Environment Environmental and Social Management Plan (ESMP)

For

Rehabilitation/Reinforcement of 7No. Transmission Substations:
- 330/132/33kV T/S at Kumbotso (Kano State), Shiroro and Kainji (Niger State) and 132/33kV T/S at Kankia (Katsina State), Dakata and Dan Agundi (Kano State), Central Area (Abuja FCT) respectively. (PACKAGE 1 LOT 1)

Under

Nigeria Electricity Transmission Project (NETAP).

By

TCN-PMU

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<th>Description</th>
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<tbody>
<tr>
<td>AEPB</td>
<td>Abuja Environmental Protection Board</td>
</tr>
<tr>
<td>BOD</td>
<td>Biochemical Oxygen Demand</td>
</tr>
<tr>
<td>CBs</td>
<td>Circuit Breakers</td>
</tr>
<tr>
<td>CHS</td>
<td>Community Health &amp; Safety</td>
</tr>
<tr>
<td>CO</td>
<td>Carbon monoxide</td>
</tr>
<tr>
<td>COD</td>
<td>Chemical Oxygen Demand</td>
</tr>
<tr>
<td>CSR</td>
<td>Corporate Social Responsibility</td>
</tr>
<tr>
<td>CTs</td>
<td>Current Transformers</td>
</tr>
<tr>
<td>Cond.</td>
<td>Conductivity</td>
</tr>
<tr>
<td>dB</td>
<td>Decibel</td>
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<tr>
<td>E</td>
<td>East</td>
</tr>
<tr>
<td>EER</td>
<td>Environmental Evaluation Report</td>
</tr>
<tr>
<td>EHS</td>
<td>Environment, Health &amp; Safety</td>
</tr>
<tr>
<td>EMF</td>
<td>Electromagnetic Force</td>
</tr>
<tr>
<td>EMP</td>
<td>Environmental Management Plan</td>
</tr>
<tr>
<td>EPIC</td>
<td>Engineering, Procurement, Installation &amp; Commissioning</td>
</tr>
<tr>
<td>ERSU</td>
<td>Environment, Resettlement and Social Unit</td>
</tr>
<tr>
<td>ESIA</td>
<td>Environmental and Social Impact Assessment</td>
</tr>
<tr>
<td>ESMP</td>
<td>Environmental and Social Management Plan</td>
</tr>
<tr>
<td>FCT</td>
<td>Federal Capital Territory</td>
</tr>
<tr>
<td>FGN</td>
<td>Federal Government of Nigeria</td>
</tr>
<tr>
<td>FMEnv</td>
<td>Federal Ministry of Environment</td>
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<td>Ft</td>
<td>Feet</td>
</tr>
<tr>
<td>GBV</td>
<td>Gender Based Violence</td>
</tr>
<tr>
<td>GRM</td>
<td>Grievance and redress Mechanism</td>
</tr>
<tr>
<td>HQ</td>
<td>Headquarters</td>
</tr>
<tr>
<td>HSE</td>
<td>Health, Social &amp; Environment</td>
</tr>
<tr>
<td>IBRD</td>
<td>International Bank for Reconstruction and Development</td>
</tr>
<tr>
<td>IDA</td>
<td>International Development Association</td>
</tr>
<tr>
<td>IFC</td>
<td>International Finance Corporation</td>
</tr>
<tr>
<td>JHA</td>
<td>Job Hazard Analyses</td>
</tr>
<tr>
<td>KV</td>
<td>Kilovolts</td>
</tr>
<tr>
<td>LGA</td>
<td>Local Government Area</td>
</tr>
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<td>m</td>
<td>Meter</td>
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</table>
mm Millimeter
m/s Meter per seconds
MVA Mega Volt Amp
N North
NEGIP Nigeria Electricity and Gas Improvement Project
NESREA National Environmental Standard & Regulatory Enforcement Agency
NETAP Nigeria Electricity Transmission Project
NOx Nitrogen Oxide
OHS Occupational Health & Safety
OP/BP Operational Policy
PCBs Polychlorinated Biphenyls
PCR Physical Cultural Resources
Ph Potential Hydrogen
PM Project Manager
PMU Project Management Unit
PMT Project Management Team
PPE Personal protective equipment
TCN Transmission Company of Nigeria
TSP Transmission Service Provider
USD United States Dollars
SEA Sexual Exploitation and Abuse
SEP Stakeholder Engagement Plan
SO₂ Sulphur dioxide
S/s Substation
WB World Bank
WHO World Health Organisation
MW MegaWatts
WWI Written Work Instruction
μg/m³ Microgram per meter cube
% Percentage
°c Degree Celsius
Executive Summary

Background

Nigeria Electricity Transmission Project (NETAP) is financing investments to improve the existing transmission network in Nigeria.

The IDA support will finance investments grouped according to geographic locations in order to reduce interdependence and increase efficiency in implementation. Specific target zones include: (i) North East and North-Central - reinforcing Kaduna-Kano-FCT Axis; (ii) South-West including the Lagos network; (iii) South-South - reinforcing the Delta area network and (iv) South East with reinforcement of capacities in this area.

Subcomponent 1(a) of NETAP will finance investments for Upgrading and Reinforcement of “brown-field” (i.e. already existing) Sub-stations as well as associated equipment and costs of implementation, in order to expand the grid capacity to 10,00MW and to provide reliability to the system.

The projects are site-specific and share similar equipment, layout and operational and functional characteristics under the management of TCN, therefore justifying a consolidated report.

However, for efficiency of implementation, the Project has been divided into three (3No.) Packages {with each Package containing three (3No.) Lots}, whereby three (3No.) ESMP Reports will be produced for each Package in accordance with the division of the proposed sites into Lots.

This ESMP Report therefore provides a basis for managing environmental and social concerns associated with the implementation of the project for substations that have been grouped under Package 1 - Lot 1 (i.e. Kumbotso, Kainji, Shiroro 330/132/33kV Substations and Kankia, Abuja Central Area, Dakata & Dan Agundi 132/33kV Transmission Substations) – See Annexe III for Summary of the Project Packages as detailed by the Procurement Department of PMU

ESMP Objectives

The overall objective of the ESMP is to ensure project compliance with applicable national environmental and social legal requirements and the World Bank’s environmental and social safeguards. Further, the ESMP aims to identify environmental and socio-economic benefits of the project as well as identifying potential adverse environmental and socio-economic impacts.

The ESMP document also describes measures to prevent, minimize, mitigate and or compensate for identified potential environmental and social impacts within the framework of Environmental, Occupational Health & Safety (OHS) and Community Health and Safety (Corporate Social Responsibility - CSR). It provides a logical framework within which identified negative environmental and socio-economic impacts can be mitigated and monitored. In addition, it assigns responsibilities of actions to various actors and provides a timeframe within which the mitigation measures and monitoring can be carried out.

Project Locations and Scope/Description

The Reinforcement/Rehabilitation projects for the selected Transmission Substations covered by this ESMP Report under “PACKAGE 1 – Lot 1” are located at: Kumbotso, Dan Agundi & Dakata (Kano State), Kainji & Shiroro (Niger State), Central Area (Abuja FCT) and Kankia (Katsina State), respectively. (See table below for detailed summary):
<table>
<thead>
<tr>
<th>Project Title</th>
<th>SUBSTATION Name/Capacity</th>
<th>Location/Ambient Settlement</th>
<th>Project Scope/Description</th>
<th>Identified Environmental Issues at the Substation</th>
<th>Observed Social Status (as at time of site visit)</th>
</tr>
</thead>
</table>
| Kumbotso     | Kumbotso town, Kano State (along Challawa-Kumbotso road – off Kaduna-Zaria-Kano express road). | Kumbotso town, Kano State (along Challawa-Kumbotso road – off Kaduna-Zaria-Kano express road). | • Installation and commissioning of 1No. 300MVA 330/132kV transformer with its associated equipment,  
• Construction of additional 3No. 33kV bays,  
• Replacement of old protection and control panels,  
• Relocation of Mobile Transformer. | • Poor Waste Management (of scrapped materials i.e. breakers, cables, electric poles, etc. - littered within the substations premises,)  
• Occupational Health and Safety procedures not adequately prioritised,  
• Use of Personal Protective Equipment (PPE) not strictly adhered to,  
• Availability of PPEs and First Aid kits inadequate at the substations,  
• Preparedness for Fire Emergencies - inadequate,  
• Poor illumination within the Substation premises. | • There exists a good relationship between the Substation and the host community,  
• The community has a very low religious tolerance level and is prone to riots at the slightest perceived provocation. |
| Shiroro      | Zumba town, Niger State. | Zumba town, Niger State. | • Replacement of Obsolete Control and Relay Panels with Digital Control System,  
• High Voltage 330kV Switchgears and Associated Equipment | • Occupational Health and Safety procedures not adequately prioritised,  
• Use of Personal Protective Equipment (PPE) not strictly adhered to,  
• Availability of PPEs and First Aid kits inadequate at the substations, | • There exists a cordial relationship between the Substation and the host community. |
is ….. Populated.

### Kainji 330/132/33kV

**New Bussa town, Niger State** (along Wawa–Mokwa Road).

Situated in and lies within coordinates 9°51’N and 4°36’E in the North Central region of Nigeria.

The ambient settlement is ….. Populated.

- Rehabilitation of the 330kV Substation, High Voltage Switchgears
- Associated Equipment. Rehabilitation of Control Room including Digital control System.

- No safety signages within the Substation premises/switchyard,
- Preparedness for Fire Emergencies - inadequate,
- Poor illumination within the Substation premises,
- Poor toilet facilities for staff,
- Decrepit control room furniture,
- Poor supply of potable water to the Substation.

- Occupational Health and Safety procedures not adequately prioritised,
- Use of Personal Protective Equipment (PPE) not strictly adhered to,
- Availability of PPEs and First Aid kits inadequate at the substations,
- No safety signages within the Substation premises/switchyard,
- Preparedness for Fire Emergencies - inadequate,
- Poor illumination within the Substation premises,
- Poor toilet facilities for staff,
- Decrepit control room

- There exists a good relationship between the Substation and the host community.
| Kankia 132/33kV | Kankia town, Katsina State (along the Kankia – Ingawa Road, Kankia – Kunchi Road off Kano – Katsina highway). | **Situated within** Kankia Local Government Area and lies within coordinates 12° 32' 57” N and 7° 49' 31” E in the tropical savanna belt of Nigeria. The ambient settlement is …..Populated. | Furniture,  
- Poor supply of potable water to the Substation.  
- Security concerns with broken Substation perimeter fence.  
- Replacement of Faulty 1 x 30MVA and Upgrading of 1 x 30MVA Transformers to 2 x 60MVA 132/33kV Transformers,  
- High Voltage Switchgears and Associated Equipment Including Digital Control System  
- Poor Waste Management (of scrapped materials i.e. breakers, cables, electric poles, etc. - littered within the substations premises.)  
- Occupational Health and Safety procedures not adequately prioritised,  
- Use of Personal Protective Equipment (PPE) not strictly adhered to,  
- Availability of PPEs and First Aid kits inadequate at the substations,  
- No safety signages within the Substation premises/switchyard,  
- Preparedness for Fire Emergencies - inadequate,  
- Poor illumination within the Substation premises,  
- Poor House keeping practices in the Substation,  
- Poor supply of potable water to the Substation,  
- Poor toilet facilities for staff,  
- Security concerns - Substation perimeter **NOT** fenced,  
- There exists a good relationship between the Substation and the host community. |
| **Dakata 132/33kV** | **Dakata town, Kano State (along Independence road).** | **Reinforcement with 1 x 60MVA 132/33kV Power Transformer,**  
**Switchgears, Associated Equipment and Digital Control System.**  
**Supply and Installation of Additional 3 No. Feeders Bays.** | **Decrepit control room furniture.**  
**Occupational Health and Safety procedures not adequately prioritised,**  
**Use of Personal Protective Equipment (PPE) not strictly adhered to,**  
**Availability of PPEs and First Aid kits inadequate at the substations,**  
**No safety signages within the Substation premises/switchyard,**  
**Preparedness for Fire Emergencies – inadequate,**  
**Poor illumination within the Substation premises,**  
**Poor toilet facilities for staff,**  
**Poor supply of potable water to the Substation.** | **There exists a good relationship between the Substation and the host community,**  
**The community has a very low religious tolerance level and is prone to riots at the slightest perceived provocation.** |
| **Dan Agundi 132/33kV** | **Kano town, Kano State (along Sharada Road and BUK Road/Kalapi Chowk Road).** | **Reinforcement of 1 x 60MVA 132/33kV Power Transformers,**  
**High Voltage Switchgears, Associated Equipment.**  
**Complete Rehabilitation of Substation.** | **Occupational Health and Safety procedures not adequately prioritised,**  
**Use of Personal Protective Equipment (PPE) not strictly adhered to,**  
**Availability of PPEs and First Aid kits inadequate at the substations,**  
**No safety signages within the Substation premises/switchyard,**  
**There exists a good relationship between the Substation and the host community,**  
**The community has a very low religious tolerance level and is prone to riots at the slightest perceived provocation.** |
### Abuja Central Area 132/33kV

**Central Area – Abuja, FCT.**

Situated within AMAC Local Government Area and lies within coordinates 9°06'N and 7°49'E in the North Central region of Nigeria.

The ambient settlement is ….Populated.

- Upgrading of 2 x 45MVA with 2 x 100MVA 132/33kV Power Transformer,
- High Voltage Switchgears, Associated Equipment Including Gas Insulated Substation,
- Rehabilitation of Civil Structures of the Control Room and Digital Control System.

- Preparedness for Fire Emergencies – inadequate,
- Poor illumination within the Substation premises,
- Poor House keeping practices in the Substation,
- Poor supply of potable water to the Substation,
- Poor toilet facilities for staff,
- Decrepit control room furniture.

- Occupational Health and Safety procedures not adequately prioritised,
- Use of Personal Protective Equipment (PPE) not strictly adhered to,
- No safety signages within the Substation premises/switchyard,
- Availability of PPEs and First Aid kits inadequate at the substations,
- Preparedness for Fire Emergencies – inadequate,
- Poor illumination within the Substation premises,
- Poor toilet facilities for staff,
- Decrepit control room furniture,
- Poor supply of potable water to the Substation.

- There exists a good relationship between the Substation and the host community.
- Security concerns with broken Substation perimeter fence.
- Leaking roof in control room,
- Weak concrete structures
**ESMP Methodology**

Field visits and investigations, including interviews and discussions were conducted and information from readily available technical/baseline data concerning the project elements at the project areas were detailed for use in preparing the ESMP with least uncertainties.

Substation Environmental audits were also carried out in order to assess the existing physical, environmental and socio-economic conditions prevailing at the project sites.

National and International Standards, Regulations, Policies and Laws on Environmental and Social Safeguards were considered in preparing the ESMP.

The literature review included earlier related reports as well as web based resources, which helped in assessing:

- The environmental and socio-economic characteristics of the project area,
- Project background and proposed interventions,
- The legal, institutional and organizational framework and background of the electricity sector and the historical background
- The Nigerian legislations and the World Bank safeguard policies related the project
- Environmental and social standards and guidelines for related environmental and social issues.

**Applicable E&S Requirements**

The ESMF for NETAP covers in detail the applicable E&S requirements, in summary as follows:

e:

- **National Regulations**
  The Nigerian Environment Law, including Federal Laws of the Federal Ministry of Environment (FMEnv.), is comprehensive, covering the main issues relevant to environmental protection and law enforcement and addressing environmental issues that may arise therefrom,

**World Bank Operational Policies**

The Operational Policy (Op) triggered by the proposed project is “Environmental Assessment” (OP/BP 4.01). OP 4.01 advises borrowers to use the World Bank Group EHS Guidelines as the basis for workplace health and safety standards and ambient environmental quality standards.

World Bank Group Environmental, Health and Safety Guidelines (EHS Guidelines) are also applicable, and specifically two guidelines are relevant to NETAP: the General Guidelines and the sector-specific Guidelines for Electric Power Transmission and Distribution.

Where the host country’s regulations differ from the levels and measures presented in the World Bank Operational Policies and the EHS Guidelines, projects will be required to achieve whichever is more stringent. This also applies if there are differences between Federal and State standards, the sterner standard must be followed.

**Environmental Baseline survey findings (Summarized)**

- Climate and Meteorology
Kumbotso, Kankia, Dakata and Dan Agundi all lie within the Tropical Savanna belt of Nigeria which is characterized by a long “dry season” with high evaporation from the months of October through to May and a short “wet season” for the remaining part of the year (i.e. June to September). Mean monthly temperature in the area is approximately 20°C but daily extremes vary, reaching temperatures as high as 47°C.

Shiroro, Central Area Abuja and Kainji all lie within the North Central Region of Nigeria which is characterized by a long “dry season” with high evaporation from the months of October through to May and a short “wet season” for the remaining part of the year (i.e. April to September). During the rainy season the daytime temperature reaches 28°C to 30°C and the night temperature reaches 22°C to 23°C whilst the daytime temperature during the dry season is as high as 40°C and the night temperature as low as 12°C.

Audit Findings (Summarized):

- Generally, there was poor Waste Management of scrapped materials (i.e. breakers, cables, electric poles) which were found littered within the premises of the transmission substations.
- Occupational Health and Safety procedures not given adequate priority,
- Use of Personal Protective Equipment (PPE) was not strictly adhered to,
- Safety Signage were generally poor at all the substations,
- Availability of PPEs and First Aid kit inadequate at the substations,
- Preparedness for Fire Emergencies inadequate,
- Housekeeping Generally poor,
- Control Room furniture in bad conditions except for Kumbotso and Dakata
- No good potable water system except for Kumbotso Substation
- Kankia S/S not fenced
- Central Area Abuja and Kainji S/S had broken fences
- Community Relations is generally cordial.
- All the substation are not properly illuminated both in the control room and switch yards.
- Most of the substations lacked adequate security
- The toilet facility was generally poor
- The control rooms are poorly ventilated

Potential Environmental and Social Impacts of the Proposed Reinforcement/Rehabilitation Project

Expected negative Impacts during the Construction Phase of the project that are likely to occur include:

1. Impacts due to handling of construction waste,
2. Construction air emissions,
3. Construction noise,
4. Impacts on Fauna and Flora,
5. Health and Safety,
6. Socioeconomic (Impacts on traffic),
7. Social (Transmission of communicable diseases from social interactions between TCN Staff, Construction workers and the host communities).
8. Cultural clashes between workers and residents of the host communities
9. Gender-Based Violence (GBV) and Sexual Exploitation and Abuse (SEA) resulting from a largely male workforce located in or near communities.
e Expected negative Impacts during Operation Phase of the project that are likely to occur include:

1. Risk associated with poor management of a generated waste,
2. Exposure to EMFs,
3. Risk of soil and groundwater contamination,
4. Impacts due to noise emissions,
5. Human Health and Safety.

**Implementation/Monitoring Plan**

The ESMP will be implemented on site by all responsible parties and a monthly report shall be submitted through the management structure of the project for management review and close-out function, guided by an **Environmental and Social Monitoring Plan Matrix**.

Contractor and the Project Management Team (PMT) shall strictly comply with the provisions of this ESMP and operate a monitoring programme that would lead to sustainable project-environment relationship. This will be strengthened with the occasional monitoring visits of the ERSU-PMU. The monitoring programme shall commence from site preparation through implementation to operation stages in order to keep track of the entire project activities and performance. The programme will provide information on impacts compared with prediction and by doing so provide advance warning of any adverse changes in both the environmental and socio economic developments.
CHAPTER ONE
INTRODUCTION

1.1 Background

Nigeria Electricity Transmission Project (NETAP) is financing investments to improve the existing transmission network in Nigeria.

The IDA support will finance investments grouped according to geographic locations in order to reduce interdependence and increase efficiency in implementation. Specific target zones include: (i) North East and North-Central - reinforcing Kaduna-Kano-FCT Axis; (ii) South-West including the Lagos network; (iii) South-South - reinforcing the Delta area network and (iv) South East with reinforcement of capacities in this area. Additionally, the project will finance spare equipment in order to provide quick replacements spares and add reliability to the network. Support would be geared towards underpinning key potential ‘growth poles’ in the country for access enhancement and job growth.

Subcomponent 1(a) of NETAP will finance investments for Upgrading and Reinforcement of “brown-field” (i.e. already existing) Sub-stations as well as associated equipment and costs of implementation, in order to expand the grid capacity to 10,000 MW and to provide reliability to the system.

Since the Transmission Substations referred to are similar in Lay-out, equipment content, purpose, functionality and life-span, and all come under the common management of TCN, implying related generic operations, a single consolidated ESMP Report would be produced for this lot.

However, for efficiency of implementation, the Project has been divided into three (3No.) Packages {with each Package containing three (3No.) Lots}, whereby three (3No.) ESMP Reports will be produced for each Package in accordance with the division of the proposed sites into Lots.

1.2 Project Locations

This ESMP Report covers Transmission Substations that fall and under “PACKAGE 1 – Lot 1” they are located at: Kumbotso, Dan Agundi & Dakata (Kano State) Kankia (Katsina State), Shiroro & Kainji (Niger State) and Central Area (Abuja FCT) respectively.

The “Consolidated Report” presents the Environmental and Social Management Plan (ESMP) for the Rehabilitation/Reinforcement of the proposed three (3No.) 330/132/33kV located at Kumbotso (Kano State), Kainji & Shiroro (Niger State) Transmission Substations and Four (4No.) 132/33kV Transmission Sub-Stations located in Kankia (Katsina State), Dakata and Dan Agundi (Kano State), Central Area (Abuja FCT) respectively.
Figure 1.1: TCN 330kV/132kV Transmission Lines Grid Map of Nigeria indicating the proposed Substation Project sites under NETAP (Package 1- Lot 1) are situated.

Figure 1.2: Satellite image showing Kumbotso 330/132/33kV Transmission substation with a 47m distance from the Transmission Facility to developed settlement.

Figure 1.2: Satellite image showing Kumbotso 330/132/33kV Transmission substation.
Figure 1.3: Satellite image showing Dan Agundi 132/33kV Transmission Substation with adjacent developments measuring about 46-50m away from the facility.

Figure 1.4: Satellite image showing Kankia 132/33kV Transmission Substation with adjacent developments 80m nearest to the facility.
Figure 1.5: Satellite image showing Dakata 132/33kV Transmission Substation with adjacent developments around the facility measuring 48m.

