GOVERNMENT OF GHANA

ENVIRONMENTAL PROTECTION AGENCY

WORLD BANK GROUP

GHANA, AFRICA ENVIRONMENTAL HEALTH AND POLLUTION MANAGEMENT PROGRAM (AEHPMP)

FINAL

ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR THE PROPOSED TWEAPEASE CLEAN MINE DEMONSTRATION CENTER (CMDC)

JUNE 2025

EXECUTIVE SUMMARY

Introduction and background

The informal, unsafe, and unregulated nature of mercury use in Artisanal Small Scale Gold Mining (ASGM) Sector creates a legacy of severe adverse and irreversible environmental and health damage in its wake. It is therefore a priority to reduce, and where feasible, eliminate mercury use in ASGM as required in Article 7 of the Minamata Convention. Current crude methods of handling mercury to process gold lead to release of mercury into the environment with limited controls, leading to occupational and community exposures. For mercury abatement, technologies to promote phasing out of mercury usage have been proposed as part of the Africa Environmental Health and Pollution Management Program (AEHPMP), whose objective is to reduce exposure to mercury and regulate mercury use in ASGM. The focus will be on promoting alternative technologies for gold extraction without the use of harmful chemicals. Possible technologies to avoid the use of mercury in ASGM include sluicing, direct smelting, improved milling, shaking table, reactivation, centrifuges etc.

The Government of Ghana (GoG), acting through the Ministry of Environment, Science, Technology and Innovation (MESTI) and the Environmental Protection Agency (EPA), is implementing the AEHPMP with funds from the World Bank. The AEHPMP is being implemented by EPA where a Project Implementation Unit (PIU) has been established. To achieve the objectives of the project, the PIU has proposed to establish Clean Mine Demonstration Centers (CMDC) in four Small Scale Artisanal Gold Mining (ASGM) sites in Ghana namely Dakrupe and Tinga in Bole District of Savannah Region, Apinto/ Fanti Mines in Prestea Huni Valley Municipal of Western Region and Tweapease of Birim North Municipal of Eastern Region.

The GoG has acquired a 0.96-acre (0.39Ha) land at Tweapease for the establishment of one of the CMDCs through a Voluntary Land Donation (VLD) made by the Tweapease community, led by their Traditional Authority. The land which is the subject matter of the VLD is part of the parcel of land designated for the Tweapease Community Mining Scheme. The donation has been subjected to the World Bank's VLD Protocol through which the community was duly informed about their right to refuse the donation and to be compensated for land so donated. No households were displaced as a result of the donation.

The site is located on the outskirts of the town and about 50m from the Mamang River on the Tweapease – Abehenase – Asuoum – Kade Road. The CMDC at Tweapease will be housed in prefabricated container structures and will have the following:

- Provision of offices/washrooms/training spaces to cater for the anticipated number of people;
- Appropriate-sized washrooms have been provided to serve the anticipated population of users;
- Use of environmentally friendly materials;
- Use of energy-efficient materials and facilities; and
- Provision for water storage including harvesting of rainwater.

The main facilities proposed for the Tweapease CMDC includes the following:

- Demonstration Area (Processing Area and Smelting Area);
- Tailings Storage and Water Recycling Ponds Area;
- Office Rooms;
- Training Spaces (Indoor and Outdoor) and Eating Space;
- Storage Spaces;
- Visitor Amenities (Washrooms);
- Fencing; and
- Car Park

This has necessitated an Environmental and Social (E&S) study for the preparation of an Environmental and Social Management Plan (ESMP) for the Tweapease CMDC site. The E&S risks identified at the site includes:

- Contamination of the Mamang River as a result of chemical spills, contamination from runoff/ seepage from tailings storage due to nearness of the site to the Mamang River; and
- Current use of the site for farming by an indigene of Tweapease although the land has been acquired by the GoG through the PIU for the project hence the need for compensation payment to the farmer.

Alternative Considerations
The alternative analyses covered the following:
- Site Selection Option- the chosen site vis-à-vis the other site in the mining concession at Tweapease;
- Choice of Building Materials for the Tweapease CMDC- use of prefabricated containerized structures as against typical brick/block and mortar;
- Choice of Technology- use of a combination of comminution, gravimetric concentration and gold separation and to avoid mercury use through leaching and direct smelting; and
- Do nothing scenario- no CMDC is provided at Tweapease and the status quo remains.

Construction Materials and Equipment
The materials required for construction of the Tweapease CMDC include building materials such as shipping containers, cement, cement block, sand, gravel, stone chippings, concrete, iron rods, water, PVC/HDM pipes and admixtures. Other accessories will include barbed wire, wire mesh, balustrade, etc. The construction equipment to be used includes excavators, backhoes, shovels/ pickaxes, concrete mixers, haulage trucks, dump trucks, concrete dispensing trucks, water pumps etc.

Construction Labor
It is estimated that between 30 to 50 persons will be engaged during the construction phase of the project works. This will include unskilled labor, drivers, masons, carpenters, plumbers, electricians, mechanics, plant operators, engineers, and administrators. Although the Tweapease community is endowed with youth who are currently unemployed and so will be available for employment as unskilled labor.

Skilled labor will be hired from outside the Tweapease community and risks such as social conflict, increased Sexually Transmitted Diseases (STDs) and gender-based violence may occur. In this regard, adequate measures have been provided in this ESMP including Code of Conduct to regulate the conduct of the contractor and their labor force to ensure the risks associated with labor from outside the project location are minimized. Labor camps will not be established to house workers during construction, rather the workers will go to their various homes and proceed from there to work.

In line with environmental permitting requirements as provided under the Environmental Assessment Regulations of 1999, Legislative Instrument (LI) 1652, the AEHPMP PIU commissioned the preparation of this ESMP to guide the environmental and social risk management associated with the construction and operation of the Tweapease CMDC. This report is therefore the final ESMP in compliance with the World Bank Environmental and Social Standards (ESSs) especially ESS 1 on Assessment and Management of Environmental and Social Risks and Impacts.

Objective and Purpose of the ESMP
The purpose of the ESMP is to provide guidance for the environmental and social risk management associated with the construction and operation (including maintenance) of the CMDC at Tweapease.

Relevant Policies, Legal and Administrative Framework
The proposed Project will strictly adhere to and follow the World Bank's Environmental and Social Framework (ESF) as well as the legal and regulatory frameworks of Ghana. The key environmental policies, legal framework and procedures considered as relevant under the proposed Project have been presented in Chapter 2 of this ESMP. The proposed construction and operation of the Tweapease CMDC is expected to comply with the requirements of the following EPA administered Ghana Standards (GS):
1. GS 1236:2019- Environment and Health Protection – Requirements for Ambient Air Quality and Point Source/ Stack Emissions;
2. GS 1222:2018- Health Protection – Requirements for Ambient Noise Control; and
3. GS 1212:2019- Environmental Protection Requirements for Effluent Discharge (General Industry).

Ghana Environmental Assessment Regulations 1999 (LI 1652): Under the provisions of the Ghana Environmental Assessment Regulations 1999 (LI 1652), the proposed Project is classified under projects for which an EIA is required. The EPA Act 490 (1994) established the Agency and entrusted it with the responsibility of ensuring compliance with the EIA process and procedures in the planning and execution of development projects.

World Bank Environmental and Social Framework: The construction and operation of the Tweapease CMDC is World Bank Funded and therefore must also conform to the World Bank's ESSs which govern the funding agreement between the Bank and the Government of Ghana. The objective of the standards is to prevent or at least minimize biophysical environment and socioeconomic-cultural risks and impacts while increasing the environmental and the socio-economic benefits of projects. The applicable ESSs are as follows:

- ESS 1: Assessment and Management of Environmental and Social Risks and Impacts;
- ESS 2: Labor and Working Conditions;
- ESS 3: Resource Efficiency and Pollution Prevention and Management;
- ESS 4: Community Health and Safety;
- ESS 5: Land Acquisitions, Restrictions on Land Use, and Involuntary Resettlement;
- ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources;
- ESS 8: Cultural Heritage; and
- ESS 10: Stakeholder Engagement and Information Disclosure.

Stakeholder Consultations

Key stakeholders have been consulted, these include regulatory bodies, local government institutions and project affected persons and the Tweapease community. Stakeholder consultation is a continuous process and would be conducted throughout the Project implementation.

The following are key highlights of the issues/concerns raised by stakeholders/affected persons during the consultations:

- Some community members/ miners had doubts that the project will see the light of day;
- The consultees expressed concern about whether the CMDC will be able to process all the ore to be mined in Tweapease,
- The consultees are aware of the mercury problem and are eager to support the establishment of the CMDC at Tweapease so that there will be no need for mercury use when the community mining scheme commences.

Potential Environmental and Social Risks and Impacts of the Tweapease CMDC

The potential beneficial and adverse impacts of the Tweapease CMDC project have been identified and discussed based on the nature of the project and area of influence.

The potential positive impacts of the project include:

- Awareness creation on impacts and risks of mercury use in ASGM in Tweapease;
- Employment creation and enhanced business opportunities in ASGM in Tweapease;
- Deepening of construction health and safety education and awareness in Tweapease;
- Improved institutional capacity and coordination in the ASGM sector;
- Projection of Tweapease as a model mercury free mining community;
- Improved health of potential miners and community members; and
- Improvement in local and national economy.

The key adverse environmental and social issues which could possibly arise from the various stages of the Project have been evaluated and presented in Chapter 5 of this document. They include:

- Air quality deterioration and exposure of some community members to the particulates;
- Vibration and noise nuisance and exposure of some community members to the noise;
- Loss of vegetation/ habitat and impacts on flora and fauna;
- Land degradation and loss of soil resources at the Tweapease CMDC;
- Exposure of workers to noise, dust, odor and workplace accidents e.g., slips, falls etc. as an occupational health and safety issue;
- Exposure of some community members to accidents involving construction vehicles;
- Increased risk of Sexually Transmitted Diseases; and
- Gender based violence including sexual harassment, child abuse and exploitation due to labor influx.

Proposed Enhancement and Mitigation Measures for Potential Environmental and Social Risks and Impacts Identified

The proposed Environmental and Social Management and Monitoring Plan (ESMMP) which aims to ensure that the potential environmental and social risks and impacts identified are reduced to the barest minimum, or completely eliminated during pre-construction, construction, operation and decommissioning phases of the proposed project at Tweapease is presented in Chapter 6 of the document. To ensure effectiveness and compliance with sound environmental and social practices and ensure sustainability of the Tweapease CMDC, a provisional environmental and social management and monitoring program to help manage and monitor the risks and impacts and which will help sustain environmental quality within acceptable guidelines/standards, including monitoring roles and responsibilities have been provided in the ESMP. The programme includes a proposed Monitoring Plan for monitoring the effectiveness of the implementation of each of the management measures.

Grievance Redress

A grievance resolution procedure consistent with the EPA's GRM has been provided in this ESMP. It aims at addressing and resolving grievances or complaints from Project Affected Persons (PAPs) promptly, fairly and in a manner to the extent possible, acceptable to all parties during the proposed Project implementation.

Capacity Building Plan

All relevant stakeholders including contractors and their workers, the Birim North Municipal Assembly, AEHPMP -PIU staff, community opinion leaders, NGOs, project affected persons, etc. who will be involved in the implementation, monitoring and supervision of the Project implementation will undergo training to create understanding on the ESMP requirements, the roles and responsibilities of the stakeholders in order to ensure compliance with the ESMP.

Estimated Cost for the ESMP Implementation

The costs involve:

i. Implementation of the environmental and social impacts mitigation measures implementation is estimated to cost GHS770,000.00 (this cost excludes some of the mitigation management costs already included in the BoQs);
ii. Monitoring of the mitigation measures implementation is estimated to cost GHS582,000.00 (this cost excludes some of the mitigation management costs already included in the Bill of Quantities (BoQs); and
iii. Capacity Building including Grievance Redress: GHS1,245,000.00

Conclusion

The intervention, a community-focused cleaner technology, seeks to address current policy challenges as well as to strengthen regulatory frameworks and facilitate their implementation, to better address environmental health risks associated with mercury use in ASGM sector.

