to ensure adequate information during the implementation of ESMP, a number of studies will be added as necessary to ensure adequate completion and implementation of this ESMP. Additional studies will include, but will not be limited to the following:

(a) water quality monitoring;
(b) implementation and monitoring of hydrological flows periodically;
(c) fish and fisheries studies;
(d) cumulative effects assessment;
(e) development and implementation of a riverbank management system.

6.2 Schedule of the Activities of the ESMP

In order to implement the ESMP, a phased programme of activities has been proposed. However, the proposed outline does not exclude other appropriate activities as may be dictated by conditions during construction or as any other changes might occur or take place which may have a direct bearing on the construction works.

The phasing of environmental activities shall be as outlined in the table below:

Table 10: Phasing of the Environmental Activities of the ESMP

Phase	Activities	Responsible Agencies
Mobilisation	Awareness campaigns for workers: - Environmental Conservation - Health - Safety	ITPC and Contractor
	Awareness for local communities downstream and around the project area -Health - Safety	ITPC/ Contractor
	Labeling of work areas, posting notices, site rules, etc	Contractor
	Preparation of the following detailed Plans: -Construction and Worker Camp management Plan; -Reservior Clearing Plan;	Contractor

Construction	Health and Safety awareness and monitoring for both local communities and construction workers	Employer/ Contractor
	Monitoring of Conservation aspects	Employer/ Contractor
	General Monitoring of compliance by Contractor to outlined environmental mitigation measures	Employer
	Ensure implementation of environmental mitigation measures	Employer/ Contractor
Completion / Commissioning	Environmental Auditing	The Employer/ ZEMA/ GRZ

7.0 ESMP REVIEW AND UPDATE

The Employer shall periodically review, monitor and update the ESMP, including all sub-plans to ensure they are effective at all times..

7.1 Review of the ESMP

The Employer shall review the ESMP to assess its effectiveness and relevance as follows:

- A full review shall be undertaken annually;
- Following a reportable incident, or a significant non-compliance; and
- Following an addition, up-date or change order to the ESMP, or a sub-plan.

The review of the ESMP should consider the following:

- Adequacy of data collection, analysis and review;
- Reporting;
- Non-compliances; and
- Corrective actions implemented.

The ESMP shall also be reviewed periodically to evaluate environmental controls and procedures to make sure they are still applicable to the Works being carried out. Reviews shall be undertaken by the Environmental team as follows:

- The full ESMP shall be reviewed at least annually;
- Relevant parts of the ESMP shall be reviewed following a reportable incident;
- Relevant parts of the ESMP shall be reviewed following the receipt of an updated subplan; and
- At the request of stakeholders, including the Contractor, Supervising Engineer, ZEMA and other government regulators, financiers or the communities.

The review shall include analysis of the data collection and analysis of data, monitoring reports, incident reports, complaints/grievances and feedback from stakeholders, consultation and awareness meetings minutes and training records to evaluate the effectiveness of EMP procedures. Site visits, interviews and other auditing methods may also be used. Updates to the plan shall follow the procedure in Section 7.2.

7.2 Control and Update of the ESMP

This document will be issued as a controlled document to all relevant staff and institutions. The procedure to be followed to control the issue of the document, provide a review of its effectiveness and provide updates will be as follows:

- Issued copies by the Employer shall be numbered;
- The Employer shall initiate a review of any relevant sections following modification to the ESMP

- Environmental Approval, issue of a new approval, receipt of written requirements by ZEMA, or a change to internal procedures based on corrective actions or improvements in methodologies or analytical procedures

8.0 ENVIRONMENTAL MITIGATION BUDGET

The various mitigation activities and related costs are outlined in the table below. This budget includes costs related to environmental awareness campaigns; general conservation aspects; monitoring and audits; and regulatory fees. The total initial environmental related cost on the proposed project is estimated at US $ 500, 000 as outlined below.

Table 9-1: Estimated Costs of ESMP

No.	Activity	Amount $
1.	Awareness campaigns	100,000
2.	General conservation aspects	50, 000
3.	Monitoring and Audits	50, 000
4.	Transport for monitoring and Audits	50, 000
5.	Regulatory Fees	50,000
6.	Training/ Capacity Building	100, 000
	Grand total	**400, 000**

Grand total of Environmental, Mitigation, Audits and Monitoring Costs is:

US $400,000.00

Note: The above costs estimates were determined during the EIA at pre-feasibility study stage and therefore, may vary according to prevailing market prices.

The Contractor is required to make his own estimates for environmental mitigation costs and include them in the tender price for the works.

9.0 REFERENCES

GRZ (2011): ***Environmental Management Act No.12 of 2011*** sections 3 (1) of statutory Instrument No. 28 of 1997

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Yachiwo Engineering. 1995. ***The National Water Resources Master Plan in the Republic of Zambia,*** Final Report Support (Volume-1), Lusaka.

ITPC (2012): ***Environmental and Social Impact Assessment (EIA) Report for the proposed Itezhi Tezhi Hydroelectric Power Project*.**

10.0 APPENDICES

- EIA Decision Letter from ZEMA
- Stakeholder Engagement Plan –ITPC
- ITPC Safety and Health Management Plan