Figure 1.6: Satellite image showing Shiroro 330/132/33kV Transmission substation.
Figure 1.7: Satellite image showing Central Area 132/33kV Transmission Substation.

Figure 1.8: Satellite image showing Kainji 330/132/33kV Transmission Substation.
1.3 ESMP Objectives

The main aim of the ESMP is to ensure that the project complies with applicable national environmental and social legal requirements and World Bank’s environmental and social safeguards, as applicable. Further, the ESMP aims at identifying environmental and socio-economic benefits of the project as well as identifying any potential adverse environmental and socio-economic impacts.

To mitigate the adverse impacts and enhance project benefits the ESMP describes measures to prevent, minimize, mitigate and or compensate for adverse environmental and social impacts. The ESMP is specifically providing the following:

- Assessment of the baseline environmental and social situation of the Site and the surrounding area (including auditing the existing facility),
- Assessment of the potential environmental and social impacts of different project components and subcomponents during construction and operation phases,
- Proposed measures that may be adopted to mitigate negative impacts, enhance positive impacts and achieve overall improved management of environmental and social challenges and opportunities.
- A guide Document towards ensuring compliance of the rehabilitation process with pertinent national regulations and World Bank safeguard policy (Whenever there is a discrepancy between national and international requirements, the more stringent ones will be considered)

The Environmental and Social Management Plan (ESMP) provides a logical framework within which identified negative environmental and socio-economic impacts can be mitigated and monitored. In addition, the ESMP assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done.

The ESMP covers information on the management and/or mitigation measures that will be taken into consideration to address impacts in respect of the project life cycle.

Mitigation measures proposed in the ESMP are designed to bring the project into full compliance with pertinent national laws and regulations as well as World Bank safeguard operational policies, and IFC Environmental Health and Safety guidelines. These Guidelines cover the following elements:

- Environment
- Occupational Health and Safety
- Community Health and Safety (Corporate social Responsibility)

World Bank Operational policies are designed to ensure that World Bank-financed projects are environmentally and socially sound and sustainable, and that potential negative environmental impacts are avoided wherever possible, and/or mitigated.
1.4 Methodology/Approach

The Safeguards Team of PMU (ERSU) – to the extent possible – identified and compiled the readily available technical data and information concerning the project elements and the project areas. In addition, field visits and investigations, including interviews and discussions, have been conducted to allow preparing the ESMP with the least uncertainties.

Baseline surveys were performed in order to assess the existing conditions at the project sites. In preparing the Environmental and Social Impact Assessment, the ERSU considered the following standards, regulations, and laws to ensure full compliance:

- The World Bank Safeguard Policies and Environmental Health and Safety Guidelines,
- Nigerian Environmental Impact Assessment Decree No. 86 of 1992
- The regulations, guidelines and standards of the Federal Ministry of Power as it concerns high voltage power transmission in Nigeria,
- The regulations, guidelines and standards of the Federal Ministry of Environment concerning power generation and transmission activities in Nigeria,
- The regulations, guidelines and standards of the Niger, Kano and Katsina States Ministries of Environment on environmental protection, respectively,
- The regulations, guidelines and standards of the Abuja Environmental Protection Board (AEPB) for Central Area Abuja FCT,
- All International Conventions/Treaties on Environmental Protection to which Nigeria is party,
- The Corporate and Operational Policies of the Transmission Company of Nigeria,
- Electricity Law related to the right of way and the public electricity connections
- The World Bank safeguards Operational Policy OP 4.01 on Environmental Impact Assessment,
- IFC Environmental and, Health and Safety guidelines.

1.5 Impact Characterization, Categorization & Magnitude

This Chapter distinguishes between significant positive and negative impacts, direct and indirect impacts, immediate and long-term impacts during construction and operation phases - indicating their importance levels and probability of occurrence. Also impacts which are unavoidable or irreversible are identified.

Cumulative effects are addressed taking into account projects or actions planned within each of the selected Substation premises and this shall include environmental and social/economic impact assessment.

Each potential positive and negative impact resulting directly or indirectly from the project is categorized based on Magnitude and Sensitivity.
1.5.1 Impact Characterization

In order to further describe the Impact of the various project activities on the biophysical and socio-economic environment, the identified impacts have been characterised as follows.

- **Beneficial Impacts**: Impacts that would produce positive effect on the biophysical or socio-economic environment.
- **Adverse Impacts**: Impacts that may result in:
  - Irreversible and Undesirable change(s) in the social and/or biophysical environment;
  - Decrease in the quality of the biophysical or social environment;
  - Limitation, restriction or denial of access to or use of any component of the environment to others, including future generations; and
  - Sacrifice of long-term environmental viability or integrity for short-term economic goals.
  - Human health and safety
- **Direct Impacts**: Impacts resulting directly (direct cause-effect consequence) from a project activity.
- **Indirect Impacts**: Impacts that are at least one step removed from a project activity. They do not follow directly from a project activity.
- **Short-term Impacts**: Impacts that will last only within the period of a specific project activity.
- **Long-term Impacts**: Impacts whose effects remain even after a specific project activity.
- **Irreversible Impacts**: Impacts whose effects are such that the subject (impacted component) cannot be returned to its original state even after adequate mitigation measures are applied.
- **Cumulative Impacts**: Impacts resulting from interaction between ongoing project activities with other activities, taking place simultaneously or planned for the future.
- **Incremental Impacts**: Impacts that progress with time or as the project activity proceeds.
- **Residual Impacts**: Impacts that would still remain after mitigation measures have been applied.
1.5.2 Impact Categorization and Magnitude

The impacts resulting as a direct consequence of the project activities are categorized as positive or negative impacts; the latter is further analyzed and its magnitude assessed as:

- **Negligible** – No anticipated change to the baseline environment,
- **Low** – Minor anticipated change to the baseline environment,
- **Medium** – Moderate anticipated change to the baseline environment,
- **High** – Significant anticipated change to the baseline environment,

*(Medium and High impacts usually cause a major temporary variance to the baseline conditions or a long-term ongoing modification.)*

The main parameters are:

- **Duration** - As the time duration of the impact increases, it is weighed more heavily (Special consideration is given to impacts that go beyond the project’s anticipated life-expectancy).
- **Time** – The time of which an impact commences or occurs can be vital to construction and maintenance operations.
- **Spatial** – The area impacted is to be considered, as some impacts may extend beyond the project’s boundaries or interfere with land regulations, etc.
- **Probability** – The chance of an impact occurring and its frequency is to be assessed
- **Reversibility** - The possibility and extent to which an impact can be intervened or mitigated for a factor to return to the Baseline environment
- **Compliance** – National and international standards and regulations may dictate an impact’s maximum allowable consequence.

CHAPTER TWO
ENVIRONMENTAL LEGISLATIVE AND REGULATORY FRAMEWORK

It is a requisite by the World Bank that Investments which it finances comply with the host country’s national standards as well as other relevant International environmental and social policies. In addition to Nigerian legislations, the Project should address World Bank operational policy regarding environmental and social issues as it covers the requirements of many of the financing institutions.

When the host country’s regulations differ from the levels and measures presented in the World Bank operation policies, projects will be required to achieve whichever is more stringent. This also applies if there are differences between Federal and State standards, the sterner standard must be followed.

2.1. National Legal Framework

The national environmental regulatory framework applicable to Electrical Energy Transmission projects includes the following laws and decrees:

2.1.1 National Environmental Laws

The Nigerian Environment Laws which is midwifed by the Federal Ministry of Environment (FMEnv.) covers the main issues relevant to environmental protection and law enforcement.
Among the objectives of Nigeria’s National Environmental Laws are:

- Protecting the environment from all sorts and types of pollution
- Protecting public health and social welfare
- Incorporating environmental resources protection in all social and economic Developmental Plans and promoting sustainable development to protect the rights of future generations;
- Conserving ecologically sensitive areas, protecting biodiversity, and rehabilitating environmentally damaged areas;
- Setting inter-ministerial cooperation regulations and standards various environmental protection areas and jurisdictions;
- Promoting environmental information collection and publication, public awareness, education and training.

The Nigerian Environmental Laws also address various environmental issues including:

- Management and protection of various resources. Issues covered are related to land environment, air environment, water resources and aquatic environment, natural, archeological, and historical heritage protection.
- Environmental and Social Impact Assessment (ESIA) and auditing, permitting of development projects, monitoring of environmental resources and their parameters.
- Penalties to be applied in case of violation of any article presented under the law.
- Other issues addressed by the legislation include emergency preparedness, public participation, research training and public education.

### 2.1.2 Federal Laws and Regulations of the Federal Ministry of Environment (FMEnv)

The applicable laws are:

- The Environmental Impact Assessment Act CAP LFN E12 2004,
- National Environmental Protection (Effluent Limitations) Regulations (S.I.8) of 1991,
- National Environmental Protection (Pollution Abatement in Industries Producing Waste) Regulation (S.I.9) of 1991,
- Federal Ministry of Environment (FMEnv) National Guidelines for Environmental Audit in Nigeria 1999,
- FMEnv Procedural Guidelines (1995),
- FMEnv Guidelines and Standards for Environmental Pollution and Control in Nigeria (Act Cap 131 LFN),
- The National Environmental Protection Management of Solid and Hazardous Wastes Regulations (S.I.15, 1991),
- Land Use Act of 1978,
- The Endangered Species (Control of International and Traffic Act, No. 11 of 1985),

### 2.1.3 State Regulations

- Kano, Niger and Katsina States’ Noise (Control) Edicts,
- Kano, Niger and Katsina States’ States Environmental Protection Agency Edicts,
- Abuja Environmental Protection Board Law.

### 2.2. International Safeguards Policies/Standards
<table>
<thead>
<tr>
<th>OB/PB</th>
<th>Safeguard</th>
<th>Policy Objective</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.01</td>
<td>Environmental Assessment*</td>
<td>Help ensure the environmental and social soundness and sustainability of investment projects. Support integration of environmental and social aspects of projects in the decision-making process.</td>
</tr>
<tr>
<td>4.04</td>
<td>Natural Habitats*</td>
<td>Promote environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions.</td>
</tr>
<tr>
<td>4.09</td>
<td>Pest Management</td>
<td>Minimize and manage the environmental and health risks associated with pesticide use and promote and support safe, effective, and environmentally sound pest management.</td>
</tr>
<tr>
<td>4.10</td>
<td>Indigenous Peoples*</td>
<td>Design and implement projects in a way that fosters full respect for indigenous peoples’ dignity, human rights, and cultural uniqueness and so that they (1) receive culturally compatible social and economic benefits, and (2) do not suffer adverse effects during the development process.</td>
</tr>
<tr>
<td>4.11</td>
<td>Physical Cultural Resources (PCR)*</td>
<td>Assist in preserving PCR and in avoiding their destruction or damage. PCR includes resources of archeological, paleontological, historical, architectural, and religious (including graveyards and burial sites), aesthetic, or other cultural significance.</td>
</tr>
<tr>
<td>4.12</td>
<td>Involuntary Resettlement*</td>
<td>Avoid or minimize involuntary resettlement and, where this is not feasible, assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.</td>
</tr>
<tr>
<td>4.36</td>
<td>Forests*</td>
<td>Realize the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests.</td>
</tr>
<tr>
<td>4.37</td>
<td>Safety of Dams</td>
<td>Ensure quality and safety in the design and construction of new dams and the rehabilitation of existing dams, and in carrying out activities that may be affected by an existing dam.</td>
</tr>
<tr>
<td>7.50</td>
<td>Projects on International Waterways</td>
<td>Ensure that the international aspects of a project on an international waterway are dealt with at the earliest possible opportunity and that riparians are notified of the proposed project and its details.</td>
</tr>
<tr>
<td>7.60</td>
<td>Projects in Disputed Areas</td>
<td>Ensure that other claimants to the disputed area have no objection to the project, or that the special circumstances of the...</td>
</tr>
</tbody>
</table>
case warrant the Bank’s support of the project notwithstanding any objection or lack of approval by the other claimants.

Table 2.2.2: World Bank Operational Policy Triggered

<table>
<thead>
<tr>
<th>Operational Policy Triggered</th>
<th>Trx. Substations affected</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environmental Assessment (OP/BP 4.01)</td>
<td>Kumbotso, Dan Agundi, Dakata, Kankia, Shiroro, Kainji, Central Area</td>
<td>The Project requires an environmental and social impact assessment, as the rehabilitation process during various phases of Construction; Operation and Decommissioning of the proposed Substations station will have both positive and negative environmental/social impacts.</td>
</tr>
</tbody>
</table>

Note: other policies are not triggered because all the sites are brown field (existing Substations) and would not require displacement or resettlement of persons nor affect sources of livelihood.

World Bank Group EHS Guidelines

The EHS Guidelines contain the performance levels and measures that are acceptable to the World Bank and are generally considered to be achievable within existing facilities - at reasonable costs, using existing technology which generally covers four areas of international good practice, namely:

- Environmental;
- Occupational Health & Safety (OHS);
- Community Health & Safety (CHS) and
- Construction and Decommissioning.

The Guidelines also address the occupational and community health and safety hazards during the construction, operation, and decommissioning of Power Transmission projects. The occupational health and safety hazards may include physical hazards such as working at heights, working with live power, and exposure to chemicals. According to the guidelines the major community health and safety hazards are aircraft safety, electrocution, and electromagnetic interference.

As stated in WBG General EHS guideline, when host country regulations differ from the levels and measures presented in the EHS Guidelines, projects are expected to achieve whichever is more stringent. The following tables present WBG threshold for pertinent impacts:

Table 2.2.3: Maximum permissible limit for noise intensity (World Bank requirements)

<table>
<thead>
<tr>
<th>Receptor</th>
<th>One hour $L_{Aeq}$ (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Day time 7 a.m. to 10 p.m.</td>
</tr>
<tr>
<td>Residential</td>
<td>55</td>
</tr>
</tbody>
</table>
Table 2.2.4: Standards and Limits for Noise Levels in the Work Environment

<table>
<thead>
<tr>
<th>Location /activity</th>
<th>Equivalent level LAeq,8h</th>
<th>Maximum LAmx,fast</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy Industry (no demand for oral communication)</td>
<td>75 dB(A)</td>
<td>110 dB(A)</td>
</tr>
<tr>
<td>Light industry (decreasing demand for oral communication)</td>
<td>50-65 dB(A)</td>
<td>110 dB(A)</td>
</tr>
<tr>
<td>Open offices, control rooms, service counters or similar</td>
<td>45-50 dB(A)</td>
<td>N/A</td>
</tr>
<tr>
<td>Individual offices (no disturbing noise)</td>
<td>40-45 dB(A)</td>
<td>N/A</td>
</tr>
<tr>
<td>Hospitals</td>
<td>30-35 dB(A)</td>
<td>40 dB(A)</td>
</tr>
</tbody>
</table>

Table 2.2.5: Standards for ambient air quality

<table>
<thead>
<tr>
<th>Air Quality</th>
<th>Ambient air parameters</th>
<th>Ambient air pollutants threshold according to WHO</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exposure period</td>
<td>1 hr</td>
<td>8 hr</td>
</tr>
<tr>
<td>Carbon monoxide CO µg/m³</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Sulfur dioxide SO₂ µg/m³</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Nitrogen oxides NOₓ µg/m³</td>
<td>200</td>
<td>N/A</td>
</tr>
<tr>
<td>Particulates PM₁₀ µg/m³</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Particulates PM₂.₅ µg/m³</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>TSP µg/m³</td>
<td>N/A</td>
<td>N/A</td>
</tr>
<tr>
<td>Ozone</td>
<td>N/A</td>
<td>160</td>
</tr>
</tbody>
</table>
CHAPTER THREE
INSTITUTIONAL ARRANGEMENTS

3.1. RESPONSIBILITIES

3.1.1. TCN/PMU

The PMU shall retain the primary responsibility of ensuring that environmental and social commitments are met throughout the project lifespan. The TCN Environment Health and Safety Department shall also enforce safeguard compliance during and after the project life span and establish a schedule of responsibilities aimed at improvements on social and environmental management of Transmission Substations. TCN shall take over at the end of the project. Environmental and social issues should be seen as a line of responsibilities for which all levels of personnel beginning from the Management to the operator are accountable.

The HSE Unit of TCN is a Division, headed by a General Manager (HSE) and it is expected that there would be at least one HSE staff in each of the Transmission Sub-Regions across the country.

Capacity building will therefore be aimed at equipping each of TCN (Regional, Sub-regional and Substation) HSE staff with basic Environmental Management Skills required to attend to minor environmental issues while major cases will be referred to the Environmental Safeguards Team domiciled at PMU. These various cadre of staff shall be trained on the job under the proposed capacity building programs for ERSU and also receive appropriate sites training required to meet various responsibilities.

TCN Engineers will also form part of the Project Management Team (PMT) during the supervision and monitoring period.

The Project implementation Organogram defining the line of Communication in the proposed Substation Reinforcement/Rehabilitation Project (NETAP) is as highlighted below:

<table>
<thead>
<tr>
<th>IMPLEMENTING OFFICES</th>
<th>DURING PROJECT</th>
<th>AFTER PROJECT</th>
</tr>
</thead>
</table>
| Head Quarters        | • Policy formulating  
      |   • Management support and implementation  
      |   • Training and capacity building  | • Policy formulation and enforcement of implementation  
      |   • Training and capacity building  |
| PMU                  | Training and capacity building |  |
| ERSU (PMU)           | • Monitoring and enforcement,  
<pre><code>  |   • Reporting  |  |
</code></pre>
<p>| Region               | Enforcement and Reporting | Enforcement, Implementation and Reporting |</p>
<table>
<thead>
<tr>
<th>Substation</th>
<th>Implementation and Reporting</th>
<th>Implementation and Reporting</th>
</tr>
</thead>
</table>

Table 3.1.1: ESMP IMPLEMENTATION RESPONSIBILITIES

- MD ISO
- MD TCN
- MD TSP
- ED TSP

- GM HSE

- PM (HSE) – Sub
- SM HSE – Sub
- Mgr. HSE – Sub
- AM. HSE – Sub
- HSE Officer – Sub

- PM PMU

- Other PMU

- Coord. ERSU

- Mgr. ERSU (PMU)
- Off. I ERSU (PMU)
- Off. II ERSU (PMU)
3.1.2. Contractor

The Contractor shall be responsible for carrying out the works at the substations in full compliance with this ESMP and applicable Nigerian Laws and regulations environmental and asocial impact management, pollution control, waste management, occupational health and safety.

The Contractor shall appoint one or HSE officer/s who will be consistently on site to ensure compliance.

The Contractor will be responsible for obtaining environmental permits and paying for waste disposal and other fees that are required for the works.

The Contractor shall be required to prepare detailed Environmental Management Plans (EMP) for implementing all aspects of the project which shall include: Environmental Management Plan, Waste Management Plan, Worker Health and Safety Management Plan, Emergency Preparedness and Response Plan, Security Plan, Grievance Mechanism (one for workers, including contractor and sub-contractor workers, and one for communities), Labor Management Policy, Incident Tracking Procedures and Log. This document shall be submitted to PMU-ERSU for prior approval before commencement of works.

The Contractor shall be required to submit the documents listed in the table below as part of efforts to ensure compliance with requisite environmental and social safeguards standards:

<table>
<thead>
<tr>
<th>s/n</th>
<th>Required Safeguard Instrument</th>
<th>Submission Period</th>
<th>Review</th>
<th>Clearance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Environmental Policy</td>
<td>During Bidding</td>
<td>ERSU Rep on Evaluation Committee</td>
<td>World Bank</td>
</tr>
<tr>
<td>2</td>
<td>OH&amp;S Policy</td>
<td>During Bidding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>E&amp;S Statement for the implementation of the Project</td>
<td>During Bidding</td>
<td>ERSU Rep on Evaluation Committee</td>
<td>World Bank</td>
</tr>
<tr>
<td>4</td>
<td>E&amp;S Bond</td>
<td>During Bidding</td>
<td>ERSU Rep on Evaluation Committee</td>
<td>World Bank</td>
</tr>
<tr>
<td>5</td>
<td>Contractor’s ESMP</td>
<td>During Bidding</td>
<td>1st Review – ERSU-PMU – 2nd Review – World Bank</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Job Risk Analysis</td>
<td>During Bidding</td>
<td>1st Review – “”</td>
<td></td>
</tr>
</tbody>
</table>

38/93
<table>
<thead>
<tr>
<th>Bidding</th>
<th>ERSU-PMU 2nd Review World Bank</th>
</tr>
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<tr>
<td><strong>9</strong></td>
<td>OH&amp;S Plan for the execution of the Project (detailing specific OH&amp;S actions and timings for major activities/aspects of the project)</td>
</tr>
<tr>
<td><strong>10</strong></td>
<td>Recruitment and Training Plan</td>
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</table>

Table 3.1.2: E&S Action Plan.

### 3.1.3. Federal Ministry of Environment

The Ministry in conjunction with its parastatal NESREA shall enforce the compliance of the Waste Management up to the disposal level by giving approval to each step of the wastes segregation.

### 3.1.4. World Bank

The Bank shall review the step by step progress report of the management plan on the implementation of this ESMP that from Project beginning to commissioning.

### 3.1.5. Community

Members of host communities are expected to embrace the project and see it as theirs and grievances or misconduct should be reported to PMU-ERSU.
CHAPTER FOUR

PROJECT DESCRIPTION

4.1. Introduction

Nigeria Electricity Transmission Project (NETAP) through a Credit from IDA is financing investments to improve the existing transmission network in Nigeria with the ultimate goal of boosting economic activities through availability of reliable energy to power homes and business activities. Some of the functions of a typical transmission substation include:

- Protection of transmission systems,
- Control of Energy Exchange,
- Ensuring steady State & Transient Stability,
- Maintenance of system frequency,
- Voltage Control,
- Provision of adequate line capacity for secure power supply,
- Determine energy transfer through transmission lines,
- Network monitoring

The objectives of the rehabilitation therefore are mainly to:

- Improve the voltage level and system stability,
- Improve socio-economic circumstances by providing a readily available electricity supply;
- Increase revenue base for Transmission Company of Nigeria (TCN) and identify requirements for responsible public engagement,
- Create job opportunities.

4.2. Project Scope

The Seven (7 No.) proposed Transmission Substations sites that fall under “PACKAGE 1 – Lot 1 are existing old sites.