The proposed establishment of a CMDC at Tweapease is to assist in eliminating mercury exposure, use in ASGM, and improve the health risks and effects associated with mercury in the community and Ghana as a whole. Mercury is a known neurotoxin with high exposures linked to some health challenges including kidney and autoimmune dysfunction.

This ESMP therefore seeks to provide mitigation and management measures to realize the benefits from the intervention while eliminating any cumulative impacts.

The overall strategy for the intervention is designed to improve ASGM operations in mining communities such as Tweapease. While eliminating the health risks associated with mercury use in ASGM as the main benefit of the intervention other multiplier effects such as employment opportunities, poverty reduction and improved national reputation, some negative impacts during implementation have been identified during construction and operation of the ASGM sector. Such negative impacts include air quality deterioration, noise level elevation and landscape destruction during construction and wastewater generation during operation and maintenance which have been identified as minor.

The studies towards the preparation of this ESMP have revealed that the execution of the CMDC at Tweapease will not severely impact negatively on the existing environmental, social, safety and health of the community.

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LIST OF ABBREVIATIONS

ADR	Alternative Dispute Resolution
AEAs	Agriculture Extension Agents
AfDB	African Development Bank
AEHPMP	African Environment Health Pollution Management Program
AIDS	Acquired Immune Deficiency Syndrome
AoI	Area of Influence
AER	Annual Environmental Report
APHA	American Public Health Association
ASM	Artisanal Small-Scale Mining
ASGM	Artisanal Small-Scale Gold Mining
AWWA	American Water Works Association
BOP	Business Operating Permit
BoQs	Bill of Quantities
BP	Bank Policy
CBD	Convention on Biological Diversity
CEO	Chief Executive Officer
CHAG	Christian Health Association of Ghana
C-ESMP	Contractor's Environmental and Social Management Plan
CEQG	Canadian Environmental Quality Guideline
CHPS	Community Health-Based Planning Services
CITES	Convention on International Trade in Endangered Species
CLM	Child Labor Monitoring
CMDCs	Clean Mine Demonstration Centers
CMS	Community Mining Scheme
COVID-19	Corona Virus Disease of 2019
CPESDP	Coordinated Programme of Economic and Social Development Policies
CSIR	Council for Scientific and Industrial Research
EA	Environmental Assessment
EAP	Emergency Assembly Point
EAR	Environmental Assessment Report
EHS	Environment, Health and Safety
SHS	Environment, Social, Health and Safety
ECG	Electricity Company of Ghana
EIA	Environmental Impact Assessment
E&S	Environmental and Social
EPA	Environmental Protection Agency
ERP	Emergency Response Plan
EMP	Environmental Management Plan
ESF	Environmental and Social Framework
ESCP	Environmental and Social Commitment Plan
ESHS	Environment, Social, Health and Safety
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
ESMMP	Environmental and Social Management Monitoring Plan
ESS	Environmental and Social Standard
FDA	Food and Drugs Authority
FDI	Foreign Direct Investment
FGD	Focus Group Discussion
GBV	Gender Based Violence
GDP	Gross Domestic Product
GEF	Global Environment Facility
GES	Ghana Education Service
GHG	Green House Gas
GHS	Ghana Health Service
GIIP	Good International Industry Practice
GNCCP	Ghana National Climate Change Policy
GNFS	Ghana National Fire Service
GGL	Goldfields Ghana Limited
GoG	Government of Ghana

GREL	Ghana Rubber Estate Limited
GRM	Grievance Redress Mechanism
GS	Ghana Standard
GSA	Ghana Standard Authority
GSS	Ghana Statistical Service
GWCL	Ghana Water Company Limited
HIV	Human Immunodeficiency Virus
I&APs	Interested and Affected Parties
ICT	Information and Communication Technology
ILO	International Labor Organization
IPF	Investment Project Financing
ISQG	Interim Sediment Quality Guidelines
ITB	Inter Tropical Boundary
ITCZ	Inter Tropical Convergence Zone
JHS	Junior High School
KID	Key Informant Discussion
KII	Key Informant Interview
KPI	Key Person Interview
KVIP	Kumasi Ventilated-Improved Pit
LC	Lands Commission
LI	Legislative Instrument
IUCN	International Union for Conservation of Nature
LMP	Labor Management Procedures
LSM	Large Scale Mining
LULC	Land Use Land Cover
LUSPA	Land Use and Spatial Planning Authority
LVB	Land Valuation Board
LVD	Lands Valuation Division
MC	Minerals Commission
MESTI	Ministry of Environment, Science, Technology and Innovation
MID	Mines Inspectorate Division
MMDA	Metropolitan, Municipal and District Assembly
MLGDRD	Ministry of Local Government, Decentralization and Rural Development
MoFA	Ministry of Food and Agriculture
MOP	Mining Operating Plan
NDCs	Nationally Determined Contributions
NEAP	National Environment Action Plan
NEP	National Environment Policy
NEmP	National Employment Policy
NGOs	Non-Governmental Organizations
NHP	National Health Policy
NLP	National Labor Policy
NWP	National Water Policy
OASL	Office of Administrator of Stool Lands
O&M	Operation and Maintenance
OP	Operational Policy
OSH	Occupational Safety and Health
PBC	Produce Buying Company
PAP	Project Affected Person
PEL	Probable Effects Levels
PIU	Project Implementation Unit
PNDC	Provisional National Defense Council
PNDCL	Provisional National Defense Council Law
POPs	Persistent Organic Pollutants
PPE	Personal Protective Equipment
PWDs	Persons with Disabilities
RBZP	Riparian Buffer Zone Policy
REDD+	Reducing Emissions from Deforestation and Forest Degradation
SDGs	Sustainable Development Goals
SEA	Sexual Exploitation and Abuse
SEP	Stakeholder Engagement Plan
SGBV	Sexual and Gender Based Violence
SH	Sexual Harassment
SHS	Senior High School

SPSS	Statistical Package for Social Sciences
STD	Sexually Transmitted Diseases
TDS	Total Dissolved Solids
TEL	Threshold Effect Level
TSP	Total Suspended Particles
TSS	Total Suspended Solids
UMaT	University of Mines and Technology
UNESCO	United Nations Educational Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
UPOPs	Unintentional Persistent Organic Pollutants
USEPA	United States Environmental Protection Agency
VAC	Violence Against Children
VLD	Voluntary Land Donation
WB	World Bank
WC	Water Closet
WHO	World Health Organisation
WRC	Water Resources Commission
WEF	Water Environment Federation
WBG	World Bank Group
WRI	Water Research Institute

1.0 INTRODUCTION

1.1 Background

The mining sector plays a vital role in the Ghanaian economy, attracting more than half of all Foreign Direct Investment (FDI), and generating more than one-third of all export revenues. The mining industry is the largest tax-paying sector in the country and makes a significant contribution to GDP and employment.

As a low-tech, labor-intensive industry with few barriers to entry, ASGM sector has become an alluring alternative livelihood for some Ghanaians especially the unemployed youth. Despite the financial benefits, a variety of environmental, social and public health concerns have accompanied the expansion of ASGM in Ghana and they include water contamination, inhalation of dust from pulverized ore and exposure to mercury and other heavy metals.

The informal, unsafe, and unregulated nature of mercury use in ASGM Sector creates a legacy of severe adverse and irreversible environmental and health damage in its wake. It is therefore a priority to reduce, and where feasible, eliminate mercury use in the ASGM as required in Article 7 of the Minamata Convention. Current crude methods of handling mercury to process gold lead to release of mercury into the environment with limited controls, leading to occupational and community exposures. For mercury abatement, technologies to promote phasing out of mercury usage has been proposed as part of this project under the Africa Environmental Health and Pollution Management Program (AEHPMP), whose objective is to reduce exposure to mercury and regulate mercury use in ASGM. The focus will be on promoting alternative technologies for gold extraction without the use of harmful chemicals. Possible technologies to avoid the use of mercury in ASGM include sluicing, direct smelting, improved milling, shaking table, reactivation, centrifuges etc.

Ghana is one of five African countries participating in the Global Environment Facility (GEF) funded AEHPMP. The Project in Ghana has four (4) Components as follow:

Component 1: Institutional Strengthening, Capacity Building and Knowledge Sharing
The component will strengthen the knowledge and capacity base of public institutions and private stakeholders to address environmental health risks associated with mercury use in ASGM sector and Persistent Organic Pollutants (POPs)/ Unintentional POPs (UPOPs) releases from e-waste.

Component 2: Support Policy Dialogue and Regulatory Enhancements
The component seeks to address current policy challenges as well as to strengthen regulatory frameworks and facilitate their implementation, to better address environmental health risks associated with mercury use in ASGM sector and POPs/UPOPs releases from e-waste. It complements activities under component 3, focused on operational-level approaches to incentivize practices and technologies less harmful to human health and the environment.

Component 3: Demonstrating the Application of Technological Tools and Economic Approaches
This component finances specific community-focused cleaner technology demonstration activities in contaminated areas, selected and designed based on environmental health risks and cost-effectiveness of interventions. The objective is to address technical and methodological challenges to the adoption and deployment of cleaner technologies and practices in complement to activities under component 2, which focuses on challenges and policy incentives to reduce environmental and health pressures.

Component 4: Project Management
This component covers the cost for project management, implementation and supervision of project activities, administration of procurement and financial management, monitoring and evaluation, and monitoring of safeguards compliance. The component covers in particular the cost of the Project Implementation Units (PIU) within the EPA.

The project's geographical scope covers all of Ghana however the establishment of the CDMCs at the four small scale mining locations are in three districts and three regions of Ghana as shown in **Table 1-1** and further illustrated in **Figure 1-1.**

Table 1-1: Selected Regions and Districts for AEHPMP Project

No.	Name of Site	District	Region
1.	Dakrupe	Bole	Savannah
2.	Tinga	Bole	Savannah
3.	Tweapease near New Abirem	Birim North	Eastern
4.	Fanti Mines at Abosso	Prestea Huni Valley	Western

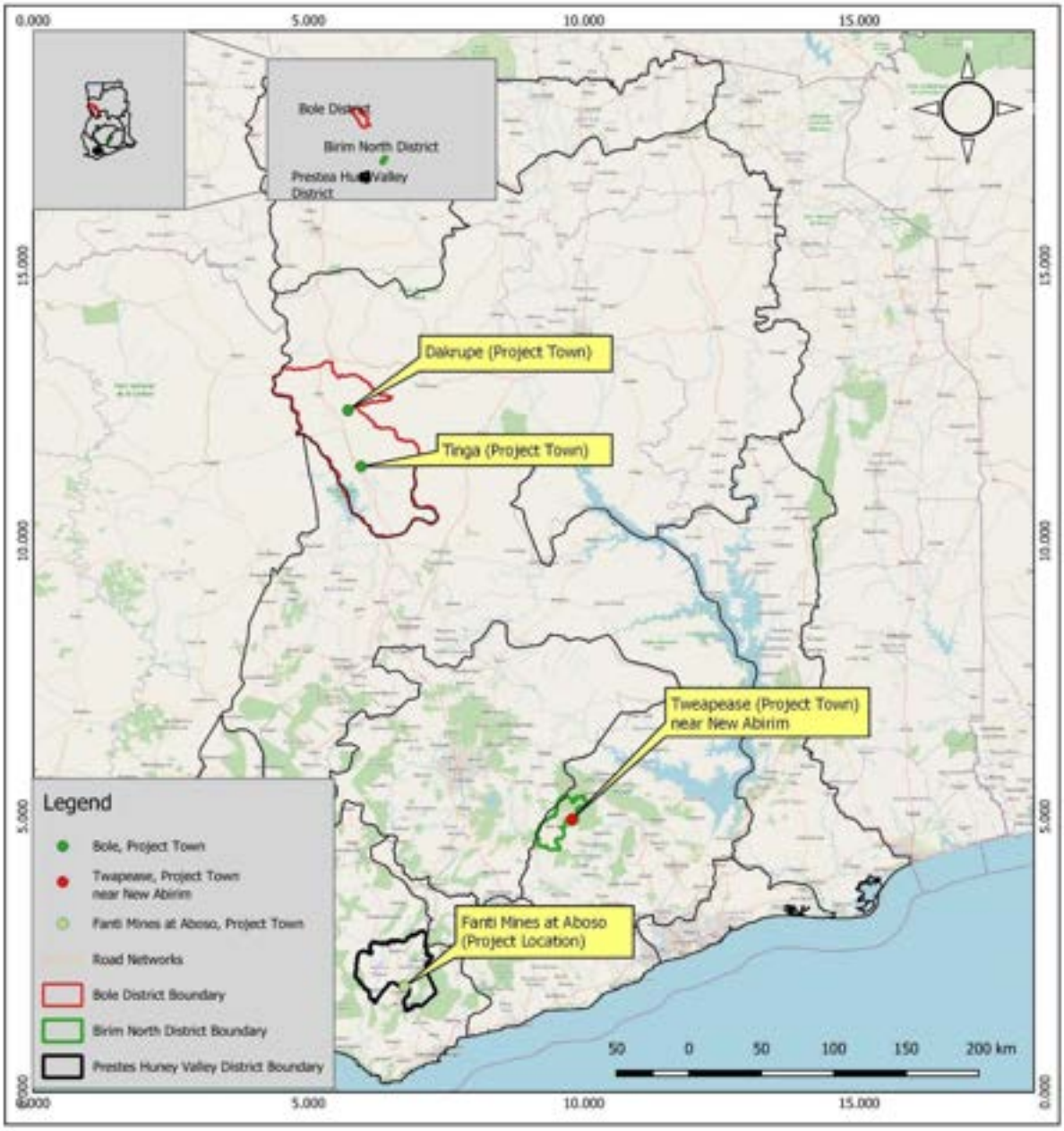

Figure 1-1: Map of Ghana Showing Proposed Project Locations

1.2 Description of the Proposed Project in Tweapease

The Tweapease CMDC

The CMDC for Tweapease will be established on a 0.96 acre (0.39Ha) land which is part of a parcel of land designated for the Tweapease Community Mining Scheme. This land, along with access roads to the site, is within areas designated for Community Mining Schemes (CMS). The designation of a place for

Community Mining Schemes (CMS) is done by the Minerals Commission of Ghana, in close consultation and involvement of relevant Traditional Authorities, District Assembly representatives and community people. In practice, such designated areas are free from any other uses and encumbrances, including farming activities. The land has been acquired by the GoG through a Voluntary Land Donation (VLD) arrangement with the Tweapease community through the Traditional Authority. The donation process followed the World Bank's VLD Protocol through which it was established that the donation was not coerced and that the owners (Tweapease community) proceeded to finalize the donation after they were duly informed about their right to refuse the donation and to be compensated for land so donated Also, it was ascertained that one farmer – Eric Sarkodie – who, although has no recognizable legal claim to the land, had cultivated it at the time of the donation. Therefore, in accordance with the provisions of ESS 5, Eric Sarkodie was meaningfully engaged on the proposed subproject and how it impacts his continued use of the land. The engagement with Eric Sarkodie culminated in a consensus that: (1) he will be allowed adequate time to harvest his crops, and (2) the Traditional Authority in Tweapease will give him an alternative land of equal productive capacity and size, to continue his farming activities. The infrastructure required for the CMDC is made up of the following:

- Built-up spaces;
- parking area;
- landscaping area; and
- circulation- internal and external and services distribution.

The design of the CMDC at Tweapease will have the following:

- Provision of offices/washrooms/training spaces to cater for the anticipated number of people;
- Appropriate-sized washrooms have been provided to serve the anticipated population of users;
- Use of environmentally friendly materials;
- Use of energy-efficient materials and facilities; and
- Provision for water storage including harvesting of rainwater.

The CMDC at Tweapease have been designed for air circulation and cross ventilation through the windows. Natural air circulation through the windows is allowed in order to eliminate or reduce the usage of mechanical ventilation systems. The CMDC in Tweapease will be housed in prefabricated container structures.

The design of the CMDC at Tweapease embodies a play of light, patterns and shades. The overall internal color scheme is proposed to be one which will reflect good lighting system. Consideration for the finishes has been based on functionality of space, durability and maintenance. Acrylic emulsion paint which allows good lighting system has been adopted.

The washroom areas will be tiled and the immediate environs of the buildings will be enhanced by the introduction of aprons and drains around the facilities.

The main facilities proposed for the Tweapease CMDC includes the following:

- Demonstration Area (Processing Area and Smelting Area);
- Tailings Storage and Water Recycling Ponds Area;
- Office Rooms;
- Training Spaces (Indoor and Outdoor) and Eating Space;
- Storage Spaces;
- Visitor Amenities (Washrooms);
- Fencing; and
- Car Park.

Generally, two types of materials have been proposed for the office space and these are (i) a masonry roofed blockwork office and (ii) a prefabricated office space. These are being proposed because of the easy availability of materials per mining area. The prefabricated office will implore the use of shipping containers (40-footer Container) which has been modified into offices. The containers are modified to have windows, doors, and toilet facilities.

The containers will have the inside paneled with cement board and complete installation of all electrical and air-conditioning fixtures and fittings.

The prefabricated type of office is recommended for the Tweapease Site in the Eastern Region which has the containers readily available because of the Sea Port at Tema and the shipment of goods to the New Abirem where there is the presence of a major mining company in that enclave.

Demonstration Area (Processing Area and Smelting Area)

The section demarcated as demonstration area will be for both processing of the ores and for smelting of the gold. The demonstration area is designed to process the daily tonnage of materials according to the technology assessment at the mine. The average tonnage of materials to be processed is estimated at 1.5 - 5t/da. The processing area will house the mercury-free technology equipment. It will serve for both practical demonstrations of the clean gold processing techniques and provide support services to miners especially women involved in ore processing. The smelting area will house the smelter, the last component of the process where the final processing is carried out to obtain the gold through direct smelting. The demonstration area will basically have sheds without enclosed walls to provide sun and rain shades for the equipment and workers during the processing and also to allow for proper ventilation and to minimize dust pollution.

Figure 1-2 shows the environmentally based process flow diagram of the gold production processes of winnowing, cyanidation and direct smelting.

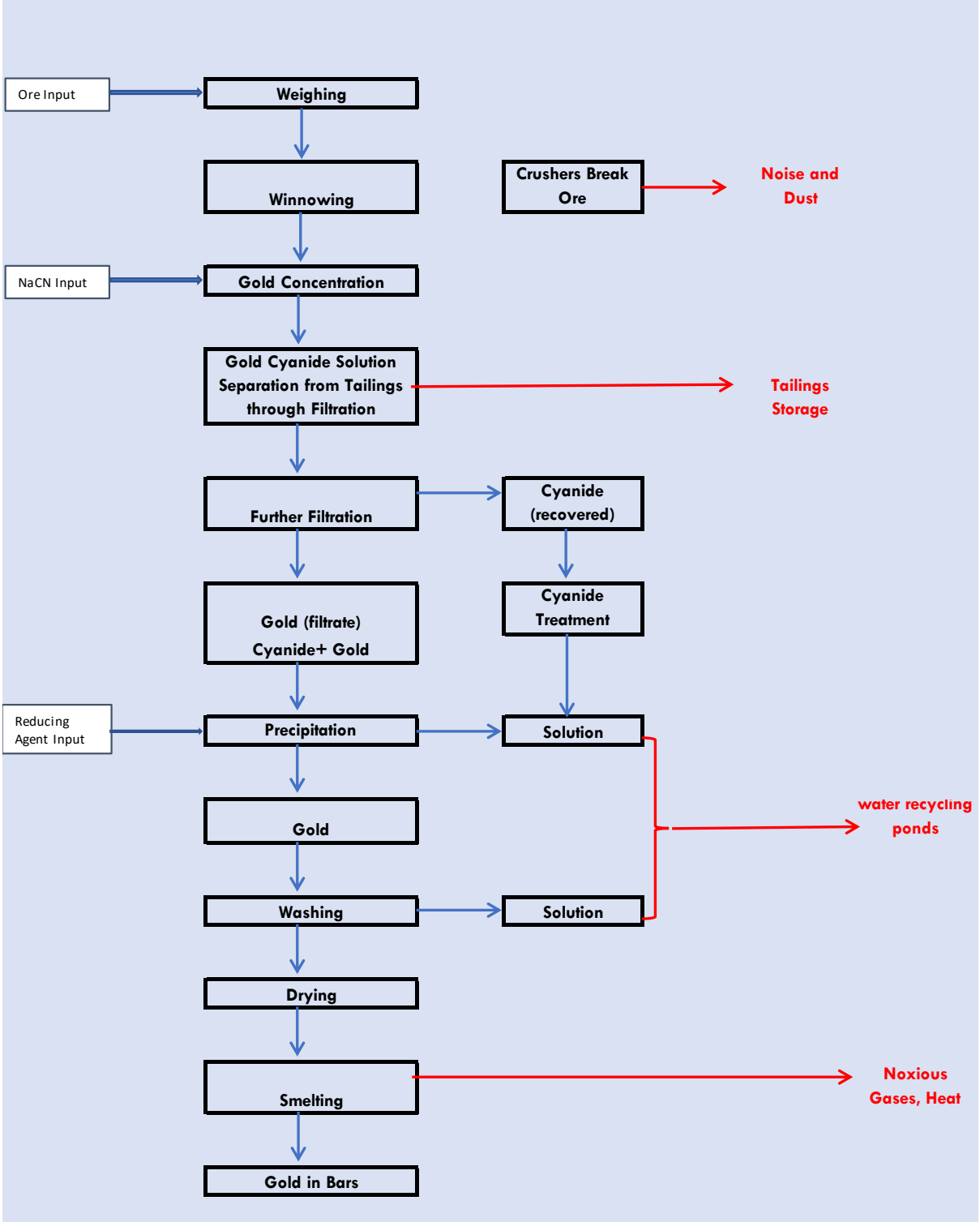

Figure 1-2: Environmentally Based Process Flow Diagram of the Gold Production Processes

Tailings Storage Facility and Water Recycling Ponds Area

Practical demonstration of the mercury-free gold processing techniques would need water (which is often scarce in the small-scale mining sites) and lead to production of tailings. An effective impoundment/TSF will serve the purpose of recycling the processed water and to contain the tailings produced during the demonstration.

An area is allotted for Tailings storage and the construction of water recycling ponds. It is proposed to provide the Tweapease site with a borehole for process water supply purposes.

Office Rooms

Office spaces will be required for administering training and for the daily operation of the center. An office space of dimension 5m (length) by 2m (width) by 2.2m (height) will be provided. Office staff of four (4) persons have been considered for the operation of the center although the space allotted for the office can contain approximately eight (8) office staff. The office will have standard desks, high back chairs, stackable chairs, filing cabinets, exhibit boards and white boards.

Training Spaces (Indoor and Outdoor)

Training spaces will also be required to do workshops for miners, the public, students etc. The proposed dimension of the space that will be adequate is 12m (length) x 2.2m (width) x 2.2m (height) to be able to house a maximum number of forty (40) people at a time for training. The training spaces will also typically have folding chairs, tables where required, whiteboards, exhibit boards, and an image projector. As with the office space the training spaces will also utilize the same material, a prefabricated container office.