The quality of electricity supply has deteriorated over the years at the various substations due to low capacity of infrastructure occasioned by attendant load demand of an ever increasing population and/or development. The existing equipment are over-stretched, obsolete and/or damaged as a result of over loading, poor maintenance and system faults/failures.

The scope of the project work in the Transmission substations shall include the following:

- Upgrade and/or installation of power transformers (replacement of lower to higher capacity).
- Replacement of obsolete isolators, circuit breakers (CBs), current Transformers (CTs) etc.
- Provision of spares of accessories for use during emergencies.

Kumbotso (Kano State) 330/132/33 kV Transmission substation

- Installation and commissioning of 1No. 300MVA 330/132kV transformer with its associated equipment
- Installation and commissioning of 2No. 100MVA 132/33kV transformer with its associated equipment
• Construction of additional 3No. 33kV bays
• Replacement of old protection and control panels
• Relocation of Mobile Transformer

Kankia (Katsina State) 132/33 kV Transmission substation
• Replacement of Faulty 1 x 30MVA and Upgrading of 1 x 30MVA Transformers to 2 x 60MVA 132/33kV Transformers
• High Voltage Switchgears and Associated Equipment Including Digital Control System

Dakata (Kano State) 132/33 KV Transmission substation
• Reinforcement with 1 x 60MVA 132/33kV Power Transformer
• Switchgears, Associated Equipment and Digital Control System
• Supply and Installation of Additional 3 No. Feeders Bays

Dan Agundi (Kano State) 132/33 KV Transmission substation
• Reinforcement of 1 x 60MVA 132/33kV Power Transformers
• High Voltage Switchgears, Associated Equipment
• Complete Rehabilitation of Substation

Shiorno (Niger State) 330/132/33 kV Transmission substation
• Replacement of Obsolete Control and Relay Panels with Digital Control System
• High Voltage 330kV Switchgears and Associated Equipment

Central Area (Abuja FCT) 132/33 kV Transmission substation
• Upgrading of 2 x 45MVA with 2 x 100MVA 132/33kV Power Transformer
• High Voltage Switchgears, Associated Equipment Including Gas Insulated Substation
• Rehabilitation of Civil Structures of the Control Room and Digital Control System

Kainji (Niger State) 330/132/33 kV Transmission substation
• Rehabilitation of the 330kV Substation, High Voltage Switchgears
• Associated Equipment. Rehabilitation of Control Room including Digital control System
CHAPTER FIVE
FINDINGS/ ENVIRONMENTAL AND SOCIAL BASELINE AT THE TRANSMISSION SUBSTATIONS

This section highlights the findings at the eight (8) Transmission Substations during the environmental assessments visits by PMU Environment Team.

5.1. KUMBOTSO 330/132/33 KV TRANSMISSION SUBSTATION

5.1.1 (I) Project Location

The Substation is located in Kumbotso town (along Kumbotso road – off Kaduna-Zaria-Kano express road) in Kano State (Kumbotso L.G.A.).

The town lies within coordinates 11°54'N and 8°31' E in the tropical savanna belt of Nigeria, sitting approximately 454m (1489ft) above sea level.

5.1.1 (II) Climate and Meteorology

Kumbotso features a hot semi-arid climate. It experiences an average yearly precipitation of 783mm, the bulk of which falls from June through to September.

The area is typically very hot throughout the year though it is noticeably cooler from December through February.

Average temperatures are typically between 21°C - 31°C in the town.

5.1.1 (III) Social Baseline

Community Relations

The substation is hosted by Gaida Community in Kumbotso L.G.A. in the metropolis of Kano (one of the major centers of commercial activities in Nigeria) in the North West area of Nigeria.

The area is densely populated and generally, Communities in this part of the country are friendly and accommodating but tend to be volatile towards religious issues.

5.1.1 (IV) Findings of Substation Environmental/Social Audit

This subsection presents the findings of the audit conducted at Kumbotso substation.

5.1.1 (IV) a Substation Building structures

The building structure which serves as Staff Offices has adequate office space to cater for requirements of staff manning the substations.

Also, the Control room space is ok but could be expanded if more control panels are to come in.
Plate 5.1: Working area within Substation Control Room.

5.1.1 (IV) b  House Keeping

Waste Management/ Storage
Litters of scraps, condemned parts and casings abound within the Substation premises thereby creating an unhealthy environment.
Although, there is demarcated area within the Substation premises being used for storage of scraps, construction materials or equipment and transformer oil drums.

Plate 5.1.2: Improperly stored accessories lying strewn on the Substation premise.

Overgrowths
The Substation premise is clean and free of any overgrowth.

Plate 5.1.3: Properly maintained Switchyard floor (free of overgrowth).
**Drainage**

The Substation premise is properly drained – no incidences of flooding. However, blockages to drainage channels (which also serve as cable trenches) could be a problem in future.

**Plate 5.1.4:** Stagnant water body trapped in drainage channel.  
**Plate 5.1.5:** Sedimentation in drainage channel.

5.1.1 (IV) c  Occupational Health and Safety

**Warning Signage**  
There are no notices or signs clearly indicating “Danger” areas within the Substation.

**Use of PPEs**  
Use Personal Protective equipment (PPEs) is not strictly enforced during routine operations by Staff, although provision of PPEs for Staff use is inadequate.

**Site Security**  
The Substation is relatively secure as there are security personnel manning the gates and overseeing the premises all through the day.

**Illumination**  
The switchyard is not properly illuminated at night. The control room illumination is fair.

**Safety Personnel/First Aid**  
There is no HSE Staff at the Substation nor were there First Aid kits on site.

**Fire-prevention/preparedness**  
Although fire extinguishing canisters were available on site (some un-serviced) but there were no smoke detectors, fire alarms, fire hose or water hydrants within the substation. Considering the nature of equipment at the Substation, it can be safely concluded that preparedness in the event of fire is grossly inadequate. Also, the transmission substation operators possess little or no training in firefighting/prevention.
Corrosion
There are no cases of corrosion at the gantry bases within the switchyard.

Oil leakage/Spillage
There are Oil leakages from some of the transformers in the Substation.

Plate 5.1.6: Oil Spillage at burnt transformer base.

Plate 5.1.7: Spilled transformer oil trapped in stagnated water body (seepages have already affected the ground water – the main source of supply at the substation).

5.1.1 (V) Environment

Accessibility
The access road leading to the Substation is clearly defined, tarred and free of encumbrances.

Aesthetics
The Substation environment is visually appealing apart from the litter of used equipment at the switchyard entrance.

Source of Water
The water source is borehole and it is connected to all needed areas in the station

Toilet Facility
The toilet facility in the station is fair but could be better.

5.1.1 (VI) Social

Traffic
The access road leading to the Substation is clearly defined, tarred and free of encumbrances.

Community Relations
The community relations was cordial and there were no incidences of agitations or disruptions.
5.2 KANKIA 132/33 KV TRANSMISSION SUBSTATION

5.2.1 (I) Project Location

The Substation is located in Kankia town (along Kankia – Ingawa Road, Kankia – Kunchi Road off Kano – Katsina highway) in Katsina State (Kankia L.G.A.).

The city lies within coordinates 12° 32’ 57” N and 7° 49’ 31” E in the tropical savanna belt of Nigeria, sitting approximately 234m (767ft) above sea level.

5.2.1 (II) Climate and Meteorology

Kankia enjoys a Tropical Continental type of climate. It experiences little precipitation throughout the year, with an average yearly precipitation of 807mm. The wet season lasts from May to September.

The area is typically very hot throughout the year though it is noticeably cooler from December through February.

Average temperatures are typically between 24.6°C – 32.7°C in the town.

5.2.1 (III) Social Baseline

Community Relations

The substation is hosted by Kankia Community in Kankia L.G.A. along the Kano – Katsina road. The community is 30mins drive to Katsina (Capital of Katsina State) in the North West area of Nigeria.

The area is partly densely populated and generally, this part of the country are friendly and welcoming. Their major occupation is farming.

5.2.1 (IV) Findings of Substation Environmental/Social Audit

This subsection presents the findings of the audit conducted at Kankia substation.

5.2.1 (IV) a Substation Building structures

The existing building structures within the substation and switchyard was initially built in the late 70s and the control room renovated and extended in 2016. The furniture and air conditioning systems in the control room are good.

5.2.1 (IV) b House Keeping

Waste Management/ Storage

Though at a corner in the switch yard, there are scraps materials and casings noticeable at the substation, wastes are not properly managed in the substation.

Also, there is no clearly demarcated area within the Substation premises being used for storage of scraps, and transformer oil drums.

Overgrowths

Overgrowths were not noticed in this substation because it’s dry season. Though it was stated by the staffs manning the station that during the rainy season the station is partially water logged and that gives room to overgrowth.
Drainage
The station drainage system is good although, some of the cover slabs are broken.

5.2.1 (IV) c  Occupational Health and Safety

Warning Signage
There are no notices or signs clearly indicating “Danger” areas within the Substation.

Use of PPEs
Use of Personal Protective equipment (PPEs) is not strictly enforced during routine operations by Staff, although provision of PPEs for Staff use is inadequate.

Site Security
The Substation is situated within a low crime area of the state. The station is not fenced but the switch yard is fenced with wire gauze. However, no organized security personnel was seen either at entrance or within the station.

Illumination
The switchyard is poorly illuminated at night while the control room is fairly illuminated

Safety Personnel/First Aid
There is no HSE Staff present or seen nor deployed to the station but there exists one at the region. Also, there are no First Aid kits on site.

Fire-prevention/preparedness
Although fire extinguishing canisters were available on site (most expired and not enough) neither were there smoke detectors, fire alarms, fire hose or water hydrants within the substation. Considering the nature of equipment at the Substation, it can be safely concluded that preparedness in the event of fire is grossly inadequate.
Also, the transmission substation operators possess little or no training in firefighting/prevention.

**Oil leakage/Spillage**
A decommissioned transformer had oil spilled on its plinth and environ. A transformer under repairs has its oils being transferred into plastic water tanks but not properly contained as the tanks leak.

![Plate 5.2.3: Spilled oil on decommissioned transformer plinth.](image)

![Plate 5.2.4: Leaking Transformer oil storage.](image)

**5.2.1 (V) Environment**

**Accessibility**
The access leading to the Substation and switchyard is well concreted and free of encumbrances.

**Aesthetics**
The Substation environment is visually ok but dusty.

**Source of Water**
The water source is borehole and it is connected to all needed areas in the station

**Toilet Facility**
The toilet facility in the station is fair but could be better.

**5.2.1 (VI) Social**

**Traffic**
The access road leading to the Substation is clearly defined, tarred and free of encumbrances.

**Community Relations**
The host community is predominantly Muslim. Going by responses from the substation staff, it appears that the community’s relations with the substation are cordial - wherefore incidences of agitations or disruptions have not been experienced.
5.3 DAKATA 132/33 KV TRANSMISSION SUBSTATION

5.3.1 (I) Project Location

The Substation is located in Dakata town in Kano State (Nasarawa L.G.A.), along Independence road and lies within coordinates 12° 01'N and 8° 34'E in the tropical savanna belt of Nigeria sitting approximately 454m (1489ft) above sea level.

5.3.1 (II) Climate and Meteorology

Dakata features a hot semi-arid climate. It experiences an average yearly precipitation of 783mm, the bulk of which falls from June through to September.

The area is typically very hot throughout the year though it is noticeably cooler from December through February.

Average temperatures are typically between 21°C - 31°C in the town.

5.3.1 (III) Social Baseline

Community Relations

The substation is hosted by Faunna Community (Nassarawa L.G.A.) - a predominantly Muslim settlement.

Dakata is densely populated and the predominant occupation is trading and farming.

The relations of the host Community with the Substation is cordial and the atmosphere was rather peaceful as at the time of the Substation visit.

However, issues of religion can be very tetchy within the community wherein the level of religious tolerance is very low and the potential for very violent “religious” riots are very real (which in most cases result in fatalities to non-muslimss and non-indigenes alike).

5.3.1 (IV) Findings of Substation Environmental/Social Audit

This subsection presents the findings of the audit conducted at Dakata substation.

5.3.1 (IV) a Substation Building structures

The Control Room building structure is modern but require proper maintenance.

Also, the Control room is spacious but the cooling systems not too good.
Plate 5.3.1: control room with the operator desk and control panels.

5.3.1 (IV) b  House Keeping

Waste Management/ Storage
There are no litters of construction equipment, scraps materials and casings noticeable at the substation, wastes are generally well managed in the substation.

However, there is no clearly demarcated area within the Substation premises being used for storage of scraps, construction materials or equipment and transformer oil drums.

Overgrowths
The Substation premise is not properly maintained of weeds overgrowths and poor graveling in the switchyard.

Plate 5.3.2 Poor graveling and overgrowths in the switchyard

Drainage
The Substation premise is properly drained but incidences of flooding occurs.

5.3.1 (IV) c  Occupational Health and Safety

Warning Signage
There are no notices or signs clearly indicating “Danger” areas within the Substation. Except on a transformer giving PPE warning.

**Use of PPEs**
Use Personal Protective equipment (PPEs) is not strictly enforced during routine operations by Staff, although provision of PPEs for Staff use is inadequate.

**Site Security**
The Substation is relatively secure as there are security personnel manning the gates and overseeing the premises all through the day.

**Illumination**
The switchyard is poorly illuminated at night while the control room is fairly illuminated

**Safety Personnel/First Aid**
There is no HSE Staff at the Substation also no First Aid kits available on site.

**Fire-prevention/preparedness**
Although fire extinguishing canisters were available on site (all serviced), there were no smoke detectors, fire alarms, fire hose or water hydrants within the substation. Considering the nature of equipment at the Substation, it can be safely concluded that preparedness in the event of fire is grossly inadequate.

Also, the transmission substation operators possess little or no training in firefighting/prevention.

**Oil leakage/Spillage**
There is Oil leakages from one of the transformers in the Substation.

Plate 5.3.3: Oil leakage from one of the transformers.

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5.3.1 (V) **Environment**

**Accessibility**
The access road leading to the Substation is clearly defined, tarred and free of encumbrances.

**Aesthetics**
The visual appeal of the Substation environment is negatively affected by the under-listed:

- Grass overgrowths.
Source of Water
The water source is borehole and it is connected to all needed areas in the station

Toilet Facility
The toilet facility in the station is fair but could be better.

5.3.1 (VI) Social

Traffic
The access road leading to the Substation is clearly defined, tarred and free of encumbrances. However, the road is very busy.

Community Relations
The community relations was cordial and there were no incidences of agitations or disruptions.

5.4 DAN AGUNDI 132/33 KV TRANSMISSION SUBSTATION

5.4.1 (I) Project Location
The Substation is located at Kofa Dan Agundi in Kano State (Kano Municipal), along BUK road in front while Sharada Road at the back and lies within coordinates 11° 35’ 42” N and 8° 35’ 42” E in the tropical savanna belt of Nigeria sitting approximately 534m above sea level.

5.4.1 (II) Climate and Meteorology
Dan Agundi features a hot semi-arid climate. It experiences an average yearly precipitation of 783mm, the bulk of which falls from June through to September.

The area is typically very hot throughout the year though it is noticeably cooler from December through February.

Average temperatures are typically between 21°C - 31°C in the town.

5.4.1 (III) Social Baseline

Community Relations
The substation is hosted by the Agundi Community (Kano Municipal). The host Community is peaceful and the relations with the Substation is cordial but could be hostile concerning religion.

Dan Agundi is densely populated and the predominant occupation in this area is commerce and white collar.

5.4.1 (IV) Findings of Substation Environmental/Social Audit
This subsection presents the findings of the audit conducted at Dan Agundi substation.

5.4.1 (IV) a Substation Building structures
The Control Room building structure is block wall but require proper maintenance.
Also, the Control room is chock but the cooling systems not too good.

Plate 5.4.1: control room with the operator desk and control panels.

5.4.1 (IV) b  House Keeping

**Waste Management/ Storage**

There is a rehabilitation and reinforcement work on going in the station. Excavation work is also ongoing. Lots of excavated laterite soil are deposited inside the switchyard by the contractor.

However, there is no clearly demarcated area within the Substation premises being used for storage of scraps, construction materials or equipment and transformer oil drums.

**Overgrowths**

The Substation premise is not properly maintained of weeds overgrowths and very poor graveling in the switchyard.

Plate 5.4.2 Poor graveling and construction waste management in the switchyard

Plate 5.4.3 Poor housekeeping and broken cable trench covers

**Drainage**

The Substation premise is properly drained but some of the drains are blocked with debris of broken cable trench covers.
5.4.1 (IV) c Occupational Health and Safety

**Warning Signage**
There are no notices or signs clearly indicating “Danger” areas within the Substation. Except on a transformer giving PPE warning.

**Use of PPEs**
Use Personal Protective equipment (PPEs) is not strictly enforced during routine operations by Staff, although provision of PPEs for Staff use is inadequate.

**Site Security**
The Substation is relatively secure as there are security personnel manning the gates and overseeing the premises all through the day.

**Illumination**
The switchyard is poorly illuminated at night while the control room is fairly illuminated.

**Safety Personnel/First Aid**
There is no HSE Staff at the Substation also no First Aid kits available on site.

**Fire-prevention/preparedness**
Although fire extinguishing canisters were available on site (all serviced), there were no smoke detectors, fire alarms, fire hose or water hydrants within the substation. Considering the nature of equipment at the Substation, it can be safely concluded that preparedness in the event of fire is grossly inadequate.

Also, the transmission substation operators possess little or no training in firefighting/prevention.

**Oil leakage/Spillage**
No oil leakages was observed in the Substation.

5.4.1 (V) Environment

**Accessibility**
The access road leading to the Substation is clearly defined, tarred and free of encumbrances.

**Aesthetics**
The visual appeal of the Substation environment is negatively affected by the under-listed:
- Grass overgrowths.

**Source of Water**
The water source is borehole and it is not connected to all needed areas in the station.

**Toilet Facility**
The toilet facility in the station is poor with no water supply.

5.4.1 (VI) Social

**Traffic**
The access road leading to the Substation is clearly defined, tarred and free of encumbrances. However, the road is very busy.

**Community Relations**
The community relations was cordial and there were no incidences of agitations or disruptions.

Plate 5.4.4 Poor working environment with no regard for safety.

5.5 SHIRORO 330/132/33KV TRANSMISSION SUBSTATION

5.5.1 (I) Project Location

The Transmission Substation is located in Zumba community in Shiroro Local government Area (L.G.A), an hour drive from Minna the capital of Niger State.

Niger state where Shiroro L.G.A is situated was created on 3rd February, 1976 under the rule of General Murtala Ramat Mohammed. The state consists of 25 local government area and it was named after the River Niger. The state recorded a population of 3,950,249 in the 2006 census with 235,404 amount of people in Shiroro L.G.A.

Shiroro, which has a land area of 5,015km² lies within the coordinates latitude 9° 58’N and longitude 6° 49’E.

5.5.1 (II) Climate and Meteorology

Shiroro has a tropical climate and experiences two distinct season, the wet season and dry season. Its average annual rainfall is 1,265mm.

The highest temperature is usually between March and June while the lowest is between December and January. The average annual temperature is 26.2°C. The hydrology and fertile soil allows for a successful cultivation of crops in the State.

5.5.1 (III) Social Baseline

**Community Relations**
The Transmission Substation is situated in Zumba community in Shiroro Local Government Area of Niger State in the north central area of Nigeria. The community is sparsely populated and the area is serene. The host community has a cordial and accommodating relationship with the TCN staff at the substation.
5.5.1 (IV) Findings of Substation Environmental/Social Audit

This subsection presents the findings of the audit conducted at Shiroro Transmission substation.

5.5.1 (IV) a Substation Building structures

The substation structure is an old standard building with adequate office spaces for the staff in the Shiroro region manning the substation.

The control room present at the Shiroro 330/132/33kV switchyard only controls the 132kV switchgears. The 330kV control panels are in the Shiroro Hydroelectric Power Station which was formerly owned by the then PHCN before it was privatized. So there is no control system for the 330kV lines in the TCN control room. There is no room for expansion on the present control room but there is adequate space to build a new control room for the 330kV control panels.

The control room and the switch yard are not properly illuminated. Also, as observed the current control room is poorly ventilated due to a faulty central cooling system. The same issues stated above also applies to the 132/33kV Transmission Substation control room in Shiroro. A rehabilitation of the substation should be put into consideration.

![Plate 5.5.1: Control room with the operator desk and control panels.](image)

5.5.1 (IV) b House Keeping

Waste Management/ Storage

There were litters of scraps in the surroundings of the control room and within the switch yard, no area was evidently mapped out specifically for storage of waste.

Adequate waste management system is not adhered to.
Plate 5.5.2: Poor housekeeping and decommissioned equipment littered within the premises

Overgrowths
The surroundings of the substation switchyard was free of grasses.

Plate 5.5.3: Properly maintained switchyard free of overgrowth.

Drainage
No proper drainage in the substation environment, the submachines are obsolete.

5.5.1 (IV) c Occupational Health and Safety

Warning Signage
No safety signs detailing areas of high risk was seen around the substation.

Use of PPEs
Personal Protective Equipment (PPEs) were adequately provided for staff use and there is good compliance among the staff.

Site Security
The substation is highly secured. There were security personnel seen guarding the gate.

Safety Personnel/First Aid
There was a HSE personnel at the transmission substation. A First aid box is present at the substation but there are no first aid supplies in the box.

**Fire-prevention/preparedness**
Fire extinguishers were present at the substation and they have all been properly serviced. However, there were no fire alarms, smoke detectors or water hydrants in the substation. A muster point was indicated in case of a fire incidence but no fire exit was noted, there was only one way in and out of the substation control room. Seeing that the equipment at the substation are prone to fire outbreak, it can concluded that the fire preparedness/prevention technique at the substation was inadequate.

**Oil leakage/Spillage**
There were no Oil leakages present at the Substation.

### 5.5.1 (V) Environment

**Accessibility**
The road network to the substation is tarred and in a fairly good condition.

**Aesthetics**
Asides from the litters resulting from used and unused equipment around the substation, the premises was visually good.

**Source of Water**
The water source is borehole

**Toilet Facility**
The toilet facility in the station is poor.

### 5.5.1 (VI) Social

**Traffic**
The road network to the substation is tarred and in a fairly good condition.

**Community Relations**
The relationship with the host community was cordial, there are no issues of violence.

### 5.6 CENTRAL AREA ABUJA FCT 132/33KV TRANSMISSION SUBSTATION
5.6.1 (I) Project Location

The Transmission Substation is located in Central Business District (also called Central Area) in Abuja FCT the capital City of Nigeria. Abuja was built in the 1980’s and it replaces the most populous city of Lagos as the new capital of Nigeria.