An outdoor training area for physical demonstration will be constructed. It will be in a tent form with timber posts as the main structural supports bolted on concrete slab and roofed with aluminum roofing sheets of 50mm x 100mm timber rafters and purlins. It will have an external envelope made of 25mm x 50mm wooden battens spaced 100mm apart to admit ventilation. The overall dimension proposed is 10m (length) x 5m (width) x 4m (height). The outdoor training area will also serve as a resting and eating area for the non-office staff and shall have benches and tables.

Storage Spaces, Kitchenette and Visitors Amenities

Storage space, kitchenette and washrooms will be of the same design principles as described for the offices. The size of the storage space and kitchenette combined shall be 20-footer shipping container with room size 5.5m (length) x 2.2m (width) x 2.2m (height). The same size is proposed for the restrooms for the prefabricated structure option.

Fencing

For maximum security against theft and other damages due to external factors a barbed wire fencing will be provided for the Tweapease CMDC for additional security against vandalism.

Construction and Operation and Maintenance Periods

It is expected to use 6 months for the construction works while the Operation and Maintenance will continue throughout the life of the proposed community mine at Tweapease supplying the CMDC.

A general block plan for the CMDC at Tweapease is as shown in **Figure 1-3**.

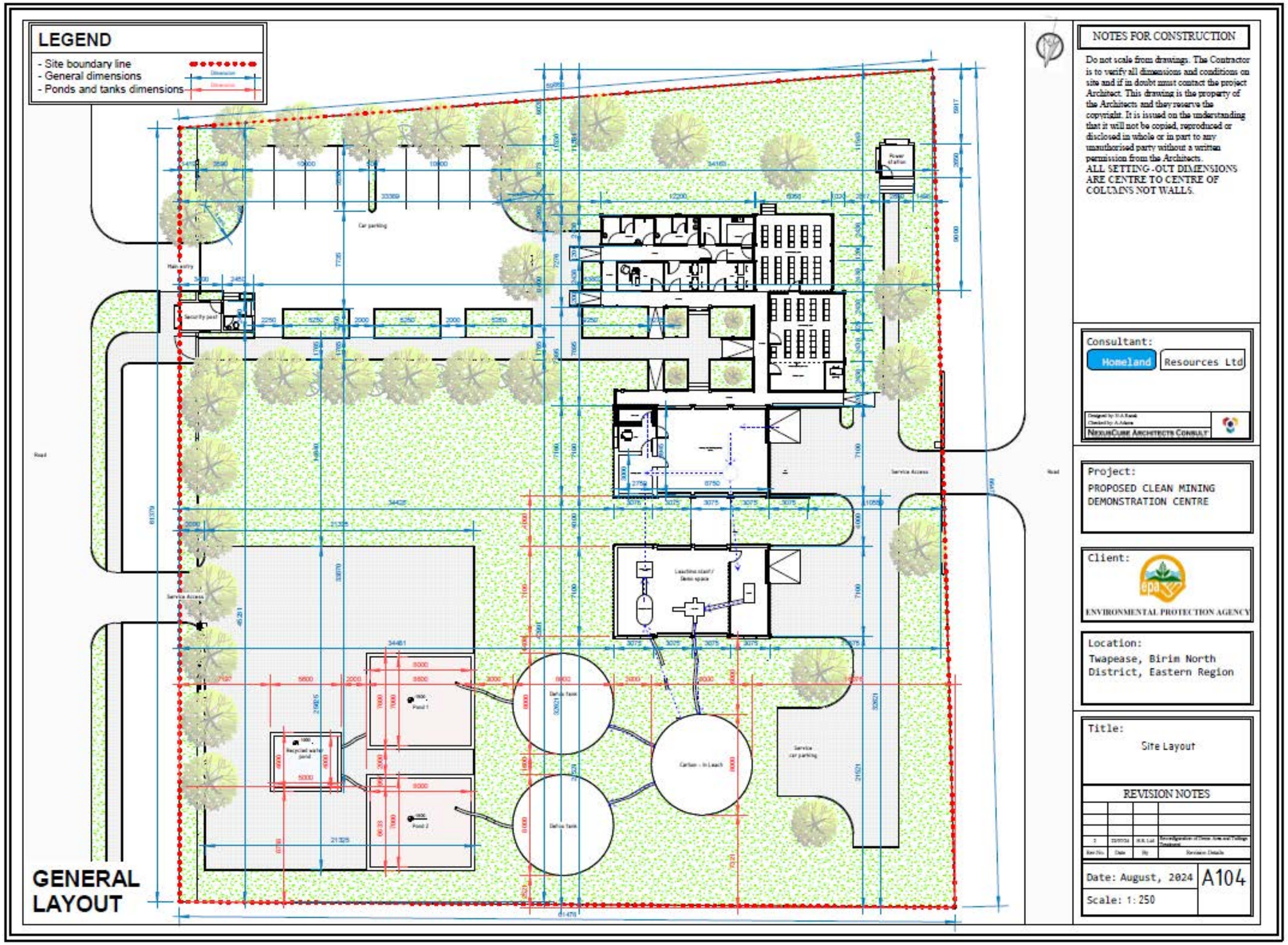

Figure 1-3: General Floor Plan of the Tweapease CDMC

Sources of the Ore for the Tweapease CMDC

The proposed source of the ore for the CMDC at Tweapease is in one location i.e., along the Mamang River. The proposed mining location is shown in **Figure 1-4**. The proposed mine is therefore alluvial.

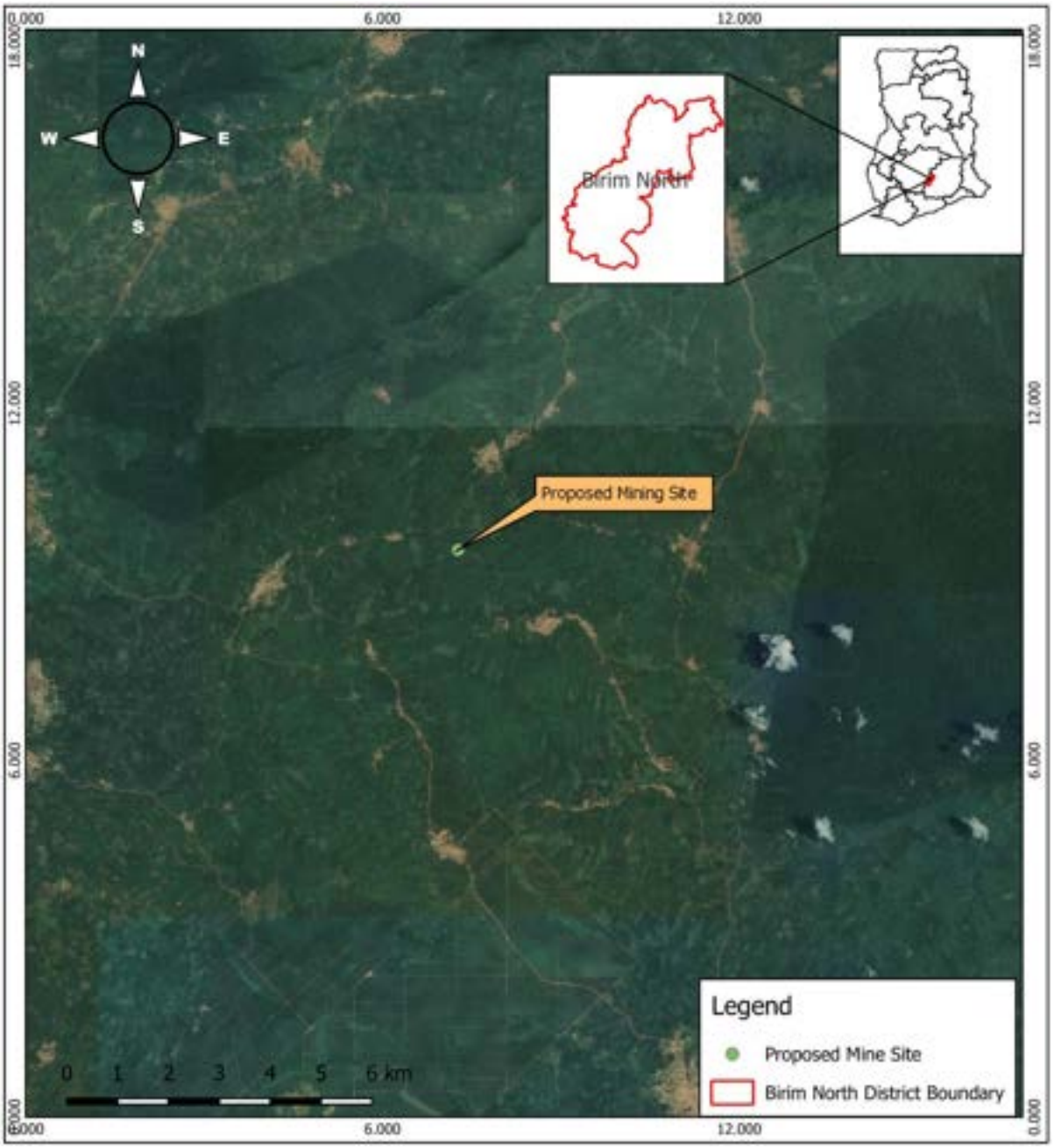

Figure 1-4: Approximate Mining Location at Tweapease

Proposed Tweapease Mine Site

Currently there is no mining activity at the proposed Mine site but preparations are ongoing to start mining operations as a community mining scheme (**see Plate 1-1**).

Plate 1-1:Proposed Mine Site at Tweapease

Milling and Gold Processing

Currently, there is no gold processing activity at Tweapease.

Construction Materials and Equipment

The constructional materials will include shipping containers, building materials such as cement, sandcrete block for the foundation works, sand, gravel, stone chippings, concrete, iron rods, water, PVC/HDM pipes and admixtures. Other accessories will include barbed wire, wire mesh, balustrade, etc. The construction equipment to be used includes excavators, backhoes, shovels/ pickaxes, concrete mixers, haulage trucks, dump trucks, concrete dispensing trucks water pumps, etc.

Construction Labor

It is estimated that between 30 to 50 persons will be engaged during the construction phase of the project works. This will include unskilled labor, drivers, masons, carpenters, plumbers, electricians, mechanics, plant operators, engineers, and administrators. Although the Tweapease community is endowed with youth who are currently unemployed and so will be available for employment as unskilled labor, use of skilled labor from outside of the community and associated risks such as social conflict, increased sexually transmitted diseases (STD, HIV/AIDs) and gender-based violence may occur. In this regard, adequate measures have been provided in this ESMP including a Code of Conduct to regulate the conduct of the contractor and the workers to ensure the risks associated with labor from outside the project location are minimized. Labor camps will not be established to house workers during construction, rather the workers will go to their various homes and proceed from there to work.

During the operational and maintenance phase, the project plans to engage between 4-8 persons who will be responsible for maintenance.

1.3 Justification for the Project

The ASGM sector predominantly deals with underground hard rock ores, which is the case at Tweapease.

The Community Mining Committee has taken a decision to avoid the use of mercury when operations start and are therefore eager to use the cleaner technology for gold extraction either than amalgamation.

The method to be employed at Tweapease will be the Strip Mining. This involves the traditional stripping using excavator dragline to remove the overburden and excavation of the ore gravel to be stockpiled for processing. The dry mining method will be adopted and will involve the following:

- Clearing and grabbing of vegetation cover;
- Stockpiling of topsoil;
- Construction of drain cut in the mining block for de-watering; and
- Excavation of gravel and stockpiling.

For alluvial mining, the ore is usually processed in a Wash Plant, which the Tweapease CMDC Project will avoid.

1.4 Purpose and Objectives of the ESMP

The purpose of the ESMP is to provide guidance for the environmental and social risk management associated with the construction, operation and decommissioning of the CMDC at Tweapease when completed. It provides adequate mitigation and management measures to eliminate and mitigate significant adverse environmental and social impacts, thereby reducing them to acceptable levels. The ESMP document defines roles, responsibilities, and procedures to guide implementation of the activities, in compliance with the World Bank and National requirements.