According to the 2006 Census, the city had an estimated population of 776,298 people and since then Abuja has grown by 139.7% between 2000 and 2010 making it the fastest growing city in Nigeria. This statistics is according to the United Nations. The city is still experiencing a yearly growth of at least 35% making it the fastest growing city in the African continent and the World at large.

The Transmission substation in the Central Area of Abuja was created in 2005 and it lies within the coordinates 9°06N 7°49’E.

5.6.1 (II) Climate and Meteorology

Abuja experiences three distinct climatic conditions every year namely dry season, warm and rainy season. The rainy season often starts by April and ends in October.

During the rainy season the daytime temperature reaches 28°C to 30°C and the night temperature reaches 22°C to 23°C whilst the daytime temperature during the dry season is as high as 40°C and the night temperature as low as 12°C.

5.6.1 (III) Social Baseline

Community Relations

The Transmission substation is located in a serene environment in the central business district of Abuja. There are no issues of violence in and around the Area.

5.6.1 (IV) Findings of Substation Environmental/Social Audit

This subsection presents the findings of the audit conducted at Central Area Abuja FCT 132/33kV substation. The substation is currently equipped with 3 x 60MVA 132/33kV power transformer as opposed to the 2 x 45MVA 132/33kV power transformer stated in the proposed NETAP project.

5.6.1 (IV) a Substation Building structures

The substation building is a standard structure made from concrete. However, there were severe cracks observed on the walls and base of the structure. This may be as a result of poor construction work, so a rehabilitation of the entire building structure should be included in the proposed intervention to prevent building collapse, which may lead to loss of life and/or equipment’s.

The control room is spacious enough for the installation of the additional equipment. The furniture in the control room on the other hand are obsolete and substandard. A replacement is required. Also the control room is poorly illuminated and ventilated. The same applies to the substation as a whole. The extractors in the switchgear room is faulty considering that this equipment generates heat it is unsafe.
Plate 5.6.1: The structure of the substation showing the cracks on the walls.

Plate 5.6.2: The control room with the control panels

5.6.1 (IV) b House Keeping

Waste Management/ Storage
Housekeeping within and around the substation environment as generally poor. Old furniture, equipment and scraps were observed littered around the substation. They constitute a health hazard because they may serve as hiding places for reptiles such as snakes. More so, trip wires were observed within the operators sitting area; this can lead to accidents resulting from falls. They have the potential of causing injuries. No waste collection site was observed.

Plate 5.6.3: Poor housekeeping and improper storage of equipment

Overgrowths
Overgrowth was noticed in the premises of the substation.
**Plate 5.6.4:** The overgrowths in the substation

*Drainage*

The drains around the switchyard at the substation was blocked although there are no incidences of flood within the surroundings of the substation.

**Plate 5.6.5:** The blocked drains

5.6.1 (IV) c  **Occupational Health and Safety**

*Warning Signage*

Notices and warnings signs clearly showing areas of immense danger was present at the substation.

**Plate 5.6.6:** Warning signs at the substation

*Use of PPEs*
Personal Protective equipment (PPEs) are provided for the staff at the transmission substation but they are old and needs to be replaced. The use of the PPEs by the staff is not strictly enforced. Non-use of these PPEs during routine work makes the staff prone to accidents.

**Site Security**
The transmission substation is moderately secured as a broken fence was observed around the substation and only one security personnel was seen on ground.

**Safety Personnel/First Aid**
There is a HSE personnel at the substation. The First Aid kit at the substation is inadequate and the operational staff at the station has not received any form of training on its use.

**Fire-prevention/preparedness**
Firefighting canisters are present at the substation but they have expired and are yet to be serviced. No training on firefighting technique has been given. Fire alarm and sprinklers was spotted at the station but the sprinklers are not functional.

**Oil leakage/Spillage**
The substation is equipped with 3 x 60MVA power transformers. Evidence of spills and leakage from the transformer oil was seen on site.

### 5.6.1 (V) Environment

**Accessibility**
The access road to the substation is tarred and good.

**Aesthetics**
The substation premises is not visually good. The premises are unkempt.

**Source of Water**
The water source is borehole but the overhead tanks are leaking.

**Toilet Facility**
The toilet facility in the station is poor with no water supply.

### 5.6.1 (VI) Social

**Traffic**
The road leading to the substation are tarred and clearly defined.

**Community**
The relationship with the community is cordial and violence free. Although there have been issues of vandalism outside the substation.

### 5.7 KAINJI 330/132/33KV TRANSMISSION SUBSTATION
5.7.1 (I) Project Location

The Kainji 330kV substation is located in New Bussa town ((along Wawa –Mokwa Road)) in Borgu Local Government Area (L.G.A) of Niger State. The state was created on 3rd February, 1976 under the regime of General Murtala Ramat Mohammed and consists of 25 Local Government Area.

The New Bussa town where the transmission substation is located happens to be the new site of Bussa after the Kainji dam set the former location underwater. According to the 2007 census, the town has an estimated population of 24,449 people out of the recorded population of the state which is about 3,950,249 people. The predominant occupation is farming and fishing.

The substation lies within the coordinates 9° 51’N and 4° 36’E in the North Central region of Nigeria.

5.7.1 (II) Climate and Meteorology

The state experiences an annual rainfall from 1,100mm to 1,600mm. The highest temperature is usually between March and June while the lowest is between December and January. The temperature never exceeds 94°C. These favorable climatic conditions allows for good agricultural practices within the state.

5.7.1 (III) Social Baseline

As mentioned earlier in 5.7.1 (I), the substation is hosted by the New Bussa community in Borgu L.G.A. in Niger State (North Central of Nigeria). The town is sparsely populated and peaceful. The people are also generally friendly and hospitable.

5.7.1 (IV) Findings of Substation Environmental/Social Audit

This subsection presents the findings of the audit conducted at Kainji Transmission substation.

5.7.1 (IV) a Substation Building structures

The 330kV control system are located in the Kainji Hydroelectric Power station but the power station has been privatized so access is restricted.

The existing building at the 330kV switchyard which should serve as the control room is dilapidated, so there is need reconstruct the control room considering that there is sufficient land space for it. The 132kV transmission substation on the other hand, has a clean, new and spacious control room.

Plate 5.7.1: The existing building in the 330kV switchyard
5.7.1 (IV) b House Keeping

**Waste Management/ Storage**
Old furniture, scraps and decommissioned equipment were observed littered around the premises of the 330kV switchyard and inside the old substation building at the switchyard. They constitute a health hazard because they may serve as hiding places for reptiles such as snakes. They also have the potential of causing injuries resulting from cuts and lacerations. No waste collection site was observed.

**Plate 5.7.2:** Decommissioned equipment and scraps lying strewn within the premises of the substation.

**Plate 5.7.3:** Poor Housekeeping in the substation
Overgrowths
Overgrowths was observed around and within the premises of the 330kV switchyard. The switchyard requires gravelling.

![Overgrowths within the switchyard](Plate 5.7.4)

Drainage
The drainage pipes within the 330kV switchyard has collapsed and as a result of this, the ground in the switchyard is gradually sinking in.

![The sinking the ground in the switchyard](Plate 5.7.5)

5.7.1 (IV) c Occupational Health and Safety

**Warning Signage**
No safety signs were observed in the substation

**Use of PPEs**
Provision of Personal Protective equipment (PPEs) is adequate and strictly enforced during routine operations by Staff.

**Site Security**
Although, the area where the substation is situated is generally peaceful, only one security personnel was observed manning the gate to the 330kV substation. This shows that the security within the substation is insufficient and needs to be improved on.
Similarly, it was observed that the switchyard was not fenced and the main fence intended to guard the substation had fallen in some areas. This makes the substation easily accessible to scoundrels and stray animals.

**Safety Personnel/First Aid**
There is a HSE Staff from TCN present at the substation. Although first aid box was made available at the substation, it is not properly equipped and the operators have little or no training on how to administer first aid in case of an emergency.

**Fire-prevention/preparedness**
Fire extinguisher canisters were available and they are well serviced. However, there are no smoke detectors, fire alarm system, fire hose or hydrants present at the substation. The transmission operators are well trained on firefighting/prevention techniques.

**Oil leakage/Spillage**
There were no Oil leakages and spillages in the Substation because there are no transformers present.

### 5.7.1 (V) Environment

- **Accessibility**
  The road to the Substation is tarred and clearly defined.

- **Aesthetics**
  The substation premises was dusty and untidy.

- **Source of Water**
  No water supply was spotted.

- **Toilet Facility**
  The toilet facility in the station is poor.

### 5.7.1 (VI) Social

- **Traffic**
  The road leading to the substation are tarred and clearly defined.

- **Community Relations**
  The relationship with the community is cordial and violence free.
CHAPTER SIX
POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS /MITIGATION

6.1: Introduction

The assessment of potential impacts has been done through analyses of various project activities in anticipation of possible changes to the environment against the backdrop of National and International Environmental and Social Standards applicable.

Each potential impact was analyzed to classify its significance to three degrees: major impacts, medium impact and minor impacts.

- **Major impacts** (impacts with significant likelihood of violating of applicable standards).
- **Medium impacts** (impacts with reasonable likelihood of violating applicable standards but only in combination with the impacts from other sources.
- **Minor impacts** are impacts which are not likely to cause violation of applicable standards.

The likelihood of each impact occurring is further categorized as having:

- **High probability of occurrence**
- **Low probability of occurrence**.

The assessment carried out by the ERSU at (6) transmission substations were site specific in order to identify potential environmental and social impacts peculiar to each Substation. This is in compliance and accordance with requirements of Federal Ministry of Environment (FMEnv.) and the Operational Policies and Procedures of the World Bank on Environmental and Social Safeguards.

The key objectives of the environmental assessment are to:

- Identify potential positive and negative impacts of the proposed rehabilitation/reinforcement Project on the transmission substations and its Enviro-Social dynamics during and post Implementation.
- Develop a Management plan that outlines relevant mitigation measures to minimize and/or mitigate negative effects and impacts and to enhance positive effects and impacts.

6.2: Potential Environmental and Social Impacts during Construction

6.2.1: Construction Waste Impacts

Wastes generated during construction activities at substations will mainly comprise of excavated soil for foundations. The excavated soil will normally be accumulated within the station, and collected after installations are completed. Other types of solid construction wastes would include the following:

- Empty cases, crates and Containers’,
- Steel Chippings,
- Cut-off trees and vegetation,
- Metals, wood, cement sacks, sand and gravel, concrete spills, cut off cables, garbage from daily activities of workers
- Hazardous wastes such as spent oils from the operation and maintenance of machinery.
Wasted or faulty materials of the towers including conductors and insulators

### 6.2.2: Excavation Impacts

During the rehabilitation of the substation poorly managed excavated areas have potential negative impacts which may ultimately lead to Project delays. The major impacts of excavation include:

- Pit falls (which may result in injuries),
- Earth collapse (which may result in damage to structures, equipment, etc),
- Contact with buried Electric cables (which may result to destruction of same or electrocution).

### 6.2.3: Land Use Impacts

The rehabilitation/reinforcement works will be carried out within existing substation premises on land legally acquired and owned by TCN. Thus, it is anticipated that limitations and impacts related to the land use of the substation is relatively limited.

### 6.3.4: Impacts due to air emissions

Excavation, filling, loading, transportation and unloading of soil and construction materials cause suspension of airborne dust/particles that raises the particulate matter concentration on ambient air. These emissions are temporary and its severity depends on the construction activity, meteorological conditions, silt and moisture content of the soil.

Another source of air emissions during construction is the exhaust fumes/gases of construction machinery and vehicles visiting and leaving the site. The extent of these emissions depends on the number of machinery working at the site at one time, the type and efficiency of the engines and also the climate conditions.

### 6.3.5: Impacts due to noise emissions

Normally construction works include noisy activities related to the operation of construction equipment, possible hammering and drilling works in addition to the noise generated from construction related trucks. The noise impacts could be analyzed in two main aspects: noise impact within the site, and the noise impact on the immediate surrounding neighborhood.

During construction activities, noise would be generated during day and night which may exceed the acceptable levels of intensity within the vicinity of all identified receptors {the threshold noise intensity should not exceed 55 Decibels during the day (7am - 10pm) and 45 Decibel during the night (10pm - 7am) in accordance with provisions of World Bank Operational Policy}.

### 6.2.6: Impacts on Socio-economics (traffic)

The greatest potential for traffic impacts to occur will arise during the periods of peak construction activities as the roads leading to and adjacent selected transmission substation project sites would be experiencing to and fro movements of vehicles conveying heavy machinery and equipment, construction workers, etc.

The impact (on the resident users, vehicles, machines and equipment) will be rather significant negative in some of the areas visited where the roads are quite busy and very dilapidated.
6.3: Impact Mitigation for the NETAP Substations Upgrade/Reinforcement Project.

The table below highlights the intended mitigation measures for the key environmental and social impacts of the NETAP (Package 1 – Lot 1) Substations Upgrading/Reinforcement Project {i.e. Kumbotso 330/132 kV, Kainji 330/132 kV, Shiroro 330/132 kV, Kankia 132/33kV, Dakata 132/33kV, Dan Agundi 132/33kV and Central Area 132/33kV Transmission Substations, respectively}.

**Table 6.3.1:** Impact Mitigation for NETAP Substations Upgrade/Reinforcement

<table>
<thead>
<tr>
<th>Project Phase - Environmental Aspects</th>
<th>Critical Control Point</th>
<th>Potential Associated Impact</th>
<th>Mitigation</th>
<th>Action</th>
</tr>
</thead>
</table>
| **Site Preparation**                  | Establishment of workers camps/accommodation and influx of construction workers. | Possible Influx of construction workers can lead to social conflict and “illicit activities such as sexual exploitation and abuse (SEA) and gender-based violence (GBV).” | - Minimize influx through giving local communities first priority when hiring unskilled workers and, to the extent qualified applicants are available, semi-skilled and skilled workers  
- Require the contractor to include in the Contractors Environmental and Social Management Plan (CESMP) measures to avoid SEA, GBV, or other social conflict, including:  
  o Development of an HIV/AIDS/STI awareness program which include provision for special targeting of girls and young women, sensitization, awareness campaigns, as well as special sensitization and targeting of sex workers and other At Risk populations  
  o mandatory awareness raising for the workforce about refraining from unacceptable conduct toward local community members, specifically women;  
  o awareness-raising to sensitize host communities, with special attention to women, about the social and health risks of sexual engagement with the workforce;  
  o informing workers about national laws that make sexual harassment, exploitation of children, and gender-based violence a punishable offence which is prosecuted and | Contractor/ERSU-PMU  
Contractor/ERSU-PMU  
Specialized NGO recognized by the National Agency for the Control of AIDS  
Contractor/Resident Engineer/ERSU-PMU  
Contractor/Resident Engineer/ERSU-PMU  
Contractor/Resident Engineer/ERSU-PMU |
Vehicular break down thereby causing traffic which will be reported to the authorities;

- code of conduct to be established for contractor employees and contract workers, acknowledging a zero-tolerance policy towards child labor; child sexual exploitation as well as Sexual and Gender Based Violence. The code of conduct will be a part of employment contracts for each contractor staff and will include sanctions for non-compliance (e.g., termination), and
- contractors adopting a policy to cooperate with law enforcement agencies in investigating complaints about gender-based violence.

- TCN and Contractor to consult with local community representatives including women regarding potential for SEA or GBV and appropriate measures to prevent and respond to it.
- TCN should ensure that contractor’s GRM is robust and operating
- Ensure that implementation of the CESMP (or influx management plan if there is one) is an enforceable provision of the construction contract.

- Contractor’s trucks should be properly serviced/maintained before mobilization
- Survey of best road route access to project site and should be conducted prior to mobilization to site,
- Heavy duty trucks conveying project equipment/material should travel at night to avoid traffic delays/accidents,
- Orientation to be conducted for all workers on the culture and tradition of the host community,
- Regular stakeholders engagement with the host community

1 The Worker Code of Conduct will specify prohibited behaviors on site and in the local communities, including: intimidation and sexual harassment in the workplace, use of drugs and alcohol on site, working under the influence of drugs and alcohol, misuse of contractor equipment and materials, allowing unauthorized access to the worksite, sexual misconduct on site and in the communities. It will also address desirable behaviors, including among others: respect for human rights, respect for and courtesy toward women and other community members, and proper responses to community requests for information or assistance.
| Vehicular transportation & local road routes | and workers on the activities ongoing.  
- Slow heavy duty vehicles causing traffic jams  
- Risk of road accidents due to increase in heavy vehicular traffic  
- Socio-cultural conflicts due to differences in customs of workers and hosts community  
- Introduction and increase of communicable diseases.  
- Outriders should be engaged whenever possible during mobilization of heavy duty trucks and equipment,  
- Radio/Television announcements should be aired to inform the general public of activities/movements,  
- Contractor should engage the services of Traffic Wardens at strategic points on local roads,  
- Strategic road signs/warnings should be placed along designated travel routes,  
- Traffic Regulations and approved speed limits along travel routes should be strictly adhered to by Contractors’ drivers/personnel, |

PMU, Contractor, Transporter, Road safety, VIO, Police
| Site Preparation | Recreational facilities | Damages to road as a result of vehicular movement of during the conveyance of project equipment/materials to site should be repaired.  
Recreation areas should be avoided (wherever possible) by vehicles carrying equipment as such areas are usually always very busy.  
Market/Schools areas should also be avoided (if possible) by vehicles carrying equipment as such areas are usually always very busy.  
Contractor should carry out early basic studies and subsequently educate workers on the socio-cultural norms of the host communities so as to conform to prevailing customs and norms of the local community (on mobilization to project site).  
Prior to mobilization to project site, all Contractors' personnel should be screened for communicable and other diseases.  
Contractor should carry out periodic health screening/checks for staff while on site and identified cases should be promptly isolated for proper medical attention,  
Contractor should develop and publish a Stakeholder Engagement Plan that includes a grievance Redress mechanism for addressing community concerns and complaints. |
| Contractor/Resident Engineer/ /ERSU-PMU |
| Contractor/Resident Engineer/ /ERSU-PMU |
| Contractor/Resident Engineer/ /ERSU-PMU |
| Contractor/EERSU/PMT |
| Contractor/Resident Engineer/ /ERSU-PMU |
| Contractor/Resident Engineer/ /ERSU-PMU |
### Site Preparation

#### Mobilization of personnel, material and equipment to project area.

#### Vegetation clearing at construction sites

#### Fuel storage

### Operational Vehicles

- Introduction and increase of communicable diseases.
- Loss of business hours and disturbance of residents and staff along the access routes during mobilization.
- Employment of unskilled labour.
- De-vegetation/loss of vegetation at construction points.
- Generation of various waste materials; vegetation, scrap materials on site, etc.

- All operational vehicles should be optimally operational.
- Operational vehicles to be used during off peak hours and all vehicle should be properly maintained to avoid break downs.

- Vegetation clearing should be limited to the minimum area required for the campsite, construction site and access roads.
- Disturbed and unwanted areas at campsite, and access roads should be re-vegetated with appropriate local species.
- Waste from site clearing should be managed in accordance with the Contractor’s approved Waste Management Plan.

- Operators **must** be trained on safe fuel handling practices,
- Storage containers should be periodically checked for leakages,
- Containers should be provided with secondary containment capable of holding 110% of its contents

### Areas to be cleared during Construction

### Storage area

- Soil/groundwater contamination from accidental leaks or spills of stored fuel and transformer oil at camp/construction sites.

- Contractor - (adherence), S/S HSE - (compliance monitoring).
- Contractor - (implement), PMT Coordinator - (monitoring), ERSU - (compliance enforcement)
## Construction

Plinths for transformer base and other related S/S equipment Installations

<table>
<thead>
<tr>
<th>Construction points</th>
<th>Within the Substations</th>
<th>Health and Safety at excavation points</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Noise and vibration from construction equipment</td>
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<tr>
<td>• Soil erosion, dust and accident due to falls and damage to vegetation/alteration in the graveled substation switch yards</td>
<td></td>
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<tr>
<td>• Respiratory tract infections due to inhalation of dust and toxic fumes during construction activities</td>
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<td></td>
</tr>
<tr>
<td>• Risk of electrocution and burns (to onsite workers during construction)</td>
<td></td>
<td></td>
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<tr>
<td>• Induced secondary development in the substations surrounding by Contractor during construction activities</td>
<td></td>
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</tbody>
</table>

- Contractor should at all occasions employ best engineering practices during excavation of pits and for ancillary facilities in order to avoid adverse alteration of the hydrological pattern of flow,
- Dug up areas should be promptly and appropriately restored.
- Contractor should maintain all construction equipment at optimal operating conditions in order to reduce noise and vibration.
- Contractor should design and enforce workplace safety procedures at sites to prevent associated construction hazards/accidents.