The specific objectives of the ESMP are to:

- Identify significant adverse environmental and social impacts, conflicts and concerns likely to arise as a result of the implementation of the project;
- outline mitigating/enhancing, monitoring, consultative and institutional measures for managing adverse environmental and social impacts and risks or to enhance the beneficial impacts; and
- address capacity-building requirements needed to strengthen key institutional stakeholders as well as affected local groups or communities' environmental and social capacities.

1.5 Scope of Work

1. Baseline studies at the Tweapease project site involving the collection and analysis of information on the land, water, air and the social environments, and with emphasis on the project Area of Influence (AoI). It consisted of the following activities:
    - desk studies to review project information and understand the scope of the proposed intervention while undertaking a gap assessment;
    - desk surveys to obtain secondary data and develop field survey tools for compiling information on the environmental and social features/ characteristics of the proposed site;
    - sites surveys to identify the project area of influence and issues of urgent environmental concern related to the proposed development and peculiarities of the existing environment;
    - sampling of environmental media – air, water and land;
    - laboratory analyses for relevant physico-chemical and bacteriological parameters;

- interviews, administration of questionnaires and sampling of public opinions on social and cultural concerns relating to the project sites and the area of influence;

2. Legislative and regulatory considerations including national, international and WB requirements;
3. Identification of the potential direct, induced and cumulative impacts;
4. Analysis of feasible project alternatives;
5. Provision of mitigation and management measures for negative impacts identified;
6. Institutional capacities to address adverse impacts; and
7. Preparation of an ESMP including monitoring and institutional roles for the Tweapease CMDC facility for review and acceptance by the PIU for securing an environmental permit for the intervention to commence.

1.6 Methodology and Approach to the Assignment

The activities carried out to accomplish this assignment are divided into four main categories as follows:

- Consultations;
- Desk work/Document Review;
- Field inspections/visits; and
- Reporting.

Stakeholder Consultations

The following institutions or organizations were consulted or contacted:

- New Abirem District Assembly;
- Tweapease Community Opinion Leaders;
- Executive of Tweapease Community Mining Scheme;
- Youth Representatives at Tweapease;
- Women at Tweapease;
- Local Mining Investors in Tweapease;
- Friends of the Nation, Non-Governmental Organization (NGO) operating in the Eastern Region/ Birim North Municipal; and
- Environmental Protection Agency (EPA)- Head Office, Accra.

Consultations with stakeholders identified some important environmental and social baseline conditions and issues as well as impacts that have been addressed in the ESMP. Details of stakeholder engagement are provided under Section 6 of this report.

Previous consultations with some of the relevant stakeholders was also utilized (**see Plate 1-2**).

Plate 1-2: Engagement with Community Mine Executives

Document Review/Desk Study

Information from relevant documents from the PIU was of immense help to completing the ESMP assignment. Key documents reviewed for this study include:

1. Relevant World Bank ESS especially ESS 1;
2. The World Bank, AEHPMP (P167788) Project Information Document (PID) dated 16 December 2019;
3. Draft Environmental and Social Management Framework (ESMF), Africa Environmental Health and Pollution Management Program (P167788), undated;
4. Draft Stakeholder Engagement Plan (SEP), Republic of Ghana/ Environmental Protection Agency, Africa Environmental Health and Pollution Management Program (P167788), December 2019;
5. Draft Environmental and Social Commitment Plan (ESCP), Republic of Ghana/ Environmental Protection Agency, Africa Environmental Health and Pollution Management Program (P167788), December 2019;
6. Preliminary Design Reports of the projects;
7. The Coordinated Programme of Economic and Social Development Policies (CPESDP) - Agenda for Jobs: Creating Prosperity and Equal Opportunity for All 2017-2024, October 2017;
8. 2021 Population and Housing Census, Results- Ghana Statistical Services, General Report Highlights in Different Volumes, February 2022;
9. Relevant National Policies;
10. Relevant Laws of Ghana including;
    a. The Constitution of the Republic of Ghana, 1992,
    b. Environmental Protection Agency (EPA) Act 1994, Act 490,
    c. Environmental Assessment Regulations (EAR) 1999, LI 652,
    d. Land Act 2020, Act 1036,
    e. Land Use and Spatial Planning Act 2016, Act 925,
    f. National Building Regulation 1996, LI 1630; and
    g. Mining Laws and Policies of Ghana.

Other relevant documents reviewed for this study include:

- ESMP documents on other projects obtained from the WB.

Field Inspection

Field inspections were undertaken to the Tweapease project sites and its immediate environs to confirm the project AoI, appreciate existing socio-economic and cultural conditions as well as existing terrestrial, conditions. The field visits were undertaken in April and July 2024.

Reporting

The ESMP report organization and contents satisfies both the WB ESSs and the EPA environmental assessment requirements. The major headings of the ESMP comprise:

- Introduction;
- Policy, Legal and Institutional Framework;
- Baseline Environmental and Social Conditions;
- Stakeholder Consultations and Disclosure;
- Assessment of Potential Environmental and Social Risks and Impacts, and Alternative Analysis;
- Environmental and Social Management Plan and Recommended Mitigation Measures for Adverse Impacts;
- Environmental and Social Action Plans and Monitoring Programs;
- Institutional Capacity Requirement for ESMP Implementation;
- Decommissioning Plan;
- Conclusion;
- Bibliography; and
- Annexes.

2.0 RELEVANT POLICIES, LEGAL AND INSTITUTIONAL FRAMEWORK

The relevant World Bank Environmental and Social Standards (ESSs) and the national legal, policy and administrative framework applicable to the preparation and implementation of the site specific ESMP at Tweapease are described below to guide implementation of project.

2.1 Relevant World Bank Environmental and Social Standards

The World Bank published a revised version of the safeguard policies in its Environmental and Social Framework (ESF) document (August 2016) in 2018. The ESF sets out the World Bank's commitment to sustainable development, through a Bank Policy and a set of Environmental and Social Standards (ESS) that are designed to support Borrowers' projects, with the aim of ending extreme poverty and promoting shared prosperity. The ESF comprises:

1. A Vision for Sustainable Development, which sets out the Bank's aspirations regarding environmental and social sustainability;
2. The World Bank Environmental and Social Policy for Investment Project Financing, which sets out the mandatory requirements that apply to the Bank; and
3. The Environmental and Social Standards, together with their Annexes, which set out the mandatory requirements that apply to the Borrower and projects.

There are ten (10) Environmental and Social Standards (ESS) that establishes the standards that the Borrower and the project will meet through the project life-cycle and they are summarized in **Table 2-1**.

Table 2-1: Summary of WB Environmental and Social Standards

Standard	Summary of Core Requirements	Key Requirements of the ESS	Relevance to the Project
ESS 1	Assessment and Management of Environmental and Social Risks and Impacts	ESS 1 places the responsibility of ameliorating the environmental impacts of a Bank-financed project on the borrower. Specifically, the objectives of ESS1 are to: ❍ Identify, evaluate, and manage the environment and social risks and impacts of a Bank financed project in a manner consistent with the Bank's Environmental and Social Standards. ❍ To adopt differentiated measures so that adverse impacts do not fall disproportionately on the disadvantaged or vulnerable, and they are not disadvantaged in sharing development benefits and opportunities resulting from the project. ❍ To utilize national environmental and social institutions, systems, laws, regulations and procedures in the assessment, development, and implementation of projects, whenever appropriate. ❍ To promote improved environmental and social performance, in ways which recognize and enhance Borrower capacity.	ESS 1 is relevant because the project activities in Tweapease are expected to cause some environmental and social risks and impacts, which will be mitigated accordingly. Thus, ESS 1 is the basis for the preparation of this ESMP.
ESS 2	Labor and Working Condition	Employment creation, income generation and welfare of labor are the core of ESS 2. It recognizes the importance of these in the pursuit of poverty reduction and economic	Activities under the proposed Project at Tweapease will make use of direct workers and contracted workers, thus making ESS 2 relevant to the project.

Standard	Summary of Core Requirements	Key Requirements of the ESS	Relevance to the Project
		growth. It requires management to treat workers fairly and provide them with safe and healthy working conditions to enhance the development benefits of projects.	
ESS 3	Resource Efficiency and Pollution Prevention and Management	ESS 3 sets out the requirements to address resource efficiency and pollution prevention (air, water and land pollution and management arising out of economic activities and urbanization) throughout the project life-cycle consistent with Good International Industry Practice (GIIP).	The Project at Tweapease will result in multiple, small and diverse sources of emissions, as well as the generation of waste, thus, making ESS 3 relevant to the Project.
ESS 4	Community Health and Safety	ESS4 addresses the potential health, safety, and security risks and impacts of Bank financed projects (resulting from project activities, equipment, and infrastructure) on project-affected communities. It places a responsibility on the Borrower to avoid or minimize such risks and impacts, with particular attention to people who, because of their circumstances, may be vulnerable.	ESS 4 is relevant because of the potential community health and safety issues to be generated by the Project at Tweapease e.g., the potential risk of increased Gender-Based violence (GBV) and Sexual Exploitation and Abuse (SEA)/ Sexual Harassment (SH) due to use of labor outside Tweapease
ESS 5	Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	ESS 5 recognizes that Bank funded projects may result in involuntary resettlement, which, if unmitigated will lead to severe consequent undesirable socio-economic and environmental impacts on project communities.	This is not relevant as land for the Project at Tweapease has been donated by the community. No household is being relocated.
ESS 6	Biodiversity Conservation and Sustainable Management of Living Natural Resources	ESS 6 recognizes that Bank funded projects could negatively impact on biodiversity and that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development.	ESS 6 is not relevant because the Project will not cause loss of biodiversity. Results of the ecological survey done indicate that the subproject area is a modified habitat, and that small scale mining has led to a decline in the quality of vegetation and loss of flora and fauna.
ESS 7	Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	This ESS applies to a distinct social and cultural group referred to variously as 'Indigenous Peoples', "Sub-Saharan African historically underserved traditional local communities," "indigenous ethnic minorities," "aboriginals," "hill tribes," "vulnerable and marginalized groups," "minority nationalities," "scheduled tribes," "first nations," or "tribal groups ."	This is not relevant as no indigenous peoples will be impact. No such indigenous peoples are in Ghana
ESS 8	Cultural Heritage	ESS 8 recognizes the importance of cultural heritage (natural areas with cultural and/or spiritual value such as sacred groves, sacred bodies of water and waterways, sacred mountains, sacred trees, sacred rocks, burial grounds, and sites) as a source of valuable scientific and historical information, as an economic and social asset for development, and as an integral part of people's cultural identity and practice. It provides continuity in tangible and intangible forms between the past, present and future and reflects constantly	Although no tangible cultural heritage could be found at the Project site at Tweapease, ESS 8 is relevant because the use of labor outside Tweapease may infringe on some unique cultures of the community and the civil works may expose some cultural artefact or relic that may call for the attention of the relevant authorities

Standard	Summary of Core Requirements	Key Requirements of the ESS	Relevance to the Project
		evolving values, beliefs, knowledge, and traditions.	
ESS 9	Financial Intermediaries	This ESS applies to Financial Intermediaries (FIs) that receive financial support from the Bank. FIs include public and private financial services providers, including national and regional development banks, which channel financial resources to a range of economic activities across industry sectors.	This is not relevant as no financial intermediaries will be used for the Project at Tweapease
ESS 10	Stakeholder Engagement and Information Disclosure	This ESS places premium on open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice.	ESS 10 is relevant to the Project at Tweapease because it involves diverse stakeholders at every stage (design, planning, construction and operations). In line with this, a standalone Stakeholder Engagement Plan (SEP) has been prepared for the Project.