Contractor - (implement), Site Civil Engr./HSE Off. - (monitor)

Contractor - (implement), ERSU/ S/S HSE Off. - (monitor)
| Welding/ Mounting transformers / Installations/ Operation of equipment | Welding/construction Work sites | Waste management | Campsites | Construction | Installation | Risk of electrocution and burns
| | | | | | | - Engagement of indigenous unskilled labour and supplies and stimulation of local economies
- Electric shock; other work-related injuries
- generation of wastes including abandoned equipment, oil, scrap metal
- Electrocution
| | | | | | | - Specialized PPEs should be provided and usage enforced during welding activities.
- Contractor should design work place procedures in line with standard industrial practice,
- Specialized PPEs should be provided for all on-site workers (including substation staff and visitors).
- All pits/holes dug during construction works should be marked or barricaded and promptly and appropriately refilled.
- Construction and packaging waste, scraps and replaced equipment should be managed and disposed in accordance with Contractor’ Waste Management Plan.
- Transformers being replaced should be handled with especial care to prevent oil leakage and transported to a safe designated location for storage.
- Contractor should develop comprehensive plan for location of secondary development
- Contractor should ensure that its construction equipment are maintained and operated at optimal conditions to reduce emissions capable of causing air pollution.
- Contractor should design, enforce and maintain good work place procedures in line with industry standard and regulatory requirement on safety,
| Contractor - (implement)  
S/S HSE Off. - (monitor)  
S/S HSE/ ERSU - (compliance enforcement)  
ERSU - (enforce compliance)  
Contractor - (implement)  
ERSU /PMT - (monitor)  
Contractor - (implement)  
S/S HSE Off. - (monitor)  
Contractor - (implement),  
S/S HSE Off. - (monitor) |
<table>
<thead>
<tr>
<th>Welding/Mounting transformers/ Installations/ Operation of equipment</th>
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<tbody>
<tr>
<td>Mobilization</td>
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<tr>
<td>Recruitment</td>
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<tr>
<td>♦ Standard work instructions for HSE critical activities should be developed and enforced.</td>
</tr>
<tr>
<td>♦ Prior to mobilization, Contractor shall screen all personnel for communicable and other diseases.</td>
</tr>
<tr>
<td>♦ Contractor should ensure that the memorandum of understanding between it and the host communities on employment are strictly followed (See Annexe II – Contractor’s Sample ESMP)</td>
</tr>
<tr>
<td>Contractor HSE/ S/S Off./ ERSU (compliance enforcement), Contractor and Site HSE Officer</td>
</tr>
<tr>
<td>Contractor (implement), S/S HSE - (compliance enforcement)</td>
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<tr>
<td>Contractor (implement), ERSU/TCN/ S/S Public Relations - (implement),</td>
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<tr>
<td>Substation Maintenance</td>
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Sub-Region/Substation – (Implement)  
ERSU/PMT – (Compliance)  
Contractor – (implement)  
S/S HSE Officer (implement)
<table>
<thead>
<tr>
<th>Substation Maintenance</th>
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<tbody>
<tr>
<td>Substation House</td>
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<tr>
<td>Keeping</td>
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- Properly maintained and kept in good condition,
- Destroyed lawns **must** be replanted with indigenous flower species and grassed accordingly,
- Naturally low growing vegetation should be maintained within Substation premises,
- Mechanical maintenance techniques should be adopted,
- Selective herbicide application should be employed for chemical maintenance options,
- Appropriate gravelling level of the Switch Yards should be maintained at the project site Substation,
- Equipment must be in sound working condition and cleaned as at and when due,
- Used transformer oil must be tested and disposed or stored as appropriate in line with regulatory requirements,
- Solid wastes must be disposed through the services of accredited waste disposal companies and in line with laid down rules.
- A decommissioning and abandonment plan should be prepared at least three months prior to decommissioning of the substation.

S/S Operation staff - (implement), S/S HSE Off. (monitor), ERSU (audit).
<table>
<thead>
<tr>
<th>Substation Maintenance</th>
<th>Decommissioning /Abandonment</th>
<th></th>
<th>ERSU /TCN</th>
</tr>
</thead>
</table>
CHAPTER SEVEN

DETAILED GUIDELINES FOR SUBSTATION UPGRADE AND REINFORCEMENT PROJECT (NETAP: PACKAGE 1 – LOT 1)

The contractor/s shall develop the following Safeguards Management Plans to ensure strict compliance with this ESMP in the cause of implementing the various Sub-Projects.

7.1 Workplace Health, Safety and Environment Plan

Operations within the work site shall be subject to government, industry and TCN Policies guidelines as well as the requirements of this ESMP. All TCN and Contractor staff shall be well informed and trained on the HSE policies and guidelines. All facilities shall also be designed to enhance safety planning, and activities shall be executed within the confines of relevant legislation and stakeholders interests. Contractor shall provide adequate health services as well as site first aid services for its workforce. The first aid services shall be extended to visiting personnel and casual workers.

The main priority to TCN shall be the prevention of accidents during mobilization, construction and operations stages of the proposed projects. Prevention of workplace accidents during the proposed projects shall be achieved using the Job Hazard Analyses (JHA) tool and approved Work Plan/Instructions by supervisors.

Consequently, the technical team must conduct JHA for all HSE critical activities and develop written and explicit work plans/instructions for such operations. The work instructions shall integrate the recommendations of the JHA. It is only upon submission of the written work instructions and the supporting JHA document that the Site HSE Coordinator may consider the project activity for approval. Project activities may only be approved if the site HSE Coordinator is objectively convinced that the Written Work Instruction (WWI) are practicable, safe and in accordance with regulatory requirements.

The use of JHA and WWI as work management systems shall include;
- Job planning and permitting,
- Shift/Tour handover meetings and logs,
- Special procedures governing higher risk activities,
- Control of simultaneous activities,
- Energy isolation and workplace preparation,
- Management controls for temporary removal of safety devices, reinstating the facilities and preparing to restart operations.

It shall also include requirements for reviewing completed jobs and capturing and communicating lessons learnt about the work and management system.

Accidents shall be reported to and investigated by the ERSU in line with TCN accident reporting procedure. All personnel shall be encouraged to report all accidents/incidents and to cooperate in the investigation of such occurrence. Staff shall be made to know that accidents/incidents investigation are “fact finding” and not “fault finding” exercises and are particularly useful as lessons in preventing re-occurrence.
All construction activities shall be properly managed through careful planning, guided by applicable and relevant HSE Policies, inclusive of the following:

Use of Permit-to-Work
- Job Hazard Analysis and toolbox meetings,
- Use of appropriate PPEs in designated areas,
- Prohibition to drinking of alcohol during working hours and at work sites and facilities,
- Prohibition of night trips,
- Regular emergency drills,
- Prohibition of smoking in fire hazards areas,

The Contractor’s HSE Plan must be approved by the PMU-ERSU prior to mobilization to site.

### 7.2 Traffic Management

TCN and Contractors shall follow journey management procedures strictly. Trips shall be planned and combined to reduce driving exposures, mandatory use of seat belts by drivers and passengers in company and Contractors vehicles shall be enforced. All drivers shall attend defensive driving course while night driving (out of town limits) shall be discouraged.

Each trip/journey to be undertaken during the proposed project shall be managed in such a manner that will not result in harm to life or property. A journey management plan specific to each trip shall be produced and submitted to the Site HSE Coordinator for approval. The details of the journey management plan shall include proposed mobilization date, mode of transportation, routes, type of cargo as well as the details of the JHA conducted for the trip. The Site HSE Coordinator may only approve the trip if he can confirm that all necessary precautions have been taken to forestall transport accidents/incidents.

### 7.3 Waste Management Plan

Since the project will generate significant volume of various wastes types, the Contractor shall prepare a Waste Management Plan for review and approval by PMU-ERSU.

The following objectives form the basis for the waste management plan of the project.

- Progressive reduction of wastes with the aim of minimizing overall emissions/discharges which have adverse impact on the environment,
- Establishment, Implementation and maintenance of waste segregation aimed at enhancing recycling,
- Ensure TCN and Contractors are responsible for effective waste handling and disposal processes which shall be monitored by relevant waste disposal authorities.
7.3.1 Waste Handling Guidelines

For proper handling and disposal, wastes shall be well defined at source and the definition transmitted along with the wastes to the final disposal points. Contractor’s personnel shall define and document all wastes generated in the course of work in a monthly waste stream report, which shall be used to track/monitor wastes generated from the Substations. Basic information that must be provided as a minimum for adequate definition of wastes include:

- Waste type identification

The major categories of wastes envisaged from the Substation Projects are outlined as follows:

**Solid wastes**: - These include felled vegetation/trunks, obsolete transformers, CBs, CTs, etc, woods from crates, metals, papers, printer cartridges and other office equipment scrapped which are due to be removed during site clean-up, domestic waste (waste generated from camp kitchens, packing materials, boxes and plastics),

**Liquid wastes**: - These include non-hazardous operational waste generated from work construction sites e.g. lubes, lubricants, sanitary water, paints etc.

**Gaseous wastes**: - These include combustion products from construction engines, welding gas, natural gas leaks etc.

**Hazardous wastes**: - any gaseous, liquid or solid, which due to quantity, physical, chemical or Infectious characteristics have the potential to harm human health, environment when improperly handled, stored, disposed, transported or treated e.g. acids, lead, phenols, etc.

7.3.2 Waste Minimization / Reduction

Waste minimization implies reduction to the greatest extent possible of the volume or toxicity of waste materials. The four principles of waste minimization (reduce, reuse, recycle and recover – 4Rs) shall be adopted as applicable. The key elements of the four waste minimization/management principles practices are outlined:

**Reduce** - Process modification / design change Material elimination Inventory control and management Material substitution Improved housekeeping

**Reuse** - Chemical /Oil containers

7.3.3 Waste Segregation

Waste segregation and characterization shall be carried out on wastes that are similar and may be combined to simplify storage, treatment, recycling and effective implementation of appropriate waste disposal methods. Wastes shall be segregated, preferably at source into clearly designated bins at strategic locations. Particular attention shall be given to the work area where a variety of wastes including fast food packaging shall be generated. The site HSE Coordinator shall be responsible for maintenance of the waste segregation scheme at the site.

7.3.4 Waste Disposal

All debris, spoilt materials, and other wastes shall be cleared regularly from the site and disposed at approved dump sites operated by designated waste disposal authorities. Instructions on material safety handling sheet shall be strictly adhered to and shall form the basis for the disposal of wastes related to such products. Wastes in transits shall be accompanied and tracked by waste disposal notes. The note shall contain such information as;
- date of dispatch,
- description of wastes,
- waste quantity,
- container type,
- designated disposal site and method,
- consignee name,
- means of transport and
- confirmation of actual disposal time and date.

Special attention will be accorded to transformers removed from the sites and also drums of transformer oil that might contain PCBs. These are to be transported to a site designated by TCN for safe storage and subsequent testing prior to disposal.

Waste management audit of facilities shall be carried out in consultation with the PMU-ERSU, and findings shall be properly documented and followed up. Accommodation, catering services areas and work site shall maintain acceptable standard of hygiene and good house-keeping.

7.4 General Security Plan

The project team led by an ERSU Officer shall ensure that adequate security arrangements are made to handle security related incidents effectively. The project team will identify, evaluate and manage risks to personnel and property arising from theft, malicious practices, crime, civil disorder or armed conflict.

In addition, each Contractor will be required to prepare a project security plan and submit to TCN-PMU for review and approval before mobilization to site. The project will also organize a security workshop to identify, evaluate and recommend contingency plans for all security risks.
7.5 Emergency Response Plan

The PMT and Contractors will demonstrate that all potentially significant hazards and potential impacts of the project activities have been identified, the associated risks evaluated and understood, and that control and recovery measures to effectively manage these risks and impacts are in place before mobilization to site. TCN will assist Contractors, where necessary, with the provision of a generic hazard list for guidance. In case of an emergency, Contractor emergency response procedure will be activated. Its objectives are:

- To ensure no loss of life,
- To ensure that the environment is protected,
- To ensure that manpower, equipment and funds are available to effectively contain the emergency (fire, explosion, electrocution, shocks, accident, spill clean-up for oil/chemical, etc.).

In order to ensure that good record keeping is maintained and accurate information concerning emergency are disseminated to the workers, public and government, the under mentioned procedures detail the information required:

- Transformer shut down,
- Outages,
- Search for leakages,
- Isolation of supply points,
- Notification of authorities,
- Safety precaution and environmental proceedings,
- Repair methods and procedures,
- Emergency repairs,
- Contractor arrangement,
- Re-commissioning and start up.

The PMT and Contractors will identify all potential emergency situations and develop procedures to use in such scenarios as explosions or fires, hydrocarbon/chemical spills, weather related disasters, hostage taking, community disturbance, kidnapping, etc. Emergency drills will be conducted to demonstrate preparedness for response and schedule of drills and testing of emergency instruments will be prepared by TCN/Contractors on the proposed projects.

Every technical Contractor on the proposed projects will prepare and submit for approval contingency plan for emergency situations and possible incidents beyond the capability of site facilities.

There will also be a community emergency response plan that will be adapted to community’s needs and cover eventualities such as oil spillage.

7.6 Stakeholder Engagement Plan (SEP)

Towards achieving a smooth and possible hitch-free project implementation, it is expected that the Project Implementation Unit (PMU - ERSU) will engage relevant stakeholders in prior and informed Consultations, whereby Stakeholders will be adequately and timely
informed about intended consultations and their purposes thereof for informed interactions and feed-backs Consultation about these rehab/reinforcement projects shall be convened at various levels by the PMU-ERSU and would involve all key stakeholders to the Project, including the Federal Ministry of Environment, the World Bank Safeguard Team, The Federal Ministry of Power, Works and Housing, TCN HQ & project sites, Host/concerned surrounding Communities, etc. The Consultations shall be continuous during Project implementation.

The table below summarizes the proposed basic Consultation schedule for the Project

<table>
<thead>
<tr>
<th>S/No.</th>
<th>Project Stage</th>
<th>Location</th>
<th>No.</th>
<th>Frequency</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pre-Project Launch</td>
<td>Abuja</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>During Project Implementation</td>
<td>Geo-Political Zone</td>
<td>6</td>
<td>Bi-Annual</td>
</tr>
<tr>
<td>3</td>
<td>Project Close</td>
<td>Geo-Political Zone</td>
<td>6</td>
<td>1</td>
</tr>
</tbody>
</table>

Aside from the basic Stakeholder Consultations highlighted in the table above, consultations would be convened at locations where required to address grievances that may arise during project implementation.

The Contractor (during Project Implementation) and the Substation Manager (during Routine Operation) shall put in place and publicize a Grievance Redress Mechanism (GRM) that provides for an accessible local contact point (telephone number, address, email address, name and title) to which stakeholders can direct questions, concerns, complaints and claims. The Mechanism will include:

- Grievance Log,
- Investigative steps taken,
- Conclusion,
- Responses to complainants.

It should also contain an appeals procedure in case the complainant is unsatisfied with the response. Grievances will be part of monitoring reports.

## 7.7 Communication Plan

Effective two-way communication between TCN and Contractor staff on HSE and security issues will include awareness programmes to motivate staff and Contractors. HSE and security information experiences shall be shared between TCN and Contractors to facilitate improvement in HSE and security performance.

Contractor shall ensure its staff involved at all levels in the proposed projects are familiar with the importance of compliance with the adopted HSE policy, regulatory compliance plan, security plan and their individual roles and responsibilities in achieving their compliance.
Each staff shall be aware of his/her respective work activities, inherent job risks/hazards and their controls, mitigation measures, established emergency response procedures. They also need to be aware of potential consequences of departure from agreed operating procedures. Consequently each Contractors will have a project communications focal point to enhance communications with the Contractor project team at various locations. Contractors will set up appropriate procedures and lines of communication to handle HSE and security issues (e.g. direct access to the nearest clinic, direct access to emergency services, etc).

Contractors should be able to communicate easily with their base offices, work site and local TCN in an emergency situation. Appropriate safety programmes and promotions need to be employed in order to effectively promote HSE and create awareness e.g. minutes of meetings, plans and performance targets, HSE performance on news board, posters, bulletins, video, news flash, e-mail etc.

Appropriate HSE incentive programmes should be established to promote individual HSE performance improvements e.g. suggestion boxes, personal recognition, observation of annual safety week, HSE performance bonus schemes etc.

### 7.8 Commissioning/Hand over Plan

The risks associated with the commissioning and handover phase of the Projects shall be adequately evaluated and should be covered in a detailed Commissioning Procedures and Guidelines document. The Engineering, Procurement, Installation and Commissioning (EPIC) contract strategy will allow time for familiarity of the commissioning/operation team. This will allow for effective supervision and carryover of priority items into the operation phase. A pre-commissioning audit will be out carried by the PMT for the proposed projects.

Specific commissioning plans covering all significant Contractor commissioning activities, particularly control of potential dangerous operations during the commissioning will be developed. The proposed facility will not be put into operation unless commissioning approval is received from PMU and TCN.

### 7.9 Decommissioning/Abandonment Plan

The design and facilities shall take due recognition of the need to decommission the Transmission Substation and the ancillary facilities at the end of their operational life by preparing a Decommissioning and Abandonment Plan at least three months prior to decommissioning. The abandonment plan shall take due note of the current national and international legislative requirements. The following shall be consider at the end of the project lifecycle:

- Need for facilities decommissioning and notification to FMEnv.,
- Team shall be set up to study and plan the decommissioning/abandonment programme in a manner that meets standard requirement,
• An Environmental Evaluation Report (EER) to determine if the activities carried out at the site have caused any detrimental effects and if any, discuss mitigations and restoration measures,
• In-depth Environmental Studies for the actual removal of equipment (demolition) has to be carried out,
• Social-economic studies, if necessary, will be carried out to assess community impacts of decommissioning and mitigation.
CHAPTER EIGHT
ENVIRONMENTAL AND SOCIAL MONITORING PLAN

Contractor and the PMT shall strictly comply with the provisions of this ESMP and operate a monitoring programme that would lead to sustainable project-environment relationship. This will be strengthened with the periodic monitoring visits of the ERSU-PMU. The monitoring programme shall commence from site preparation through implementation to operation stages in order to keep track of the entire project activities and performance. The programme will provide information on impacts compared with prediction and by doing so provide advance warning of any adverse changes in both the environmental and socio economic developments.

The main objectives of the monitoring programme are to:

• Ensure compliance with regulatory emission and discharge limits,
• Monitor changes in existing physio-chemical, social characteristics of the environment, compared to both the environmental baseline and predicted conditions,
• Ensure continual interactions and flow of information between Contractor and the stakeholders,
• Determine whether any significant change in socio-economic and environmental components has been caused as a result of the project being implemented or by other extraneous factors,
• Determine the effectiveness of the control and mitigation/enhancement measures and provide basis for recommending additional measures,
• Ensure that the established transparent procedures for carrying out the proposed project are sustained,
• Ensure sustenance of accountability and a sense of local ownership throughout the project lifecycle,
• Use lessons learnt from monitoring to further strengthen the respective teams.

The monitoring programme is for the initial stages of the project the frequency of which will be subject to review after the first year, to determine its effectiveness and possibly include other identified areas of concern. The ERSU-PMU shall ensure that the monitoring programme is fully implemented by Regional ESU and designated State/Federal Agents.

The Environmental monitoring programme designed for the installation and operations phases of the project is shown in the Table below:
**Table 8.1:** Environmental Monitoring Programme for the proposed NETAP (PACKAGE 1 – Lot 1).

<table>
<thead>
<tr>
<th>Components</th>
<th>Project Phase</th>
<th>Impact Indicator</th>
<th>Location/Method of monitoring</th>
<th>Duration/ Frequency</th>
</tr>
</thead>
</table>
| Soil                     | - Site Preparation, Construction/Installation, Operation. | PCB, Heavy metals, & Hydrocarbon             | Sampling and testing around the transformer locations and within the switch yard. | - During Site Preparation.  
- Biannually (during Operation phase). |
| Surface Water            | - Construction/Installation, Operation | pH, Cond., TDS, BOD, PCB, COD, Turbidity, Oil and Grease etc. | Sampling and in-situ testing of water from wells around the Substation and streams near the laboratory testing. | - During Construction/Installation.  
- Annually (during Operation phase). |
| Noise                    | - Site Preparation, Construction/Installation, Operation. | Noise Level 75 dB (A) at worksite; 55/45 dB(A) in residential areas during daytime/nighttime | Measurement around Substation and the adjoining host communities | - Weekly (during site preparation & construction)  
- Annually (during Operation phase) |
| Community Health and Safety. | - Site Preparation, Construction/Installation, Operation. | Common/prevalent diseases in the S/S & host communities  
Instances of Gender Based Violence (GBV) or Sexual Exploitation and Abuse (SEA) | Collection of data and statistics from Clinics and Hospitals within host communities  
Review of GRM Log and complaints from community members. | - Yearly  
- When necessary  
TCN and IDA to be informed IMMEDIATELY of instances or suspected instances of SEA or GBV. |
| Socio-economic indices   | All phases                     | Traffic flow, income levels, housing, trading activities, and social infrastructure | Within host communities                                   | - Biannually (during project phase) |
| Employment pattern       | All phases                     | Contractors/suppliers, part/full time Employment, skilled/unskilled labour recruitment | Consultations with community leaders and youths in host communities and review of Employment quota | - Monthly (during project phases) |
## ANNEX I

### COST ESTIMATES

The table below shows the cost estimate for implementing the various Intervention Plans for Mitigation, Environmental monitoring and ERSU capacity building under NETAP: PACKAGE 1 – LOT 1.

<table>
<thead>
<tr>
<th>S/N</th>
<th>Activity</th>
<th>Intervention Plan</th>
<th>No. of Sites/Qty.</th>
<th>Cost (USD/Site)</th>
<th>Sub Total (USD)</th>
<th>ACTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td><strong>Mitigation</strong></td>
<td>Site preparation</td>
<td>7</td>
<td>3,000.0</td>
<td>21,000.0</td>
<td>PMU Contractor</td>
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<tr>
<td></td>
<td>Construction</td>
<td>7</td>
<td>5,000.0</td>
<td>35,000.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Decommissioning</td>
<td>7</td>
<td>2,000.0</td>
<td>14,000.0</td>
<td></td>
<td>TCN</td>
</tr>
<tr>
<td></td>
<td>Substation Operations</td>
<td>7</td>
<td>5,000.0</td>
<td>35,000.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td><strong>Environmental and Social Monitoring</strong></td>
<td>Soil</td>
<td>7</td>
<td>1,500.0</td>
<td>10,000.0</td>
<td>PMU-ERSU</td>
</tr>
<tr>
<td></td>
<td>Surface Water</td>
<td>7</td>
<td>1,000.0</td>
<td>7,000.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Noise</td>
<td>7</td>
<td>700.0</td>
<td>4,900.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Community Health</td>
<td>7</td>
<td>1,200.0</td>
<td>8,400.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Socio-economics</td>
<td>7</td>
<td>1,000.0</td>
<td>7,000.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td><strong>ERSU-PMU</strong></td>
<td><strong>Capacity Building</strong></td>
<td></td>
<td></td>
<td></td>
<td>PMU-ERSU</td>
</tr>
<tr>
<td></td>
<td>- Training on the Handling and clean-up of PCB contaminated materials,</td>
<td>Lump</td>
<td></td>
<td>80,000.0</td>
<td>220,000.00</td>
<td></td>
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<tr>
<td></td>
<td>- Environmental Monitoring &amp; Modeling,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Environmental Audit, - Basic Sampling Techniques,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- PCB detection and Disposal Procedures,</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>- Procedure/process Provision of Soil, Water and equipment.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
### Capacity Building
- On the Job training for each substation HSE Officer,
- Provision of protective wears (Hard hats, safety gloves, Ear Muffs, Nose muffs).