2.2 National Environmental and Social Policy Framework

The national policies identified as relevant or applicable to the Tweapease CMDC are presented in this section in **Table 2-2**:

Table 2-2: Relevant National Policies and Applicability to the Proposed Project at Tweapease

No.	Policy and Key Requirements	Applicability/ Relevance to Proposed Project
1	**The Coordinated Program of Economic and Social Development Policies (CPESDP) 2017-2024- Agenda for Jobs: Creating Prosperity and Equal Opportunity for All** The Agenda for Jobs is the medium-term national development policy framework of Economic and Social Development Policies (CPESDP), 2017-2024 – An Agenda for Jobs: Creating Prosperity and Equal Opportunity for All. It serves as the implementation framework to guide the overall economic and social development of the country. This vision is informed by the need for a strong economy that expands opportunities, inspires people to start businesses, stimulates expansion of existing businesses that ultimately leads to creation of jobs, increased economic growth and higher incomes. The vision also takes cognizance of Ghana's international commitments such as the African Union (AU) Agenda 2063 and the United Nations Sustainable Development Goals (SDGs).	The proposed Project at Tweapease involves the elimination of mercury in gold mining and promotes enhanced gold production, and associated employment generation and thus in line with the policy objectives
2	**National Environmental Policy (NEP), 2014** The ultimate aim of the National Environmental Policy of Ghana is to improve the surroundings, living conditions and the quality of life of the entire citizenry, both present and future. It seeks to promote sustainable development by ensuring a balance between economic development and natural resource conservation.	The proposed Project at Tweapease seeks to promote sustainable development by including biophysical environment, economic, social and institutional considerations in its formulation.
3	**National Environmental Action Plan (NEAP), 1991** The NEAP defined a set of policy actions, related investments, institutional mandates and strengthening activities to make Ghana's development approaches environmentally sustainable. The adoption of the NEAP in 1991 led to several significant developments necessary to ensure sound resource management in the following major areas: Land management; Forestry and wildlife; Water management; Marine and coastal ecosystems; Industrial pollution; Mining; Hazardous chemicals control; and Human settlements. The NEAP was thus the strategy through which the key issues to the protection of the environment and better management of renewable resources were to be pursued. Some of the specific resultant developments from the NEAP was the establishment of the Ghana Environmental Protection Agency (EPA) with more enhanced mandate than its predecessor Environmental Protection Council (EPC), to regulate, set standards and enforce them, etc; and, the establishment of the Water Resources Commission, and subsequent adoption of policy framework for water abstraction for different uses, water law, and control of waste discharges into water bodies, etc.	The proposed Project at Tweapease seeks to promote sustainable development and eliminate mercury use in small scale mining.
4	**National Land Policy (NLP), 1999**	

No.	Policy and Key Requirements	Applicability/ Relevance to Proposed Project
	The Land Policy of Ghana aims at the judicious use of the nation's land and all its natural resources by all sections of the Ghanaian society in support of various socio-economic activities undertaken in accordance with sustainable resource management principles and in maintaining viable ecosystems. One key objective is to ensure that every socio-economic activity is consistent with sound land use through sustainable land use planning in the long-term national interest.	The construction and operation of the proposed CMDC at Tweapease will be on a land owned by one Eric Sarkodie
5	**National Water Policy (NWP), 2007** The National Water Policy of Ghana provides a framework for the sustainable development of Ghana's water resources. The policy also recognises the various cross-sectoral issues related to water-use and the links to other relevant sectoral policies such as those on sanitation, agriculture, transport and energy among others. It recognizes the competing and conflicting demands of water between mining and adjacent communities. Some of the key policy objectives include ensuring: (i) availability of water for hydropower generation, various industrial/ commercial uses, mining operations, water transport and recreational purposes; and (ii) ensure adequate protection of water sources in mining and other industrial areas.	The Environmental and Social Management Plan (ESMP) includes mitigation measures against traversing water bodies and against water pollution as well as complying with the riparian buffer zones policy.
6	**Riparian Buffer Zone Policy (RBZP), 2014** The Buffer Zone Policy is aimed at protecting, regenerating and maintaining the native /established vegetation in riparian buffer zones to improve water quality. The Policy also designates the following as water pollution hazards and must be setback from any stream or water body by the following distances: o Storage of hazardous substances – 45m; o Raised septic systems – 75m; and o Solid waste landfills- 90m.	The ESMP includes mitigation measures to protect buffer zones of water bodies (streams/ rivers) against setting up processing plants in the buffer zone. The setback distances provided to minimize water pollution will be applied especially for storage of hazardous substances.
7	**Forest and Wildlife Policy, 2012** The policy aims at the conservation and sustainable development of forest and wildlife resources for the maintenance of environmental stability and continuous flow of optimum benefits from the socio-cultural and economic goods and services that the forest environment provides to the present and future generations, whilst fulfilling Ghana's commitments under international agreements and conventions.	The proposed location although not in designated forest zones are in areas where there is substantial vegetative cover in the surroundings hence the need to avoid deforestation and hunting for wildlife.
8	**Ghana National Climate Change Policy (GNCCP), 2013** The objective of the policy is to mitigate and ensure an effective adaptation in key sectors of the economy, such as natural resources management, energy, industry and infrastructure among others. The main principles adduced in the policy for disaster preparedness and response regarding building of climate resilient infrastructure are: o The development of infrastructure and associated facilities has a direct influence on the sustainable development of the nation; and o Incorporating climate-resilient codes into basic infrastructure will significantly reduce the vulnerability of the nation to climate change risks.	The clean mine demonstration center at Tweapease will be climate resilient and help prevent further impact on climate change in the country.
9	**National Health Policy (NHP), 2020** The National Health Policy (NHP) document which aims at creating wealth through health, among other things places emphasis on improvements in personal hygiene, the practice of safe sex and the prevention of injuries at both workplaces and on the road. The policy objectives include among others to: (i) encourage the adoption of healthy lifestyles; (ii) improve the physical environment; (iii) improve the socio-economic status of the population.	The project will contribute to the elimination of mercury use in mining in the long term and also ensure community health and safety and occupational health and safety compliant measures at the clean mine demonstration centers including safety awareness creation and HIV/ AIDS prevention
10	**National Workplace HIV/AIDS Policy, 2012** The policy goal is to provide broad national guidelines to direct the formulation and implementation of workplace HIV and AIDS policies and programs. The broad objectives of the policy are to: o provide protection from all forms of stigma and discrimination in the workplace, to people with real or perceived HIV infection. o prevent the spread of HIV amongst workers and their families and dependents; and o provide access to treatment, care and support for persons infected and affected by HIV and AIDS.	The project will ensure provision of occupational health and safety measures at the workplaces that will include HIV/ AIDS awareness creation and prevention
11	**National Employment Policy (NEmP), 2014** The National Employment Policy indicates that poverty is still high at about 28.5% and that there is a strong correlation between the employment situation and poverty.	The project will provide employment and skills

No.	Policy and Key Requirements	Applicability/ Relevance to Proposed Project
	The policy states that the key source of demand for labor emanates from the productive sectors of the economy, namely, agriculture, industry and service.	development opportunities for Ghanaians during the pre-construction, construction and operational phases.
12	**National Gender Policy, 2015** The National Gender Policy aims at mainstreaming gender equality concerns into the national development processes by improving the social, legal, civic, political, economic and socio-cultural conditions of the people of Ghana. It also seeks to empower the vulnerable groups particularly women, children, and people with special needs such as persons with disabilities and the marginalized.	The management of the Tweapease clean mine demonstration center will ensure that an employment quota is given to women and the vulnerable. The criteria for selecting workers will include gender and disability in as far as the person can perform the task assigned.

2.3 Relevant Legal and Regulatory Framework

In Ghana, all minerals in their natural state in or upon any land or water are the property of the Republic of Ghana and vested in the President on behalf of the people of Ghana as enshrined in The 1992 Constitution of the Republic of Ghana, Article 257(6) of Act 527 of 1996. The Minerals Commission was established under the Minerals Commission Act, 1993, (Act 450) which mandates the commission as responsible for the regulation and management of the utilization of the mineral resources of Ghana and the co-ordination of the policies in relation to them. The Act also mandates the Minerals Commission to grant applicable licenses/ lease to registered and qualified mining firms and to ensure compliance with laid down Mineral and Mining Laws and Regulations of Ghana.

In order to manage properly all the issues involved in mining, the Government of Ghana (GoG) has promulgated the following regulations to give meaning to the Minerals and Mining Act, 2006 (Act 703) as amended by the Minerals and Mining (Amendment) Act, 2015 (Act 900) and the Minerals and Mining (Amendment) Act, 2019 (Act 995):

- Minerals and Mining (General) Regulations, 2012 (LI 2173);
- Minerals and Mining (Support Services) Regulations, 2012 (LI 2174);
- Minerals and Mining (Compensation and Settlement) Regulations, 2012 (LI 2175);
- Minerals and Mining (Licensing) Regulations, 2012 (LI 2176);
- Minerals and Mining (Explosives) Regulations, 2012 (LI 2177);
- Minerals and Mining (Health, Safety and Technical) Regulations, 2012 (LI 2182);
- Minerals and Mining (Ground Rent) Regulations, 2018 (LI 2357);
- Minerals and Mining (Mineral Operations- Tracking of Earth Moving and Mining Equipment) Regulations, 2020 (LI 2404); and
- Minerals and Mining (Local Content and Local Participation) Regulations, 2020 (LI 2431);

Thus, the relevant regulatory obligations to guide the project from its conceptualisation to its implementation and monitoring as well as decommissioning include the following and as explained in **Table 2-3**:

Environmental Protection, Planning and Permitting:

- The 1992 Constitution of the Republic of Ghana;
- Environmental Protection Agency Act 1994, Act 490;
- Environmental Assessment Regulations 1999, LI 1652;
- Fees and Charges (Miscellaneous Provisions) Act 2022, Act 1080;
- Water Resources Commission Act 1996, Act 522;
- Water Use Regulations, 2001, LI 1692;
- Hazardous and Electronic Waste Control and Management Act 2016, Act 917;
- Hazardous, Electronic and Other Wastes (Classification) and Management Regulations 2016, LI 2250;

- Minerals Commission Act, 1993 (Act 450);
- The Minerals and Mining Act, 2006 (Act 703);
- Lands Act, 2020, Act 1063;
- Fire Precaution (Premises) Regulations, 2003 (LI 1724);
- The Labour Act 2003, Act 651;
- Local Governance Act, 2016, Act 936;
- Ghana Standards on Environmental Quality:
    - GS 1236:2019- Environment and Health Protection – Requirements for Ambient Air Quality and Point Source/ Stack Emissions;
    - GS 1222:2018- Health Protection – Requirements for Ambient Noise Control; and
    - GS 1212:2019- Environmental Protection Requirements for Effluent Discharge (General Industry)

Health/Safety

- Ghana National Fire Service Act 1997, Act 537; and
- The Fire Precaution (Premises) Regulations 2003, LI 1724.

Minerals and Mining

- Minerals Commission Act (Act 450), 1993; and
- The Minerals and Mining Act, 2006 (Act 703).

Labor Rights/Issues

- The Labor Act 2003, Act 651;
- Workmen's Compensation Law 1987, PNDCL 187;
- Persons with Disability Act 2006, Act 715; and
- The Children's Act 1998, Act 560.

Land Acquisition/Land Use

- Land Act 2020, Act 1036;
- Land Use and Spatial Planning Act 2016, Act 925; and
- National Building Regulation 1996, LI 1630.

Local Governance and Alternative Dispute Resolution

- Local Governance Act 2016, Act 936; and
- Alternative Dispute Resolutions Act 2010, Act 798.