### Training
- Environmental Monitoring and Modelling,
- Environmental Audit,
- Basic Sampling Techniques,
- PCB detection and disposal Procedures

<table>
<thead>
<tr>
<th>HSE Substations</th>
<th>Capacity Building</th>
<th>Lump</th>
<th>60,000.0</th>
<th>Training</th>
<th>Lump</th>
<th>60,000.0</th>
<th>120,000.0</th>
<th>Grand Total</th>
<th>USD</th>
<th>482,300</th>
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<tr>
<td>4</td>
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<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>

PMU-ERSU
ANNEX II

SAMPLE OF Contractor’s ESMP ²

CHINA HARBOUR ENGINEERING COMPANY LIMITED

CONTRACTORS

ENVIRONMENTAL MANAGEMENT PLAN

(LAE PORT DEVELOPMENT PROJECT – TIDAL BASIN PHASE 1)

August 2012 (Revision2)

² With Permission of the author
Contractors Environmental Management

Plan

Document No. CHEC/LPDP/EN/CEMP-01

ENGINEER & CONTRACTOR DOCUMENTATION REVIEW:

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<th>Status</th>
<th>Description</th>
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<tr>
<td>☐ Status 1</td>
<td>Approved as submitted</td>
</tr>
<tr>
<td>☐ Status 2</td>
<td>Approved subject to implementation of Engineer’s and/or Employer’s comments / notation without re-submission</td>
</tr>
<tr>
<td>☐ Status 3</td>
<td>Rejected and being subject to full re-submission in response to the Engineer’s and/or Employer’s comments / notation</td>
</tr>
</tbody>
</table>

NOTE:
Consent by the Employer shall not relieve the Contractor of any duty and responsibility under the Contract.

<table>
<thead>
<tr>
<th>Rev.o</th>
<th>Date</th>
<th>Status First Name</th>
<th>Status Last Name</th>
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</table>

Prepared By: Danny Wame
ES&H Manager

Reviewed By: Wu Guansheng
Deputy project Manager

Approved By: Ma Jianhua
Project Manager
<table>
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<tr>
<th>Rev.</th>
<th>Date</th>
<th>Status</th>
<th>Prepared By:</th>
<th>Reviewed By:</th>
<th>Approved By:</th>
</tr>
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<td>Rev.1</td>
<td>10/7/2012</td>
<td>approval</td>
<td>Danny Wame, ES&amp;H Manager</td>
<td>Wu Guansheng, Deputy project Manager</td>
<td>Ma Jianhua, Project Manager</td>
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<td>Rev.2</td>
<td>14/8/2012</td>
<td>For review and approval</td>
<td>Zhengang Shi, Deputy ES&amp;H Manager</td>
<td>Wu Guansheng, Deputy project Manager</td>
<td>Ma Jianhua, Project Manager</td>
</tr>
</tbody>
</table>

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Section                           | Page |
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ii.     CHEC ENVIRONMENTAL POLICY STATEMENT | 5    |
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15.2 Air Quality

15.3 Water Quality

15.4 Affect to Ecology Fisheries

15.5 Solid Waste Pollution

15.6 Sewage Waste

15.7 Oil Spillage & Leakage

15.8 Littering

15.9 Vegetation Clearance

15.10 Visual Impact

15.11 Erosion & Sedimentation

15.12 Socio-economic Issue

15.13 Archaeological & Cultural Heritage

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18.0 APPENDICES
FOREWORD BY THE PROJECT MANAGER:

China Harbour Engineering Company Limited (CHEC) has prepared this Contractors Environmental Management Plan (CEMP) as a practical guide for employees & sub-contractors for the proposed Lae Port Development Project-Tidal Basin Phase 1.

The document is designed to be a reference point for regulatory authority, external and internal audits and general stakeholder interests in environmental practices. The overall custodian of this CEMP is the Project Manager. “Ownership” of the plan, rests with sectional heads, employees, & sub-contractors.

Sectional heads will continuously remind employees of the need to follow the dictates of the CEMP and will carry out checks to enforce environmental controls. Employees are expected to take ownership by adopting and implementing the plan in order to continually maintain and improve environmental performance. They will attend induction sessions, refresher training sessions and have daily reminders on specific topics during daily tool box briefings. Incentives may be offered to staff who demonstrate environmental awareness.

The environmental requirements detailed in the CEMP will be included in sub-contracts. Sub-Contractors will be required to implement the CEMP as a contractual obligation and this will be monitored by site supervisory staff.

The document is a living “organism”. All requests for modification to this document should be submitted to the Deputy Project Manager through Environment, Safety & Health Office. Suggestions would be reviewed and incorporated where necessary.

Together we can create a healthier and safer workplace and protect our environment and assets from harming and ensures continues improvements in our environmental practices.

Mr. Ma Jianhua

Project Manager
CHEC ENVIRONMENTAL POLICY STATEMENT:

A Project Environmental Management Policy is established to demonstrate the Project Team’s commitment in improving our environmental performance. It aims to communicate CHEC’s mission, vision and beliefs towards the environment to the staff and provides a framework for guiding CHEC’s ongoing environmental improvement efforts.

The policy will be reviewed periodically by relevant parties and will be displayed on notice boards in languages suitable for the local workforce. CHEC will modify the CEMP as needed relevant to actual construction work.

As a contractor, the Environmental Policy (See Appendix A) will be implemented and maintained by the project team, until the completion of the project.

CHEC is certified to ISO Standard 14001 - Environmental Management System (See Appendix B). Thus, the project team will continue to implement and maintain these systems for the Lae Port Development Project Tidal Basin Phase I to prevent accidents and minimize adverse environmental impacts from the project.

CHEC ENVIRONMENTAL COMMITMENT

The contractor will comply with all PNG environmental legislation, regulations and PNG government policies and procedures. In addition it will comply with the ADB’s Safeguard Policy Statement 2009.

China Harbour Engineering Company (CHEC) is internationally recognised as having a reputation for safeguarding the environment and has achieved certification to ISO Standard 14001-Environmental Management System (EMS). CHEC acknowledge that it is essential to maintain the annual renewal of this ISO certification and they ensure construction works comply with environmental standards. The steps needed to meet these standards are included in regular staff training plans.

Activities during construction will be constantly monitored on a daily basis to ensure compliance. As part of the continual improvement program, this plan will be reviewed at least once a month, and if necessary amended after discussions with the Supervisory Consultants. It may be amended and updated at any time at the discretion of the Project Management and will be formally reviewed once a year for the life of the project. At completion of the project a Project Completion Report will be submitted confirming that all necessary environmental clean-up measures have been completed.

The basis for amendments, improvements and updates will be environmental inspections, audits and reviews of the contractor’s environmental performance. This will ensure procedures for control of contractors are sufficient to maintain project environmental standards, meet project environmental targets and comply with environmental legislation and regulations relevant to the project.

1.0: INTRODUCTION:
This Contractors Environmental Management Plan (CEMP) covers the Construction Phases of Lae Port Development Project – Tidal Basin Phase 1. The plan is developed following the findings of the Environmental Impact Assessment (EIA) undertaken by Haskoning Nederland BV in association with Ports & Maritime Consultancy Ltd. Port Moresby, in year 2007. In the EIA, both bio-physical & socio-economic impacts of the project have been identified and mitigation measures recommended. It also follows the requirements and recommendations of the Initial Environmental Examination (IEE) of “PNG: Lae Port Development Project – Additional Works” October 2011, prepared by Independent Public Business Corporation for the Asian Development Bank.

China Harbour Engineering Company (CHEC) is an internationally recognised company and maintains its reputation in safeguarding the environment by meeting regulatory requirements in the country of operation and adopting a “Best Environmental Code of Practice” which is based on CHEC’s certification to ISO Standard 14001-Environmental Management System (EMS). Thus all construction works will comply with acceptable relevant environmental standards and the steps needed to meet these are included in staff training plans.

2.0: DEFINITION:

<table>
<thead>
<tr>
<th>Terms</th>
<th>Definitions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Environment</td>
<td>Surroundings and conditions in which CHEC’s construction works operates or which it may affect including living systems (human and others) therein.</td>
</tr>
<tr>
<td>Environment Policy</td>
<td>A unique document that shows who does what and when and how to do it. Environment policy does influences all business activities including the selection of people, equipment and materials, the way work is done and how it is designed to provide goods and services. The policy is in compliance with PNG environmental protection laws and ADB’s Safeguard Policy Statement.</td>
</tr>
<tr>
<td>Hazard</td>
<td>Any situation with the potential to cause danger to environment, cause injury or illness to people</td>
</tr>
<tr>
<td>Accident</td>
<td>Any event which result in damage or loss to environment</td>
</tr>
<tr>
<td>Incident</td>
<td>An event which has caused or could have caused damage or loss to environment or injury to personnel on site</td>
</tr>
<tr>
<td>Near-miss</td>
<td>Any event which has the potential to cause damage or loss to environment but avoided by circumstances</td>
</tr>
<tr>
<td>Risk</td>
<td>The potential for a hazard to result in an incident</td>
</tr>
<tr>
<td>Risk Assessment</td>
<td>A careful consideration by competent people of the hazard associated with a task. The potential effect of each hazard, how severe it might be and the likelihood of it occurring</td>
</tr>
</tbody>
</table>
### Risk Management

A management system which eliminates or mitigates the threat from hazard

### Environmental Management System

The company structure, responsibilities, practices, procedure, process, and resources for implementing environmental management

### Environmental Audit

An independent systematic & documented process of assessing compliance of an Environmental program with legislation

### Contractors Environmental Management Plan

A description of the means of achieving environmental objectives during the construction phase in compliance with the EIA and IEE prepared for the project.

#### 3.0: PROJECT BACKGROUND:

Due to the archipelagic nature of Papua New Guinea (PNG) and rugged terrain, which creates widely dispersed population pockets and limits mobility and opportunities to develop the domestic market, the country heavily relies on trade, particularly exports, for economic growth and fiscal revenue. The port sector provides a vital link between PNG and the world market, with more than 80% of PNG exports shipped from ports.

The city of Lae, located in Morobe province, is PNG’s industrial and commercial trade centre. Lae port, the largest port of Papua New Guinea, is centrally located in the country and is on most Pacific shipping routes. It is situated on the coast of the Markham Bay at the northwestern corner of the Huon Gulf, approximately 1.5 km east of the mouth of the Markham River.

Over the past decade, Lae port has been adapting to the demands of container operations. However, the current five berths of Lae port, with a total length of about 520m and a total storage area of 52,600 m² for cargo marshalling, are aging and insufficient to handle increasing cargo volumes and ship size. As early as the 1970s a plan to expand port capacity by developing a tidal basin project in the marshland area located to the west of the existing port facilities was formulated. The project did not proceed due to a dispute relating to land ownership. During the following two decades decreased economic growth discouraged not only investment in the tidal basin project, but also adequate maintenance of the existing port facilities. Improved economic performance and steady increase of the cargo throughput at Lae port since 2003 have generated revenues for the Government and PNG Ports Corporation Limited.

#### 4.0: PURPOSE:

The purpose of this CEMP is to;

- Comply with the requirement of PNG Environment Act 2000
- Practically apply CHEC’s Environmental Policy
- Comply with EMS (ISO 14001) Requirements
- Address potential environmental issues pro-actively and systematically in a timely manner
5.0: OBJECTIVES & TARGET:

Project environmental objective & target are as follows:

<table>
<thead>
<tr>
<th>No</th>
<th>Objective</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>To comply with legal requirement</td>
<td>Zero conviction</td>
</tr>
<tr>
<td>2</td>
<td>To ensure best environmental performance</td>
<td>Zero non-compliance in environmental practice</td>
</tr>
</tbody>
</table>

6.0: ENVIRONMENTAL LAWS, POLICIES & STANDARDS:

- PNG Environmental Act 2000
- CHEC Environmental Policy
- Environmental Management System
- ADB’s Social Safeguard Policy Statement 2009
- Standards to be adopted for discharges will be in accordance with the PNG Department of Environment and Conservation Permits for Noise, Air, Water and Land Discharges as issued after Minister’s Approval in Principle is given, which has been obtained
- Standards for Mitigation and Monitoring will be as stipulated in the IEE 2011 to include parameters, locations, timing and frequency.

7.0: ENVIRONMENTAL MANAGEMENT STRUCTURE:

The ES&H management structure is shown below. The ES&H Manager is directly responsible and report to the Project Manager/ Project Director.
8.0: RESPONSIBILITIES:

Respective personnel within the environmental management structure are responsible and accountable for the implementation of this EMP.

8.1: Project Manager (PM);

The Project Manager is responsible for providing support in dealing with all aspects of environmental issues within the project, and reporting to the CHEC Supervisory Board.

8.2: Deputy Project Manager (DPM);

The responsibilities of the Deputy Project Manager are as follows:

a) Ensure works are executed in accordance with the CEMP.
b) Arrange routine joint site inspection with ES&H Manager and ES&H Engineer.
c) Provide necessary guidance & supervision to ES&H Manager and ES&H Engineer in order to implement CEMP
d) Monitor and control the works including those subcontractor(s) to ensure compliance with specified requirements.
e) Ensure appropriate environmental protection and pollution control mitigation measures are properly implemented in accordance with the relevant procedures.
f) Assist in handling any complaints received from the public.
g) Ensure remedial action is undertaken immediately if there is a non-compliance of statutory or contractual requirements of the environment practices.
h) Liaise with PMU and PMU’s IES as required

8.3: Environmental, Safety & Health (ES&H) Manager;

ES&H Manager is responsible for;

a) Providing advice to project management in respect of any environmental protection issues such as noise abatement, air & water pollution control, refuse disposal etc.
b) Assuming environmental duty on site with the assistance of Environmental Engineer. Held responsible for any environmental issues arising due to construction activities and in relation to environmental practices adopted on site.
c) Providing necessary guidance & supervision to ES&H engineer in order to implement environmental management plan & program
d) Ensure works are executed in accordance with this CEMP.
e) Liaise with relevant government department in obtaining required license, permit and test report.
f) Arrange routine joint site inspection with ES&H engineer in consultation with Deputy Project Manager.
g) Prepare, implement and update the Contractors Environmental Management Plan;

h) Arrange and provide the environmental training including the site specific induction training and toolbox talks for the staff and workers on the Site, and to organize environmental promotional activities;

i) Advise the company on the implementation of an environmental management system;

j) Attend Site Safety and Environmental Management Committee (SSEMC) Meetings

k) Liaise with PMU and PMU’s IES as required

l) Apply for environmental permits and ensure conditions stated therein are complied with during construction activities and site works

m) Ensure that approved CEMP is available at the site office

n) Ensure that the elements from the approved CEMP are translated into site inspection forms and monitoring forms.

n) Ensure that the regularity of the site inspections are followed as per the daily and weekly inspection charts given in the Appendices C and D.

8.4: Environmental, Safety & Health (ES&H) Engineer;

Duties and responsibilities of the ES&H Engineer are as follows;

a) Provide engineering advice to project management in respect of any environmental protection issues such air & water pollution control, refuse disposal etc.

b) Work in parallel with the design team and project management to ensure environmental issues are fully considered during the design and implementation stages.

c) Advise on measures to be taken in the interest of environmental protection, and implement such measure;

d) Liaise on all matters relating to environmental monitoring and auditing;

e) Carry out inspections of the site for identifying potential hazards to the environmental, and to report findings with recommendations for corrective actions;

f) Participate in the environmental audit, and monitor the environmental performance on the Site;

g) Check and ensure that any polluting or potentially polluting situation is promptly rectified as per ES&H Managers advice

h) Attend Site Safety and Environmental Management Committee (SSEMC) Meetings

i) Keep a copy of the following documents (including but not limited to):

- Any statutory required environmental permits/licenses including construction noise permits, noise levels for compressors and hand held percussive breakers, effluent discharge licenses, dumping permits;
• All correspondences with Department of Environment and Conservation, Central Environment Authority and complaints;
• Records regarding the handling of contaminated wastes;
• Records regarding the disposal of all construction and demolition materials to the specific or designated area.
• Record of all trained personnel in the site offices and update the record.

j) Update the monthly summary Waste Flow Table

k) Report to the ES&H Manager regarding non-compliance of any environmental protection issues and ensure any non-compliance is handled

l) Ensure complaints are handled properly

m) Liaise with PMU and PMU’s IES as required

n) Apply for environmental permits and ensure conditions stated therein are complied with during construction activities and site works

o) Ensure that approved CEMP is available at the site office

p) Ensure that the elements form the approved CEMP are translated into site inspection forms and monitoring forms

q) Updating of CEMP based on changes in operating procedures or new issues brought to light. Proposed revisions to the CEMP will be tabled in the monthly progress meetings CHEC/KECC/IPBC.(See Figure 1 below)

r) Carry out site inspections in accordance with the monitoring plan and complete daily and weekly inspection charts as given in the appendices C,D. All findings will be reported including “Near Misses”, not just corrective actions. This relates to potential incidents that were avoided and no actions were required but these must still be reported, as lessons learned can be circulated
8.5: Site Engineers & Assistant Engineers;

The Site Engineers / Assistant Engineers have the following duties in relation to environmental control;

a) Assist the Environmental Manager in implementing the CEMP
b) Monitor and control the works including those of sub-contractors to ensure compliance of both contractual and statutory requirements;
c) Report to the Environmental Manager or Environmental Engineer regarding non-compliance of any environmental protection issues;
d) Investigate and verify the complaint received from public;

e) Ensure the remedial actions or mitigation measures are carried out as planned

f) Carry out noise and vibration monitoring as required.

g) Attend induction and regular meetings on environmental health and safety matters

h) In the event of complaints being received by any staff i.e. site engineers/assistant engineers they must report to ESHE and ESHM and follow the procedure laid down in the Complaints Response Procedure. (Figure 2)

8.6: Technical officers, Foremen, Supervisors;

Technical officers/Foremen/Supervisors are responsible for the following duties in relation to environmental control;

a) Assist the Site Engineers/ Assistant Engineers to implement the CEMP

b) Control the works, including those of sub-contractors, to fulfil environmental requirements;

c) Report to the Site Engineers/ Assistant Engineers any non-compliance of environmental protection and mitigation measures;

d) Investigate the complaint received from public,

e) Carry out remedial actions or mitigation measures to rectify the non-compliance.

i) Attend induction and regular meetings on environmental health and safety matters

j) In the event of complaints being received by any staff i.e. site engineers/assistant engineers they must report to ESHE and ESHM and follow the procedure laid down in the Complaints Response Procedure. (Figure 2)

8.7: CHEC Employees;

a) to carry out agreed site environmental practices as instructed by ES&H Manager, ES&H Engineer, Site Engineers and Foremen.

b) Report promptly to their immediate supervisor who will report to ES&H Manger/ or Engineer on any non-compliance of environmental protection and mitigation measures.

c) Participate and co-operate with the Project Management Team to achieve the environmental objectives.

9.0: IMPLEMENTATION AND MONITORING:

It is essential to formulate monitoring system in order to evaluate remedial action taken in respect of water, air, land & waste pollution etc. The CEMP Monitoring Plan is a process of observing the tasks to be carried out on site after identification of environmental risks and hazard events and check whether the actions were executed according to the codes, regulations, and specification requirements. The construction works executed will be observed and checked from time to time through site inspection or Ad-hoc inspection, any non-conformance found will be recorded and collective action will be taken. Thus, work procedures will be setup for
controlling and monitoring the construction works to be implemented within the codes and specifications requirements.

The CEMP Monitoring Plan includes the following:

- Setup CEMP Monitoring Program.
- Carry out preliminary survey and take necessary records for all elements involved before construction;
- Carry out daily site visit to monitor project construction compliance with codes and regulation requirements (Please refer appendix –C for daily inspection check list)
- Weekly site visit to monitor material production plants such as metal quarry, crusher, asphalt plant and concrete batching plant. (Pls refer appendix –D for weekly inspection check list)
- Carry out CEMP site inspection and audit, issue Non-Conformance Record (NCR)
- Regular communication with local community, and record any complaint regarding to environmental issues;
- Report to the ES&H Manager, Project Manager, Employer and Employer Representative on any non-conformance;
- Documentation of records

9.1: Monitoring Program;

The monitoring program is a detail environmental monitoring work program, it defines each and individual mitigation action which needs to be taken during the construction period. Moreover, the “daily inspection check list” & “weekly inspection check list” (see Appendix C & D) will be main tool for monitoring program since those lists indicate both compliances and non compliances in all relevant aspects of project activities. (See Appendix E).

Within the monitoring period, site inspection, the environmental audit frequency will be planned according to the construction works program. Furthermore, environmental monthly meeting will be assigned as one aspect of monitoring program. The environmental monthly meeting will include Employer, Employer Representative, contractor and sub-contractors (if any).

9.2: Preliminary Survey and Records;

Before commencement of construction, each and individual item listed in the EIA report will be reviewed. Action plan will be prepared for the necessary testing items to be carried out on site.

Finally, the necessary investigation will be carried out to verify of any changes on the existing environmental conditions. Detail records and testing report will be kept and documented, and it will be submitted for review and approval.

9.3: Environmental Inspection and audit;

In the CEMP, the site inspection and audit procedures will be setup.
To enhance the environmental management and control, environmental inspections and audit are the effective mitigation measure to reduce the environmental impact. As a minimum, it will include the following:

1). The environmental site inspection will be carried out according to the program to verify site activities compliance with the project specifications and local codes requirements;

2). The environmental non-conformance records will be listed in the monthly construction progress report to bring the attention to the project team;

3). Non-Conformance Report (NCR) will be issued in an event of non-conformity with ES&H aspect and it should be closed after rectifying with given time period. (Pls refer Appendix –E for NCR)

4). Random or Ad-hoc environmental inspection will be carried out to check the site activities without advance notice by senior management staff.

5). The Environmental documentation audit will be carried out periodically and adjust to suit the needs;

6). The anticipated environmental impact will be monitored to provide continuous improvement and maintain at the As Low As Reasonably Practicable level;

7). All NCR, CAR will be reported to Project Manager, Engineer & Employer, and in the monthly meeting.

8). Monitoring report will be prepared and included in the monthly report.

The ES&H Manager and ES&H Engineer will be response to carry out the environmental site inspection and audit.

9.4: Monitoring & Reporting;

The ES&H Manager will be response for the preparation of monitoring report, and the coordination and communication among Engineer, Employer, and CHEC project team. He is also response for reporting to the Engineer, Employer, ES&H Manager, and Project Manager on major environmental issues or non-conformance found.

9.5: Job Hazard;

For those works with high risk or dangerous factors, proper guidance will be provided for safety operational, such as confined space, welding, etc.

In accordance with related law, requirements and regulations of job hazard and risk assessment in PNG, prediction and evaluation of the present or expected hazards/dangers in the operating environment will be conducted.

To control ES&H risks more effectively, all the engineering activities must comply with the plan, and with the other relevant applicable PNG ES&H directives. In general, the ES&H risks identified as having the most serious impact or consequences must be dealt immediately.
Most of the risks identified have direct repercussions on the construction and operational process; therefore, the continued monitoring of these risks is an important part of Construction Management. Examples of risk that have been identified include:

- Delivery of major equipment & materials such as caissons, piles, quarry rock.
- Contamination of sea water or accidental dumping of dredge material.
- Environmental impact such as noise and dust during construction
- Weather considerations
- Accidents.
- Precautionary measures with regard to health and safety will be described comprehensively in The Project Health & Safety plan.

9.6: Emergency Response Plan

CHEC will establish, implement and maintain a procedure to identify potential emergency situations and potential accidents that can have an impact on the environment. It will consider the following:

- Accidents, hospital facilities and ambulances
- Fire, distance to fire station, how long does it take a fire engine to get to the site (response time), what on-site fire fighting equipment is maintained on site to fight the fire?
- Fire fighting water tank. Does it hold enough water to fight the fire until the fire brigade responds?
- Marine spill - does the Lae port have an oil spill response plan? What equipment do they have? Do they have boats? What is their response time? Can CHEC participate in their plan? Can this be applied to the dredger?
- UXO - what is the procedure in the event of finding UXO?

This procedure will be prepared and submitted to ADB for approval before works commence.

9.7: Performance Monitoring

The ES&H Manager will be responsible for the monitoring on the environmental management carried out on site. He will check regularly either on site activities or documented records. The performance of the environmental management will be properly monitored through the site activities, inspection records, audit records, and other reports. If any abnormal situations happen action will be taken either informing site staff to take immediate action or report to the Project Manager/ Employer regarding to the issue.

10.0: ENVIRONMENTAL MANAGEMENT & MITIGATION MEASURES;

Summary of the potential hazard events identified in EIA Report are listed below. The initial mitigation measures are proposed for identified impacts. Any other site specific impacts which occur during the construction period will be evaluated and appropriate measures taken accordingly.
11.0: COMPLAINT MANAGEMENT:

CHECL have developed a complaint management program to deal with any complaints raised from the public with regard to environment, health and safety issues as a result of operations. The complaint registers will be maintained and will be regularly monitored.

12.0: ENVIRONMENTAL TRAINING:

All project personnel carrying out activities affecting the environment are sufficiently trained and competent in performing their assigned duties. All employees will receive appropriate training on environmental and waste management as followings:

a. Environment Training for Site Supervisory Staff

A training session of “Environmental Protection” shall be provided to Site Supervisory Staffs within 14 days from the date of employment of such staff on the Site.

b. Environment Management Training for Site Managerial Staff

A training session of “ISO14001 Environmental Management System on Site” made by Head Office shall be provided to site managerial staff within 3 month from the date of works commencement.

c. Environmental Site Specific Induction Training

All staff and workers employed in the Project directly or in connection with the Project indirectly shall attend the Environmental Site Specific Induction Training delivered by the ES&H Manager/ES&H Engineer. They shall also attend the refresher training per every half-year. The training should cover but not be limited to legislation and regulations, policy, organization structure, duties and responsibilities, mitigation measures, targets in Environmental Management Plan, in-house rules and regulations.

d. Environmental Toolbox Talk

All the workers employed on the Project directly or in connection with the Project indirectly shall attend the Environmental Toolbox Talk regularly regarding the environmental nuisance abatement and waste management. Toolbox meetings will take place daily. The topics of toolbox training shall include but not limited to:

- Air pollution control;
- Wastewater treatment;
- Noise control;
- Waste reduction;
- Waste management;
- Site tidiness;
- Handling of chemical waste; and
- Environmental emergency preparedness.

13.0: ENVIRONMENTAL REPORTING:
Related environmental issues will be included in the monthly report including records from site inspection, environmental accidents, etc.

ESH inspection form and reporting procedure have been developed. This form will be modified relevant to actual work. CHEC is developing relevant forms such as incident investigation form, ESH toolbox forms, incident reporting forms and others with respect to ISO 14001 – EMS.

CHEC has developed non conformance record sheets modified to match this project. ESH issues will be recorded in a register and CHEC management will ensure these issues are addressed in a timely manner.

The monthly report shall be prepared by the ES&H Engineer containing the following information:

- A list of major forthcoming activities in the next two months which will likely have environmental impacts and nuisances to the surroundings and the control measures in mitigation;
- The training programme for the next month and the records of training arranged/conducted in the previous month;
- The updated organization chart on environmental management; and
- A summary of defects and deficiencies identified during inspections and weekly environmental walks and the follow-up actions and remedies taken to prevent recurrence.

The ESH Manager will prepare a quarterly ESH performance report and submitted to Project Manager who then report to PMU & IPES.

In addition, the Employer/ Employer’s Representative will be informed immediately if any major environmental incident occurs.

The evaluation and identification of all possible hazard events will follow the procedure as described below.

14.0: MANAGEMENT REVIEW:

Top management of CHEC will review the Environmental Management System, at planned intervals, to ensure its continuing suitability, adequacy and effectiveness. Reviews will include assessing opportunities for improvement and the need for changes to the Environmental Management System, including the environmental objectives and targets. Moreover the ISO14001 Environmental Management System will be followed in implementation of the CEMP.

15.0: SITE SPECIFIC ENVIRONMENTAL PARAMETERS:

Potential site related specific environmental issues identified in the EIA and IEE are listed here under.

a) Noise emission & Vibration

b) Air quality
c) Water quality

d) Ecology & fisheries

e) Solid waste

f) Sewage waste

g) Oil spillage & leakage

h) Littering

i) Vegetation

j) Visual impact

k) Erosion & sedimentation

l) Socio-economic impact

m) Archaeological & cultural heritage

n) Environmental training

15.1: Noise & Vibration

Noise emission will come from the following sources

- Construction works carried out in land,
- Vehicular traffic associated with construction requirement
- Operation of machineries and equipments.
- The construction activities for breaking, piling, excavation, loading/unloading materials, reclamation
- Site formation work

Other major source of noise and vibration includes

- Quarry, crusher plant
- Asphalt plant operations.

With the proper implementation of all noise & vibration mitigation measure during the construction period, the resultant noise & vibration impacts can be mitigated and minimized to an acceptable level.

It is expected that the vibration issue will arise during the breaking of rock profile at a location along the quarry wall foundation. CHEC management will overcome this by using control blasting method under the supervision of qualified engineer. To minimise noise and reduce vibration forces, quarry site will have to be located further away from residential areas to reduce level of vibration and noise reaching them.

Noise emitted from the sources identified poses a threat to the employees working in the site and general public. This noise causes naissance and can cause problems in hearing. However
impact level is expected to be a minor medium level. A sound noise survey will be undertaken periodically to establish noise levels within the construction site.

15.2: Air Quality

The potential of air quality impact during construction is limited. Air pollutants will come from the following sources

- Breaking
- Excavation
- Loading/unloading materials
- Reclamation operations
- Acquiring of construction materials such as metal aggregates and sand etc from outsourcers

Small particles dispersed in the air and ozone sourced from the mentioned areas are air pollutants. When inhaled, these pollutants can aggregate the lungs and can lead to chest pain, coughing, shortness of breath and throat irritation.

Air quality & vibration management plan is being developed to deal with air quality issues at the construction site.

15.3: Water Quality

The major cause of marine water quality impacts will be due to dredging marine sediments and the associated reclamation activities. The dredging works and reclamation are planned to be carried out simultaneously in a marine environment. These will likely to give rise to the following environmental impacts

- Increased turbidity
- Threatened geotechnical stability
- Siltation in the existing harbour
- Sediment transportation
- Change in the current pattern
- Change in adjacent beaches
- Wave disturbance and impact on water quality

It is necessary to note that periodic widespread high turbidity will be common in the project area because of sedimentation processes caused by the Markham River. The surface runoff from construction site may create potential pollution to the sea water during construction period. This will be effectively mitigated through the implementation of standard control measure, such as sediment traps, on-site wastewater collection and treatment systems, chemical toilet etc.

15.4: Ecology & Fisheries
The dredging and reclamation work will cause permanent loss of benthic habitat over about 340 ha of seabed for the reclamation, and temporary loss of 820 ha for the approach channels and basin, the benthic habitat support mollusks, crustaceans, and fishes. Fish and shrimp spawn generally appear on the sandy sea bottom. The ecological value of benthic in these areas is not significant and similar habitats exist elsewhere. There are also two small isolated areas of limestone cap rock at the proposed entrance channel, but they do not provide a habitat for sponges, corals, and echinoderms. There are no protected habitats close to the project area, and therefore dredging and reclamation are not anticipated to have significant impacts on identified habitat in the dredging and reclamation areas. However, due to the high rock profile at a location along the quay wall foundation, under-water blasting is necessary. This may affect to marine fauna badly if blasting take places without considering possible danger for marine fauna.

15.5: Solid Wastes

Different types of waste will be generated during the construction period following are the major construction wastes;

- Construction and dredged materials,
- Chemical waste
- General refuse.

Unsuitable dredged & paving materials, used materials for temporary works such as concrete, off-cut timbers, paving materials, unsuitable metal and glass etc. are unavoidable although the amount can be controlled and minimized at the construction site. It is estimated that there will be a large volume of waste produced every month. CHEC management realizes the importance of proper management of waste arising from the construction works and has developed a Waste Management Plan to minimise environmental impact during the construction period. Waste Management Register will be developed to track down types and classes of wastes produced during the construction activities.

15.6: Sewage

Sewage waste and grey water would be produced from the construction area as the construction works will accumulate construction personnel for the project duration. Such waste would require proper management as this may contribute towards problems of odor, surface and groundwater pollution.

15.7: Oil spillage & leakage

Environmental issue in relation to a spill and leak are expected in the construction area. Leak & spills can escapes into the storm water drainage accelerated by fluvial processes and can pollutes storm & marine water. Hazardous materials such as battery acids can cause significant effect on both health and environment when improperly and or incorrectly used or applied.

Proper storage, handling and usage of both hazardous and non hazardous chemical at the construction site are required to reduce the risk of spillage and leachate which will have impact on the health and environment when carelessly stored, handled or used.
15.8: Littering

Littering of construction site by the employees and sub-contractors may become an environmental health hazard if trash and other solid wastes are not properly managed. Although impact would be minor and temporary, it requires proper management and therefore specific details of managing littering will be implemented.

15.9: Vegetation Clearance

Portions of the proposed construction area and the surrounds are fully covered by vegetation of mainly short grasses and scattered scrubs.

The terrestrial ecological status is being maintained over time. This means that the area is a bird and insects friendly environment.

15.10: Visual impacts

Visual impact of the proposed construction site due to clearance of vegetation and alteration of landscape is inevitable hence will cause nuisance to the nearby community and the general public. Therefore it is an issue required to be addressed in this EMP.

15.11: Erosion & Sedimentation

The key environmental issue for consideration with respect to topography, geology & soil are erosion & sedimentation control. Proposed construction site clearance will be implemented with respect to design drawing or site plan to maintain the potential of erosion and sedimentation.

15.12: Socio-economic issues:

The Lae Port Development Project would generally have a positive impact on the lives of the locals. This project already provides employment opportunities for the locals who would earn some cash from the project and improve local income generation.

However, with the positive impacts, there are also negative impacts that are anticipated on the social environment. However due to the Resettlement Program the local community now live further away from the project site so negative impacts are expected to be minimal.

15.13: Archaeological & Cultural Heritage

The proposed construction project may uncover some relics of archaeological and cultural significances. Archaeological and cultural heritage management issues are considered during the construction periods.

16.0: ENVIRONMENTAL MANAGEMENT PLAN:

Table 1 below summarizes the environmental monitoring plan, showing the environmental issues, proposed mitigation measures and monitoring plan (locations, parameters, frequency, and responsibility). The monitoring plan for construction operations will be refined after the baseline is completed.
Table 1 - Environmental Management and Monitoring Plan of Lae Harbor Construction and Operation

<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>DESIGN / PRE-CONSTRUCTION PHASE</td>
<td></td>
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</tr>
<tr>
<td>Avoidance of sensitive areas for dredge disposal</td>
<td>• Detailed field surveys in consultation with authorities ascertained that proposed dredged material disposal sites are not in sensitive areas. Area is clearly delineated and tipping must remain further than 300m from mouth of Markham River and in at least 50m depth of water.</td>
<td>Proposed dredged material disposal site</td>
<td>Design plans</td>
<td>Verify draft and final plans</td>
<td>CHEC / PMU</td>
</tr>
<tr>
<td>Environmentally sound design</td>
<td>• Ensure that final harbor configuration will not cause</td>
<td>Adjacent shore line beach and river mouth</td>
<td>Design plans</td>
<td>Verify draft and final plans</td>
<td>CHEC / PMU</td>
</tr>
</tbody>
</table>
Environmental Management and mitigation monitoring

<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
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</thead>
<tbody>
<tr>
<td>changes to shoreline, entrance to existing port and dynamics of adjacent areas.</td>
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**CONSTRUCTION PHASE**

**Turbidity (suspended sement load/sediment plumes) during harbor dredging**

- CHEC will identify and map all areas where soil disturbances will occur.
- For each of these areas, identify appropriate sediment control structures (silt fences, bunds, sediment traps, basins, and various sediment control drains) and install these structures prior to Construction areas.

- CHEC will inspect its surrounding to ensure that the erosion and sediment control measures recommended are implemented on site.
- If the recommended measures are not implemented, Weekly during dredging operations Contractor-CHEC.
### Environmental Management and mitigation monitoring

<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
</tr>
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<tbody>
<tr>
<td>to commencement of work</td>
<td>• CHEC will establish which month of the year are likely to experience higher rainfall</td>
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<td></td>
<td>• Site preparation works will be minimised during period of high rainfall</td>
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<td></td>
<td>• Works will be undertaken during dry season so that large quantities of unconsolidated materials are not exposed to rain and run-off.</td>
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<td>• A bund or trench will be constructed to divert runoff to sediment control</td>
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<td></td>
<td>appropriate action will be undertaken immediately to remedy the situation</td>
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<td></td>
<td>• Areas that have been re-vegetated will be inspected on a regular basis to ensure that vegetation is re-established.</td>
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<tr>
<td></td>
<td>• Turbidity will be measured directly at the edge of the construction site where runoff may occur.</td>
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<td>Contractor-CHEC</td>
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</tbody>
</table>

Daily with direct reading instruments for turbidity and bi-weekly for suspended sediments.
Environmental Management and mitigation

<table>
<thead>
<tr>
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<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>structures. These bunds and trench will be removed after completion of construction works.</td>
<td>All disturbed earthworks sites will be covered or protected to avoid exposed soil from being washed away</td>
<td>All construction will be implemented according to the design plans that are compatible with respect to soil, climate, landform, drainage, vegetation cover and land use factors at the site.</td>
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</tbody>
</table>
Environmental Management and mitigation monitoring

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<tbody>
<tr>
<td></td>
<td>• All drainage on site will be constructed according to design plan so that run-off from outside the construction area does not mix with unfiltered run-off within the works area</td>
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<tr>
<td></td>
<td>• Earthwork area will be protected as much as possible so that only a smallest area is required to be exposed at any one time. Disturbed soil will be compacted on an artificial slopes</td>
<td></td>
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<tr>
<td></td>
<td>• Construction spoil materials</td>
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</tbody>
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Environmental Management and mitigation monitoring

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</thead>
<tbody>
<tr>
<td>Excessive noise during dredging, sheet-piling, and demolition</td>
<td>• All employees working in an environment subject to high ambient noise level would be required to wear hearing protectors, which meets an international noise standard</td>
<td>Construction area</td>
<td>• ES&amp;H Manager will carry out visual monitoring within the construction areas. Any workers not wearing full PPE</td>
<td>Vibration and noise levels will be measured periodically (half yearly intervals) to verify its</td>
<td>Contractor CHEC PMU KECC</td>
</tr>
</tbody>
</table>
## Environmental Management and mitigation

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Noise</td>
<td></td>
<td></td>
<td>including ear protectors in noisy areas will be disciplined.</td>
<td>acceptability as per standards.</td>
<td>Noise measurements will be made if necessary in response to complaints.</td>
</tr>
</tbody>
</table>

- ES&H Manager will provide hearing protectors such as earplug and ear muffs to the employees exposed to noise emitted by machinery within the construction site.
- The ES&H Manager in liaison with ES&H Engineer will ensure that equipment and machinery utilized in the construction works are well maintained and serviced so that the noise levels are minimized as much as possible.
- Any noise complaints from residents will be dealt with in a timely and effective manner.
Environmental Management and mitigation monitoring

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<tr>
<td>Noises sourced from crusher plants &amp; asphalt plant will be minimised by providing adequate buffer zone away from any residential areas.</td>
<td></td>
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<tr>
<td>Working area will be suitably shielded from surrounding area either by bunding or appropriate noise reflective security fencing.</td>
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<tr>
<td>Silencers or mufflers will be utilized in all construction equipment and properly maintained</td>
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<tr>
<td>Any areas where noise levels possible.</td>
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</tbody>
</table>

- Noises sourced from crusher plants & asphalt plant will be minimised by providing adequate buffer zone away from any residential areas.
- Working area will be suitably shielded from surrounding area either by bunding or appropriate noise reflective security fencing.
- Silencers or mufflers will be utilized in all construction equipment and properly maintained.
- Any areas where noise levels possible.
### Environmental Management and mitigation monitoring

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</tr>
</thead>
<tbody>
<tr>
<td>Disposal of dredge spoils</td>
<td>Surface debris will be cleared and disposed of to an approved landfill</td>
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<td></td>
<td>Dredged materials which are unsuitable will be dumped in an approved Disposal Area offshore. Silt curtains will be deployed at the excavation area and at the dumping area. See Dredging Plan in Appendix G for details.</td>
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<td></td>
<td>Dredged material which is</td>
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<td></td>
<td>are above 85 dB(A) will be highlighted with sign boards and appropriate control measures taken</td>
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<td>Constructio n site</td>
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<td>Approved dumping ground 300 m offshore in &gt; 50 m water depth.</td>
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<tr>
<td></td>
<td>Direct readings will be made of water quality for turbidity near the onshore discharge point and around the dumping zone</td>
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<td></td>
<td>Stockpiled materials will be inspected for dust generation.</td>
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<td></td>
<td>Daily observation</td>
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<td>Contractor</td>
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<td>CHEC</td>
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<td></td>
<td>KECC</td>
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</tbody>
</table>
useful will be stockpiled on site for future use in the platform age construction. Stockpiles will be covered with tarpaulins to prevent dust entrainment by winds.