Table 2-3: Relevant Legal Framework and Applicability to the Proposed Project at Tweapease

No.	Legal Framework and Key Compliance Requirements	Applicability to Proposed Project
	Environmental Protection, Planning and Permitting	
1	**The Constitution of the Republic of Ghana, 1992** The Constitution provides for in Article 41(k) as a duty of a citizen of Ghana "to protect and safeguard the environment".	This project has been designed to contribute to the protection and safeguarding of Ghana's environment for present and future generations.
2	**Environmental Protection Agency (EPA) Act, 1994 (Act 490)** The Environmental Protection Agency (EPA) Act 1994 (Act 490) gives mandate to the Agency to ensure compliance of all investments and undertakings with laid down Environmental Assessment (EA) procedures in the planning and execution of development projects, including compliance in respect of existing ones. The Environmental Protection Agency (EPA) Act 490 Section 12 of 1994 confers enforcement and control powers on the EPA to compel existing companies to meet environmental or pollution management plans on their operations as a management tool for effective pollution control. The EPA is the responsible for issuing environmental permits for operations such as this project subject to EPA review.	The Agency is ensuring compliance with laid down Environmental Assessment (EA) procedures in the planning and execution of the project. An environmental permit from the EPA is required prior to commencement of works and would be obtained using this ESMP document.
3	**Environmental Assessment Regulations, 1999 (LI 1652)** The Environmental Assessment Regulations 1999 (LI 1652) enjoins any proponent or person to register an undertaking with the Agency and obtain an Environmental Permit prior to commencement of the project. This regulation allows the EPA to place proposed undertakings at the appropriate level of	An ESMP (or a Preliminary Environmental Report in the case of country requirements) is being prepared in compliance with the

No.	Legal Framework and Key Compliance Requirements	Applicability to Proposed Project
	environmental assessment. The LI 1652 seeks to ensure that development is undertaken in a sustainable environment. Part 1 of the Environmental Assessment Regulations, 1999 LI 1652 on Environmental Permit describes undertakings requiring registration and issuance of environmental permit, as: '1. (1) No person shall commence any of the undertakings specified in Schedule 1 to these Regulations or any undertaking to which a matter in the Schedule relates, unless prior to the commencement, the undertaking has been registered by the Agency and an environmental permit has been issued by the Agency in respect of the undertaking. 2. No person shall commence activities in respect of any undertaking which in the opinion of the Agency has or is likely to have adverse effect on the environment or public health unless, prior to the commencement, the undertaking has been registered by the Agency in respect of the undertaking.'	requirements of the World Bank, and Ghana's Environmental Assessment Regulations, 1999 (LI 1652). The project activities will not occur in an environmental sensitive area (as no environmental sensitive areas have been identified in the project area, which is a mining concession)
4	**Fees and Charges (Miscellaneous Provision) Act, 2022(Act 1080)** The Fees and Charges (Miscellaneous Provision) Act 2022 replaces the Fees and Charges (Amendment) Instrument 2019 (L.I. 2386) and it provides comprehensive rates, fees and charges collectable by Ministries, Department and Agencies (MDAs) for goods and services delivered to the public.	All stipulated fees and charges including Processing and Permit Fees shall be paid by the PIU in order to obtain the environmental permit from EPA
5	**Water Resources Commission (WRC) Act, 1996 (Act 522)** The Water Resources Commission Act, 1996 (Act 522) establishes and mandates the Water Resources Commission (WRC) as the sole agency responsible for the regulation and management of the utilisation of water resources and for the co-ordination of any policy in relation to them. Section 13 prohibits the use of water (divert, dam, store, abstract or use water resources or construct or maintain any works for the use of water resources) without authority. Section 16 empowers the Commission to grant Water Rights (water use permits) to prospective users. The Act states under Section 24 that any person who pollutes or fouls a water resource beyond the level that the EPA may prescribe, commits an offence and is liable on conviction to a fine or a term of imprisonment or both.	The project will involve the use of water for the mercury free gold processing plants. The appropriate authorization will be sought from the WRC prior to the commencement of the work(s).
6	**Water Use Regulations, 2001 (LI 1692)** The Water Use Regulations 2001, LI 1692 prohibits the use of water resources without authority from the Water Resources Commission. The Act provides under section 16 for any person to apply to the Commission in writing for the grant of water right. The Regulations also prescribe the raw water charges and processing fees to be paid by prospective water users with respect to the water use permits. The Commission is also mandated to request for evidence that an EIA or an EMP has been approved by the EPA before issuance of the Water Use Permit.	The PIU will be required to acquire a water use permit after obtaining the environmental permit. The abstraction of water for any aspect of the Project at Tweapease will also require a water use permit from the Commission.
7	**Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917)** The Act prohibits the importation, exportation, transportation, selling, purchasing or dealing in hazardous wastes or other waste, or depositing of hazardous wastes or other wastes on any land in the country or in the territorial waters of Ghana except as otherwise provided for in the Act.	All hazardous and electronic waste arising out of the proposed project implementation will be managed in compliance with this law. Waste oils, e-waste chemical additives/ admixtures for construction and any expired chemicals requiring disposal will fall under this law
	Health/Safety	
8	**Public Health Act, 2012 (Act 851)** The Act makes provision with respect to the protection of public health in Ghana to prevent diseases, promote, safeguard, maintain, and protect the health of humans and animals in the country and lays down rules relative to environmental sanitation (Part 5). The Act among other things, provides rules relative to food vending and food-borne diseases. Part 7 of the Act mandates the Food and Drugs Authority (FDA) to protect the public through the regulation of food, drugs, household chemical substances, cosmetics and medical devices.	The project activities will be guided by this Act in (i) ensuring the prevention of communicable diseases to workers and (ii) that the project activities do not adversely affect the health of communities hosting the clean mine demonstration center.
9	**Ghana National Fire Service Act, 1997 (Act 537)** The Act re-establishes the National Fire Service to provide for the management of undesired fires and to make provision for related matters. The objective of the Service is to prevent and manage undesired fire. For the purpose of achieving its objective, the Service is to organise public fire education programs to create and sustain awareness of the hazards of fire, heighten the role of the individual in the prevention of fire and provide technical advice for building plans in respect of machinery and structural layouts to facilitate	This act requires the PIU and miners to register their facilities/work offices with GNFS who will provide advisory and emergency response services in the detection/prevention and management of fire outbreaks at the project sites and facilities. The GNFS is

No.	Legal Framework and Key Compliance Requirements	Applicability to Proposed Project
	escape from fire, rescue operations and fire management. The GNFS has a rural fire department responsible for the control and management of bushfires.	mandated to create awareness and conduct sensitization programs on fire prevention and control as well as issue fire permits for proposed project sites and facilities.
	Minerals and Mining	
10	**Minerals Commission Act, 1993 (Act 450)** The act establishes the Minerals Commission and provides for its composition and functions relating to the regulation and management of the utilisation of minerals. The act also provides for other related matters.	The Act requires the miners to comply with the requirements of the Minerals Commission
11	**The Minerals and Mining Act, 2006 (Act 703)** The Act revises and consolidates the law relating to minerals and mining and provides for connected purposes. It states that every mineral is "vested in the President in trust for the people of Ghana". Section 73 of Act 703 provides for compensation for disturbance of owner's rights which includes resettlement. It indicates that the owner or lawful occupier of any land subject to mineral right is entitled to compensation for disturbance of his/her rights and the amount of compensation should be determined by agreement between the parties, the Lands Valuation Division will determine the compensation payable. Section 74 of the act provides for the compensation principles to be applied. Where resettlement is triggered, it shall be carried out with due regard to the economic well-being and social and cultural value of the affected people and the cost of resettlement borne by the holder of mineral right. The subsidiary legislations for the management of the minerals and mining industry to operationalize the Minerals and Mining Act, 2006 (Act 703) as indicated supra include the following: o Minerals and Mining (General) Regulations, 2012 (LI 2173); o Minerals and Mining (Support Services) Regulations, 2012 (LI 2174); o Minerals and Mining (Compensation and Settlement) Regulations, 2012 (LI 2175); o Minerals and Mining (Licensing) Regulations, 2012 (LI 2176); o Minerals and Mining (Explosives) Regulations, 2012 (LI 2177); o Minerals and Mining (Health, Safety and Technical) Regulations, 2012 (LI 2182); o Minerals and Mining (Ground Rent) Regulations, 2018 (LI 2357); o Minerals and Mining (Mineral Operations- Tracking of Earth Moving and Mining Equipment) Regulations, 2020 (LI 2404); and o Minerals and Mining (Local Content and Local Participation) Regulations, 2020 (LI 2431); Excerpts of aspects of the listed regulations are as presented hereunder: Among the many regulations of LI 2173 is the requirement to ensure good record keeping and reporting obligations (Regulation 8). LI 2174 regulates the registration of entities to provide support services to a holder of a mineral right and what is required of them. LI 2175 regulates the requirements for compensation payment and resettlement. It specifies the formulation of resettlement plan and engagement of the affected persons among others. LI 2176 regulates the grant of various licenses in the mining sector including the grant of mining leases. LI 2177 regulates the conveyance, storage, possession, manufacture, and use of explosives for mining, quarrying, and civil works as well as substances used for manufacture of explosives. The regulation 8(1) of the Minerals and Mining (Health, Safety and Technical) Regulations 2012, LI 2182 stipulates that the holder of a mining lease must obtain a Mining Operating Permit from the Inspectorate Division of the Minerals Commission prior to commencement of operations by submitting to the Division a Mining Operating Plan (MOP), the content of which is as set out in Regulation 9. The regulation 11(1) of the Minerals and Mining (Health, Safety and Technical) Regulations 2012, LI 2182 stipulates that the owner or manager of a mine shall submit to the Inspectorate Division for Approval, an Emergency Response Plan (ERP) capable of being implemented at any time in response to an emergency that occurs in the mine. The LI 2357 specifies the ground rent payable annually by a mineral rights holder in respect of a cadastral unit of land. The purpose of LI 2404 is to (i) provide for the registration and tracking of earth moving and mining	The Act requires the miners to comply with a number of legislations providing for the health, safety and other issues pertaining to the operation of the mine