- Silt traps will be installed in runoff drains
  - Cutter suction hopper dredger will be employed as far as practically possible to minimize increased turbidity
- Level of suspended solid, turbidity,
**Environmental Management and mitigation monitoring**

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<tr>
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</thead>
<tbody>
<tr>
<td>dissolved oxygen and PH</td>
<td>will be monitored during dredging operation in order to identify changes in marine water. If any significant changes occur, remedial action will be taken promptly.</td>
<td></td>
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<tr>
<td>A stable transition region will be established between existing sea bed and the area to be dredged in order minimize</td>
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Environmental Management and mitigation monitoring

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<tr>
<td>risk of geotechnical instability.</td>
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</tbody>
</table>
- The dredging will increase turbidity, but the spread of suspended solids is anticipated to be limited. The impacts related to a high level of suspended solids will not significantly reduce the primary productivity of these areas. |
- Although high level of suspended solids in
### Environmental Management and mitigation monitoring

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<tr>
<td>the water column are not uncommon and localized increase in turbidity are not expected to significantly impact on water quality, the best practice controls in dredging operations will be executed to minimize the risk of uncontrolled release of sediment-laden water.</td>
<td></td>
<td></td>
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<tr>
<td>All construction plant</td>
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Environmental Management and mitigation monitoring

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<tr>
<td></td>
<td>and equipment will be designed and maintained properly to avoid the risk of silt, sediments, contaminants or other pollutants being released or leaked into the sea.</td>
<td></td>
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<tr>
<td>Silt curtain will be deployed around the immediate dredging area when there is significant chance of silt dispersion to surrounding water</td>
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### Environmental Management and mitigation monitoring

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</thead>
<tbody>
<tr>
<td>Marine ecology and fishery</td>
<td>• To reduce the impact to the marine fauna during blasting at quay wall foundation, control blasting practices and setting up of bubble curtains will be carried out during blasting work. • Ensuring that the dredging and reclamation as well as construction of the permanent and temporary revetments</td>
<td></td>
<td>CHEC</td>
<td>will carry out ecological survey &amp; sediment analysis half yearly intervals to identify changes in marine fauna and flora. Thereby magnitude of changes can be measured</td>
<td>Contractor CHEC PMU KECC</td>
</tr>
<tr>
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</tr>
<tr>
<td>do not extend beyond</td>
<td>identified by</td>
<td>monitoring</td>
<td>those results.</td>
<td>monitoring</td>
<td>responsibility</td>
</tr>
<tr>
<td>the designated areas</td>
<td>benchmarking</td>
<td>frequency</td>
<td>result.</td>
<td>identified</td>
<td>responsibility</td>
</tr>
<tr>
<td>• CHEC will monitor</td>
<td>marine and</td>
<td>fishery</td>
<td>impacts by</td>
<td>observation of</td>
<td>behaviour of</td>
</tr>
<tr>
<td>• CHEC will monitor</td>
<td>marine and</td>
<td>fishery</td>
<td>impacts by</td>
<td>observation of</td>
<td>marine fauna</td>
</tr>
<tr>
<td>• CHEC will monitor</td>
<td>marine and</td>
<td>fishery</td>
<td>impacts by</td>
<td>observation of</td>
<td>regularly to</td>
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<td>• CHEC will monitor</td>
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<td>observation of</td>
<td>help identify</td>
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<td>observation of</td>
<td>behavioural</td>
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<tr>
<td>• CHEC will monitor</td>
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<td>fishery</td>
<td>impacts by</td>
<td>observation of</td>
<td>pattern.</td>
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</table>
| Spills of fuel and other hazardous materials      | • Material Safety Data Sheet (MSDS) will be made available as a guide for the proper use of a type of chemical.  
  • MSDS will be consulted whenever needed to guide the use of hazardous & non hazardous chemicals.  
  • The CHEC management will construct a hard surface area with a containment bund for the refuelling facility to contain spills should a refuelling facility be built within the construction site. | Work sites | ES&H Manager will undertake regular inspection of fuel storage tanks or drums to ensure that no leach or spill occurs.  
  • ES&H Manager will undertake daily visual checks around the construction site to detect any leakages or spill of effluents.  
  • ES&H Manager will make Regular checks of containers for any | Daily inspection | Contractor CHEC  
  |                                                   |                                        |           |                      | PMU  
<p>|                                                   |                                        |           |                      | KECC |</p>
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<td><strong>Environmental Issue</strong></td>
<td><strong>Mitigation Measures</strong></td>
</tr>
<tr>
<td><strong>Oil storage containers or drums</strong></td>
<td>Oil storage containers or drums will be placed in the bunded area to contain leach and spill.</td>
</tr>
<tr>
<td><strong>Drip trays</strong></td>
<td>Drip trays will be used under drums during fuel or solvent transfer</td>
</tr>
<tr>
<td><strong>Waste oil</strong></td>
<td>Waste oil will be collected and removed from the site by a licensed contractor to an authorised disposable location</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Truck / traffic impacts due to hauling of rock from quarry and spoil</th>
<th>Implementation of hauling schedules that minimize local traffic problems</th>
<th>From port area to land disposal sites and from quarry to port site</th>
<th>Complaints or traffic jams</th>
<th>Daily observation</th>
<th>Contractor CHEC</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Implementation of traffic</td>
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## Environmental Management and mitigation

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<tr>
<td>removal as may interfere with local vehicle traffic. Falling rocks from vehicles or mud on road.</td>
<td>control scheme to minimize need to cross against existing traffic flows</td>
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<td></td>
<td>• All vehicles carrying loads to be covered with tarpaulins</td>
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<td></td>
<td>• Wheel washing facilities and “cattle grids” at access points to site</td>
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</tr>
<tr>
<td>Disturbance of cultural remains</td>
<td>• Protect and never touch known cultural relic building during working.</td>
<td>Harbor area and surroundings</td>
<td>Reports from site staff, site supervisors</td>
<td>Constant observation Daily reminders to staff during “Tool Box” briefings</td>
<td>Contractor CHEC PMU KECC</td>
</tr>
<tr>
<td></td>
<td>• Report to the Engineer for instruction when possible cultural relics are found and stop work until getting approval from the Engineer.</td>
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</table>
| Archaeological and cultural heritage                          | • CHEC will raise awareness among employees, on the significances of archaeological relics and heritage found on site  
• CHEC will ensure that personnel on site are aware of or trained in the need to report any sightings of artefacts and relics or heritage remains that are uncovered or disturbed during the |           |                      |                      | Contractor                |
|                                                               | • CHEC’s construction personnel are to watch out for any items of cultural significances  
• CHEC will ensure that the sub-contractors and employees are mindful of cultural heritage when undertaking |           |                      |                      |                          |
<table>
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</thead>
<tbody>
<tr>
<td>excavations activities</td>
<td>Any archaeological finds during works should be reported to ES&amp;H Manager to have them salvaged</td>
<td></td>
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<tr>
<td>the works</td>
<td>The National Museum will be immediately contacted to undertake any salvage activity which cannot be handled by CHEC</td>
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<tr>
<td>Harbour area and surroundings reports from site staff, site supervisors concerning verbal or formal</td>
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<tr>
<td>Daily reminders to staff during “Tool Box”</td>
<td>Contractor CHEC PMU</td>
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Complaints from local Community over

- Report to the Engineer for instruction when complaints received.
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<tr>
<td>construction activities</td>
<td>• Follow complaints procedure</td>
<td>complaints</td>
<td>briefings</td>
<td>KECC</td>
<td></td>
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<tr>
<td>Construction Workers Camp</td>
<td>• CHEC will provide showers, toilets, and clothes washing</td>
<td>Site area</td>
<td>CHEC will undertake</td>
<td>daily</td>
<td>Contractor</td>
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<tr>
<td></td>
<td>facilities for use by employees at convenient locations</td>
<td></td>
<td>visual monitoring to</td>
<td>observation</td>
<td>CHEC</td>
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<tr>
<td></td>
<td>within the construction site</td>
<td></td>
<td>ensure the adequate</td>
<td>monthly</td>
<td>PMU</td>
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<tr>
<td></td>
<td>• Waste water discharges from general site activities</td>
<td></td>
<td>treatment of sewage</td>
<td>reporting</td>
<td>KECC</td>
</tr>
<tr>
<td></td>
<td>includes waste water treatment units, oil traps, silt</td>
<td></td>
<td>and grey water before</td>
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<tr>
<td></td>
<td>traps and settlement tanks will be properly controlled</td>
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<td>being discharged</td>
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<td>before released to the city</td>
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<td>sewer system or through any temporary outfall.</td>
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<td></td>
<td>• If connection to the city system is not feasible CHEC will ensure that all sewage waste are properly treated prior to discharge into surroundings</td>
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</tr>
<tr>
<td></td>
<td>• Ensure that sewage treatment units established on site are working adequately</td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td>• Ensure that all grey water is also treated prior to discharge</td>
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<tr>
<td></td>
<td>• Provide awareness to all</td>
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</table>
Environmental Management and mitigation monitoring

<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>personnel working on site to use the toilet facilities provided and not the bushes</td>
<td></td>
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<tr>
<td></td>
<td>• If alternative pit toilets are used on site, they will be kept hygienic to avoid nuisance</td>
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<tr>
<td></td>
<td>• Any cooking facilities will be cleaned regularly and maintained in a sanitary condition</td>
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<tr>
<td></td>
<td>• Any food waste will be stored in closed bins to be bagged and removed from site daily</td>
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<tr>
<td></td>
<td>• All other waste such as paper, cardboard, plastic bags and bottles, glass bottles, and</td>
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<tr>
<td>Environmental Issue</td>
<td>Mitigation Measures</td>
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</tr>
<tr>
<td>Cans</td>
<td>cans will be segregated for recycling if possible and the removed by an authorised sub-contractor to a government approved sanitary landfill.</td>
<td></td>
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</tr>
<tr>
<td>Scavenging</td>
<td>Scavenging of recyclable solid waste materials by employees will be disallowed.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Forbidden burning</td>
<td>Forbid unnecessary burning of garbage within the construction site as this will contributes to Green House Effect.</td>
<td></td>
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</tr>
<tr>
<td>Vermin control</td>
<td>Vermin control will be implemented. Uncontrolled</td>
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</tbody>
</table>
### Environmental Management and mitigation monitoring

<table>
<thead>
<tr>
<th>Environmental Issue</th>
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<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>waste food disposal</td>
<td>will not be permitted as it encourages vermin and disease bearing vectors.</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>• Regular pesticide</td>
<td>and insecticide spraying will be implemented to control mosquitoes</td>
<td></td>
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<tr>
<td>• Stagnant water</td>
<td>will not be allowed to accumulate as it provides a haven for mosquito breeding.</td>
<td></td>
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<tr>
<td>• HIV awareness</td>
<td>programs will be instituted and all workers required to attend</td>
<td></td>
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<tr>
<td>• Interaction with</td>
<td>local</td>
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</tbody>
</table>
Environmental Management and mitigation monitoring

<table>
<thead>
<tr>
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<th>monitoring frequency</th>
<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Littering</td>
<td>• CHEC will establish a central litter collection centre at the construction area so that all litter at the construction area are collected at the main Site area</td>
<td>• ES&amp;H Manager will undertake visual monitoring on a regular basis to ensure that</td>
<td>Daily</td>
<td>Contractor CHEC PMU KECC</td>
<td></td>
</tr>
</tbody>
</table>

- The populace will be carefully monitored and workers continually reminded to avoid conflict situations
- The Workers Camp will enforce a Zero Tolerance Policy towards possession on site or in the camp of alcohol, drugs, and weapons.
<table>
<thead>
<tr>
<th>Environmental Management and mitigation monitoring</th>
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</thead>
</table>

<table>
<thead>
<tr>
<th>Environmental Issue</th>
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<th>Locations</th>
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<tbody>
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</tbody>
</table>

- collection point which will be disposed at the authorised site.
- Place rubbish bins at the strategic locations within the construction site to store rubbish.
- ES&H Manager will notify and encourage all sites personnel to avoid littering and dump their wastes at the central collection points or into the rubbish bins

littering does not become a problem at the construction area
Environmental Management and mitigation monitoring

<table>
<thead>
<tr>
<th>Environmental Issue</th>
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<th>monitoring frequency</th>
<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetation</td>
<td>• Any unreasonable removal of the vegetation surrounding the construction area will be avoided as much as possible</td>
<td>Site area</td>
<td></td>
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<tr>
<td></td>
<td>• Avoid making fire on the grasses surrounding construction site which may destroy the grassland ecosystems.</td>
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<tr>
<td></td>
<td>• ES&amp;H Manager will monitor by doing spot checks to ensure that an unreasonable removal of vegetation at the surrounding areas do not occur</td>
<td></td>
<td></td>
<td>Daily</td>
<td>Contractor CHEC PMU KECC</td>
</tr>
<tr>
<td>Environmental Management and mitigation monitoring</td>
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<th>monitoring frequency</th>
<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock Quarry Operation</td>
<td>● Water sprinkling will be done as required in exposed area of quarry site and transport route to suppress dust generation.</td>
<td>● ES&amp;H Manager will make spot checks on quarries to review their operation.</td>
<td>As required</td>
<td>Contractor CHEC PMU</td>
<td></td>
</tr>
</tbody>
</table>

undertake visual inspection to ensure that the making of fires surrounding area is avoided as much as possible.
### Environmental Management and mitigation

<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Mitigation Measures</th>
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<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Water sprinkling system will be adopted in crusher plant as applicable in loading point of hopper and other parts of the crusher which emits dust.</td>
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<tr>
<td>• Material transport route is also to be watered to minimize dust emission.</td>
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<tr>
<td>• When transporting dusty material by vehicles, those materials will be</td>
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</table>
### Environmental Management and mitigation monitoring

<table>
<thead>
<tr>
<th>Environmental Issue</th>
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<th>monitoring frequency</th>
<th>monitoring responsibility</th>
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</thead>
<tbody>
<tr>
<td>covered with tarpaulin cover in order to prevent accidental spillage.</td>
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</tbody>
</table>

### OPERATION PHASE

**Pollution from port’s sewage and stormwater**

- Waste water discharges from port activities includes waste water treatment units, oil traps, silt traps and settlement tanks will be properly controlled before released to the city storm-drainage system or through any temporary outfall.
- Toilet and other sanitary facility for employees will be

  - Harbor area
  - IPBC will undertake visual monitoring to ensure the adequate treatment of sewage and grey water before being discharged
  - Monthly
  - IPBC/ Port Management Authority
## Environmental Management and mitigation monitoring

<table>
<thead>
<tr>
<th>Environmental Issue</th>
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<th>Locations</th>
<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollution from port’s solid wastes</td>
<td>• All solid wastes will be placed into the rubbish bin drums. When full, they will be removed and disposed of to an authorised dump site</td>
<td>Harbor area</td>
<td>ES&amp;H Manager will watch out for any unacceptable practice of waste disposal within the port by employees and visitors.</td>
<td>Weekly</td>
<td>IPBC / Port Management Authority</td>
</tr>
</tbody>
</table>

- All sewage waste will be properly treated prior to discharge into surroundings
- Provide awareness to all personnel working on site to use the toilet facilities provided and not the bushes

provided at convenient locations within the port
## Environmental Management and mitigation monitoring

<table>
<thead>
<tr>
<th>Environmental Issue</th>
<th>Mitigation Measures</th>
<th>Locations</th>
<th>monitoring parameter</th>
<th>monitoring frequency</th>
<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pollution from sewage of ships in port</td>
<td>• Disposal of sewage and bilge water in accordance with MARPOL 73/78.</td>
<td>Harbor area</td>
<td>Illegal sewage discharges</td>
<td>Daily when ships are in harbor</td>
<td>Visiting ships and Harbor Master</td>
</tr>
<tr>
<td>Oil spills and leakage within harbour, or escape the</td>
<td>• The sewage and waste oil of vessels should be collected. Applications should</td>
<td>Port area and offshore water</td>
<td>Illegal waste water discharges</td>
<td>Daily</td>
<td>Harbor Master &amp; Port Managemen</td>
</tr>
<tr>
<td>Environmental Issue</td>
<td>Mitigation Measures</td>
<td>Locations</td>
<td>monitoring parameter</td>
<td>monitoring frequency</td>
<td>monitoring responsibility</td>
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</tr>
<tr>
<td>harbour area</td>
<td>be applied before pumping out of tanks. All vessels’ engineers should make records of the Oil Discharges.</td>
<td></td>
<td></td>
<td></td>
<td>t Authority</td>
</tr>
<tr>
<td>Oil spills from vessels entering, berthing and leaving the harbour</td>
<td>• Implementation of the Cook Islands Prevention of Marine Pollution Act (1998) and of existing oil spill contingency plan</td>
<td>Port area and offshore water</td>
<td>Spills of oils</td>
<td>Daily when ships are in harbor</td>
<td>Visiting ships and Harbor Master</td>
</tr>
<tr>
<td>Pollution from sewage and bilge water from ships in harbor areas</td>
<td>• Disposal of sewage and bilge water in accordance with MARPOL 73/78.</td>
<td>Harbor area</td>
<td>Illegal sewage and bilge water discharges, presence of oil sleek</td>
<td>Daily when ships are in harbor</td>
<td>Harbor Master</td>
</tr>
<tr>
<td>Environmental Issue</td>
<td>Mitigation Measures</td>
<td>Locations</td>
<td>Monitoring Parameter</td>
<td>Monitoring Frequency</td>
<td>Monitoring Responsibility</td>
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</tr>
<tr>
<td>Pollution from solid wastes of ships in port</td>
<td>With prior notice, CIPA will provide solid waste reception for disposal in accordance with MARPOL 73/78.</td>
<td>Harbor area</td>
<td>Illegal dumping of solid wastes</td>
<td>Daily when ships are in harbor</td>
<td>Harbor Master</td>
</tr>
<tr>
<td>Pollution due to accidents or emergencies</td>
<td>Implementation of a Contingency Plan with the necessary equipment and personnel training.</td>
<td>Harbor area</td>
<td>Release of materials during accidents and emergencies</td>
<td>During accidents and emergencies</td>
<td>Harbor Master</td>
</tr>
<tr>
<td>Proactive management of port’s environmental footprint and advance port</td>
<td>Implement an environmentally responsible port management system (EMS) to achieve and</td>
<td>Harbor area</td>
<td>EMS components</td>
<td>Monthly</td>
<td>IPBC PMU</td>
</tr>
<tr>
<td>Environmental Management and mitigation monitoring</td>
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<tr>
<td>Environmental Issue</td>
<td>Mitigation Measures</td>
<td>Locations</td>
<td>monitoring parameter</td>
<td>monitoring frequency</td>
<td>monitoring responsibility</td>
</tr>
<tr>
<td>sustainability</td>
<td>maintain continual environmental quality of the harbor area.</td>
<td></td>
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</tr>
<tr>
<td>Air quality</td>
<td>• Periodic emission test will be carried out on machineries &amp; equipment in order to identify malfunction areas and possible inefficiency of emission control mechanisms</td>
<td>Harbor area</td>
<td>• Carryout a regular visual inspection around the port to ensure that the does not becomes a problem</td>
<td>Monthly</td>
<td>IPBC PMU</td>
</tr>
<tr>
<td></td>
<td>• Water sprinkling will be applied on exposed excavation areas to</td>
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</table>
### Environmental Management and mitigation monitoring

<table>
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<th>monitoring responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dust suppression</td>
<td>dust generation</td>
<td>Harbor area</td>
<td>ES&amp;H Manager</td>
<td>Monthly</td>
<td>IPBC PMU</td>
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<td></td>
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<tr>
<td></td>
<td>Ambient air quality test will be carried out half yearly at the port.</td>
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<tr>
<td></td>
<td>Loading, unloading, transfer, handling or storage of bulk cement will be carried out in an enclosed area and any vent or exhaust will be fitted with air pollution control system.</td>
<td></td>
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</tbody>
</table>

- Refuelling facility will be bunded to prevent water quality issues.
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<tr>
<th>Environmental Management and mitigation monitoring</th>
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</thead>
<tbody>
<tr>
<td><strong>Environmental Issue</strong></td>
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<tr>
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<tr>
<td>spill which when percolated into the soil will pollute the underground water table and when washed down to into the storm water drainage and further into the sea will affect aquatic &amp; marine organisms.</td>
</tr>
<tr>
<td>‣ Sewerage water arisen from toilet will driven to sewerage water treatment unit for required</td>
</tr>
</tbody>
</table>
Environmental Management and mitigation monitoring

<table>
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<th>monitoring responsibility</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>purification before disposed to marine environment or city sewer water drainage pipeline.</td>
<td>being discharged or placed in a designated area.</td>
<td></td>
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</tbody>
</table>
# Appendix C - Daily Monitoring check list – Construction area

## DAILY MONITORING CHECK LIST – CONSTRUCTION AREA

Date _______________ Time _______________ Location __________________

<table>
<thead>
<tr>
<th>Key Aspects</th>
<th>Constraints/ Mitigation Measures</th>
<th>Yes</th>
<th>No</th>
<th>NR</th>
<th>Remarks/ Action taken( if any NCR )</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Dredging</strong></td>
<td>Are TB(dredger name) used for dredging</td>
<td></td>
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<td></td>
<td>Are there any spillage of oil or other hazardous substance from machineries/equipment</td>
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<tr>
<td></td>
<td>Is level of suspended solid within tolerance</td>
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<tr>
<td></td>
<td>Is level of turbidity within tolerance</td>
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<tr>
<td></td>
<td>Is level of turbidity within tolerance</td>
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<tr>
<td></td>
<td>Is level of dissolved oxygen within tolerance</td>
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<td></td>
<td>Is any complication observed in marine fauna</td>
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</tr>
<tr>
<td><strong>Disposal of sewage and waste water from land – based source</strong></td>
<td>Is oil trap/ grease trap working properly</td>
<td></td>
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<tr>
<td></td>
<td>Is sewer water treatment plant working satisfactory</td>
<td></td>
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<tr>
<td><strong>Disposal of sewage and waste water from construction Vessels.</strong></td>
<td>Is there any leakage or spillage of waste water</td>
<td></td>
<td></td>
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<tr>
<td><strong>Surface water runoff from reclamation area</strong></td>
<td>Are silt/sand traps available in required area</td>
<td></td>
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<td></td>
<td>Are de silting done satisfactory</td>
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<td></td>
<td>Are manhole covered adequately</td>
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<tr>
<td></td>
<td>Are material stockpiles covered adequately</td>
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<tr>
<td>Key Aspects</td>
<td>Constraints/ Mitigation Measures</td>
<td>Yes</td>
<td>No</td>
<td>NR</td>
<td>Remarks/ Action taken (if any NCR)</td>
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<tr>
<td>Production Process</td>
<td>Is noise /vibration level within standards at the boundary</td>
<td></td>
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<tr>
<td></td>
<td>Is it necessary to adopt sound proof measure</td>
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<tr>
<td></td>
<td>Are there any spillage of oil or other hazardous substance from machineries/equipment</td>
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</tr>
<tr>
<td>Description</td>
<td>Question</td>
<td>Table Entry</td>
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<td>-------------------------------------------------</td>
<td>--------------------------------------------------------------------------</td>
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<tr>
<td>Is waste water generated</td>
<td></td>
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<tr>
<td>If “yes”, is there any waste water treatment system</td>
<td></td>
<td></td>
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<tr>
<td>Is waste water analytical report available</td>
<td></td>
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<tr>
<td>If “yes” are tested parameters conformed with standards</td>
<td></td>
<td></td>
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<tr>
<td>Is air emission possible</td>
<td></td>
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<tr>
<td>If “yes” is emission control system / water sprinkling available</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>If “yes”, is treatment system satisfied</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>Is ambient air quality test report available</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>If “Yes”, are tested parameters conformed with standards</td>
<td></td>
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<tr>
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<td>Are emission test available for equipments, machineries &amp; vehicles</td>
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<td>General refuse disposal</td>
<td>Are silencers or mufflers fixed in machineries</td>
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<td>Is previous day waste collection carried out</td>
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**Inspected by:**  
ES&H Engineer  

**Approved by:**  
ES&H Manager
Appendix – E Non Conformance Report

NCR No. _______________ To _________________

Location _______________ Date _______________ Time _________________

Description of non-conformity:

Suggestion for rectification:

-----------------------------

ES&H Manager

TO: ........................................

Please implement above suggestions immediately / within ------ days & report

----------------------------- ES&H Manager

TO: ES&H manager

Completed/ not completed.

--------

Head of the department (NCR receiver)

Satisfactory / Unsatisfactory

-----------------------------

☐ ES&H Engineer ☐ Safety Officer

Approved & recommend for closing

ES&H Manager
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<td>Replacement of Faulty 1 x 30MVA and upgrading of 1 x 30MVA Transformers to 2 x60MVA 132/33kV Transformers, High Voltage Switchgears and Associated Equipment including Digital Control System</td>
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### PACKAGE 6

**132kV Line Reconstruction and Reconductoring**

### Lot 1

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<td>Replacement of Faulty 1 x 30MVA and upgrading of 1 x 30MVA Transformers to 2 x60MVA 132/33kV Transformers, High Voltage Switchgears and Associated Equipment including Digital Control System</td>
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**Lot 2**

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<td>Alagbon Supply &amp; Installation of 1 x 300 MVA 330/132kV, 2 x 100MVA 132/33kV Power Transformers, Switchgears and Associated Equipment</td>
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*Note: Item 5 (i.e. Birnin Kebbi S/S - highlighted) in Package 1 - Lot 1 is a very recent addition to the project sites selected and an environmental assessment is yet to be carried for the Substation.*