No.	Legal Framework and Key Compliance Requirements	Applicability to Proposed Project
	equipment used in mineral operations and (ii) ensure that the earth moving and mining equipment are used only in the specific mineral rights area that the earth moving and mining equipment is registered for. LI 2431 reinforces the need for local participation and local content in the mining value chain. The implication for the project will be to comply with above mentioned LIs presented supra.	
	Labour Rights	
12	**The Labour Act, 2003 (Act 651)** Section 118(1) of the Labour Act 2003 (Act 651) stipulates that it is the duty of an employer to ensure that every worker employed works under satisfactory, safe and healthy conditions. Act 651 contains several specific provisions relating to an employer's duty of care to its workers. These include providing and maintaining "at the workplace, plant and system of work that are safe and without risk to health" and taking "steps to prevent contamination of the workplaces by, and protect the workers from, toxic gases, noxious substances, vapours, dust, fumes, mists and other substances or materials likely to cause risk to safety or health". A worker is required to report situations that he believes may pose "an imminent and serious danger to his or her life, safety or health". The law prohibits persons below the age of eighteen from employment to operate any lifting machine driven by mechanical power or to give signals to its operator.	This Act requires the PIU and the miners to ensure the welfare of workers. The miners will be committed to ensure the safety and health of their workers by providing a safe working environment and providing the required apparatus and measures to mitigate impacts.
13	**Workmen Compensation Law, 1987 (PNDCL 187)** The law holds employers responsible for the payment of compensation to workmen for personal injuries caused by accidents arising out and in the course of their employment.	The Law enjoins the PIU to ensure and be responsible for the safety of its workers and provide compensation to its workers for injuries arising in the course of work in accordance with this Law
14	**Persons with Disability Act, 2006 (Act 715)** The Act covers key thematic provisions such as rights, accessibility, employment, education and transportation for Persons with Disabilities (PWDs) amongst others. Section 6 states that the owner or occupier of a place to which the public has access shall provide appropriate facilities that make the place accessible to and available for use by a person with disability. Section 10 of the Act 10. (1) The Government shall grant a person who employs a person with disability an annual tax rebate of the taxable income in respect of each person with disability employed as shall be prescribed in Regulations made under this Act.	The PIU and the miners will be guided by this Act in the design of the mercury free plants and the employment of labour for the proposed project and will ensure that there is no discrimination against PWDs
15	**The Children's Act, 1998 (Act 560)** The Act spells out the rights of the child, quasi-judicial/ judicial child adjudication, parentage/ custody/ access/ maintenance, fosterage/ adoption and employment of children issues. The Act defines a child as a person below the age of 18 years. The minimum age for admission of a child to employment is fifteen years and the minimum age for the engagement of a person in hazardous work is eighteen years. No person shall engage a child in exploitative labour; labour is exploitative of a child if it deprives the child of its health, education or development.	The PIU and the miners will be guided by this Act in the employment of labor for the proposed facility and will ensure all persons engaged are not below the minimum age.
	Land Acquisition/Land Use	
16	**Land Act, 2020 (Act 1036)** The Land Act, 2020 (Act 1036) repeals the State Lands Act, 1962 (Act 125), and other related laws. Section 2 of Chapter 3 of the Act 1036 states that "A holder of an interest or right in land may, by an instrument, transfer that interest or right to any person with or without consideration." Section 234(2) of the Act 1036 also states that "the State may accept land as gift from the owner of the land and the land shall, where the donor specifies a purpose for the gift, be used for the purpose determined by the owner."	The PIU will ensure that the Tweapease CMDC has acquired all the necessary land documents and are valid.
17	**The Land Use and Spatial Planning Act, 2016 (Act 925)** The Act seeks to revise and consolidate the laws on land use and spatial planning, provide for sustainable development of land and human settlements through a decentralized planning system, ensure judicious use of land in order to improve quality of life, promote health and safety in respect of human settlements and to regulate national, regional, district and local spatial planning, and generally to provide for spatial aspects of socio-economic development and for related matters. This Act therefore repeals the following: (i) Town and Country Planning Act 1945 CAP 84; (ii) Part II of Act 462 on Planning Functions; (iii) Towns Act of	The design of the proposed project facilities must conform with the planning regime of LUSPA

No.	Legal Framework and Key Compliance Requirements	Applicability to Proposed Project
	1892, CAP 86; and Towns and Country Planning (Amendment) Act 1960, Act 33.	
18	**National Building Regulations, 1996 (LI 1630)** The National Building Regulations, LI 1630 provides guidance and standard to any person who intends to erect any building; or make any structural alteration to any building; or executes any works or installs any fittings in connection with any building. As per clause 14.14 of the National Building Regulations, "…buildings of four floors and over shall be subject to such requirements as may be laid down by the District Planning Authority for each particular case". The process of obtaining a development permit makes it contingent on the issuance of an environmental permit by the EPA.	The implication of this Act is that a Development Permit would have to be obtained from the Bole District Assembly
	Local Governance and Alternative Dispute Resolutions	
19	**Local Governance Act, 2016 (Act 936)** The Local Governance Act 2016, which repeals the Local Government Act 1993 (Act 462) re-establishes and regulates the local government system and gives authority to the Regional Coordinating Council (RCC) and the District Assembly (DA) to exercise political and administrative power in the Regions and District, provide guidance, give direction to, and supervise all other administrative authorities in the regions and district respectively. The Assembly is mandated to initiate programs for the development of basic infrastructure and provide municipal works and services as well as be responsible for the development, improvement and management of human settlements and the environment in the district. The Local Governance Act 2016 also empowers the Assemblies to establish Waste Management Departments to be responsible for the development and management of waste disposal within their areas of jurisdiction. Therefore, the management of waste at the construction and operational stages of the proposed project will have to be done in conjunction with the relevant MMDAs	The Bole District Assembly will provide the needed supervisory roles in the implementation of the proposed Project at Tweapease and the ESMP.
20	**Alternative Dispute Resolution Act, 2010 (Act 798)** The purpose of the Act is to "…provide for the settlement of disputes by arbitration, mediation and customary arbitration, to establish an Alternative Dispute Resolution Center and to provide for related matters." The Act further defines Alternative Dispute Resolution "as the collective description of methods of resolving disputes otherwise than through the normal trial process" (Section 135). The ADR Act covers both domestic and international arbitration in Ghana and the enforcement of both domestic and foreign arbitral awards within the jurisdiction.	The PIU and the miners will ensure that the alternative dispute resolution option is used to address disputes and conflicts within the frame of the EPA GRM and other indigenous ways of resolving disputes instead of the more expensive and time-consuming legal court system.

Ghana Standards on Environmental Quality

The Ghana Standards Authority (GSA) has in collaboration with the EPA and through various National Technical Committees issued Ghana Standard (GS) requirements for Noise Control and Measurements, and Air Quality, and Requirements for Effluent Discharge (General Industry) as follows:

1. GS 1236:2019- Environment and Health Protection – Requirements for Ambient Air Quality and Point Source/ Stack Emissions;
2. GS 1222:2018- Health Protection – Requirements for Ambient Noise Control; and
3. GS 1212:2019- Environmental Protection Requirements for Effluent Discharge (General Industry).

2.3.1.1 GS 1236:2019

The GS 1236:2019 provides for permissible levels for a variety of air pollutants as shown in **Table 2-4**.

Table 2-4: National Ambient Air Quality – GS 1236:2019

NO.	SUBSTANCE	TIME WIGHTED AVERAGE, (TWA)	AVERAGING TIME
1.	Sulphur Dioxide (SO_2)	*520* µgm^{-3} 50 µgm^{-3}	*1hr* 24hrs
2.	Nitrogen Oxides (measured as NO_2)	*250* µgm^{-3} 150 µgm^{-3}	*1hr* 24hrs
3.	Total Suspended Particulate (TSP/SPM)	*150* µgm^{-3} 80 µgm^{-3}	*24hrs* 1yr

NO.	SUBSTANCE	TIME WIGHTED AVERAGE, (TWA)	AVERAGING TIME
4.	PM_{10}	*70 µgm^{-3}* 70 µgm^{-3}	*24hrs* 1yr
5.	$PM_{2.5}$	*35 µgm^{-3}*	*24hrs*
6.	Carbon Monoxide (CO)*	*100 mg/m^3* 60 mg/m^3 30 mg/m^3 10 mg/m^3	*15mins* 30mins 1hr 8hrs

(Source: GSA, 2019)……Fenceline Air Pollutant Standard*

2.3.1.2 GS 1222:2018

The GS 1222:2018 provides for permissible night and day noise levels as shown in **Table 2-5.**

Table 2-5: Ambient Noise Control Levels

ZONE	DESCRIPTION OF AREA OF NOISE RECEPTION	PERMISSIBLE NOISE LEVEL IN dB(A)	
		DAY 0600 - 2200	NIGHT 2200 - 0600
A	Residential areas	*55*	48
B	Educational and health facilities, office and law courts	*55*	50
C	Mixed Use	60	*55*
D	Areas with some light industry	*65*	60
E	Commercial areas	*75*	*65*
F	Light industrial areas	*70*	60
G	Predominantly heavy industrial areas	*70*	*70*
Ensure that maximum noise level near the construction site does not exceed 66dB(A) in other areas and 75dB(A) in an industrial area			

(Source: GSA, 2018)

2.3.1.3 GS 1212:2019

The environmental protection- requirements for effluent discharge are as provided in **Table 2-6.**

Table 2-6: Environmental Protection - Requirements for Effluent Discharge for Gold Mining

Parameter	Unit	GS 1212:2019+
Color	TCU	200
Conductivity	µS/cm	1,500
Temperature	°C	≤ 3° above ambient
Turbidity	NTU	*75*
pH	pH Units	6 - 9
Total Dissolved Solids (TDS)	mg/l	1,000
Total Suspended Solids (TSS)	mg/l	50
COD	mg/l	250
Ammonia as Nitrogen	mg/l	1
Nitrate as Total Nitrogen	mg/l	50
Oil/ Grease	mg/l	*5*
Fluoride	mg/l	10
Cyanide (Total)	mg/l	1
Free Cyanide	mg/l	0.2
WAD Cyanide	mg/l	0.6
Silica	mg/l	20
Selenium	mg/l	1
Copper	mg/l	*5*
Arsenic (Total)	mg/l	1.0
Arsenic (Soluble)	mg/l	0.1
Chromium (Total)	mg/l	0.5
Lead	mg/l	0.1

(Source: GSA, 2019)

Project Standards

The proposed project will apply the stricter of either national laws or the WBG standards (EHS Guidelines). The Project standards for emissions and performance therefore are the stricter of:

- Ghana standards; and
- Applicable standards of the World Bank Group EHS Guidelines.

2.4 World Bank Group Environment, Health and Safety (EHS) Guidelines

The World Bank Group (WBG) Environmental, Health, and Safety (EHS) Guidelines (General EHS Guidelines, April 30, 2007) are technical reference documents with general and industry-specific examples of Good International Industry Practice (GIIP). The industry sector EHS guidelines are designed to be used together with the General EHS Guidelines document. The applicable EHS guidelines include:

1. General EHS Guidelines;
2. EHS Guidelines for Mining; and
3. EHS Guidelines for Base Metal Smelting and Refining.

General EHS Guidelines

The General EHS Guidelines (April 30, 2007) provides guidance to users on common EHS issues potentially applicable to all industry sectors. The general guidelines provide GIIP advice relating to the following elements to protect human health and the environment:

The WBG General EHS Guidelines are relevant to the proposed project as they provide internationally accepted GIIP for relevant EHS issues. The recommendations contained in the guidelines will be reviewed during the preparation of the ESMPs and will be incorporated into the prescribed management and mitigation measures as appropriate.

EHS Guidelines for Mining

The EHS Guidelines for Mining are applicable to underground and open-pit mining, alluvial mining, solution mining, and marine dredging. Potential environmental issues associated with mining activities may include management of the following:

- Water use and quality;
- Wastes;
- Hazardous materials;
- Land use and biodiversity;
- Air quality;
- Noise and vibrations;
- Energy Use; and
- Visual Impacts.

EHS Guidelines for Base Metal Smelting and Refining

The EHS Guidelines for Smelting & Refining cover information relevant to base metal smelting and refining of lead, zinc, copper, nickel, and aluminum. It does not include the mining and concentration of the raw materials, which is covered in the EHS Guidelines for Mining. Significant environment aspects of smelting and refining during the operational phase relate to:

- Air Emissions;
- Wastewater;
- Hazardous materials;
- Residues and waste; and
- Noise.

2.5 Relevant International Conventions and Protocols

The following international laws and conventions which Ghana is a signatory are considered applicable to this proposed project:

- African Charter on Human and Peoples' Rights (adopted 1998, entered into force 2005);

- African Convention on the Conservation of Nature and Natural Resources (adopted 1968, entered into force 1969);
- International Covenant on Economic, Social and Cultural Rights (adopted 1966, entered into force 1976);
- International Labor Organization's (ILO) Core Labor Standards on Freedom of association and collective bargaining; conventions 87 (1950) and 98 (1951);
- Elimination of forced and compulsory labor; conventions 29 (1932) and 105 (1959)
- Elimination of discrimination in respect of employment and occupation; conventions 100 (1953) and 111 (1960)
- Abolition of child labor; conventions 138 (1976) and 182 (2000)
- United Nations Convention on the Protection of the Rights of All Migrant Workers and Members of their Families (adopted 1990, entered into force 2003)
- United Nations Framework Convention on Climate Change (adopted 1992, entered into force 1994)
- Kyoto Protocol to the United Nations Framework Convention on Climate Change (adopted 1997, entered into force 2005)
- United Nations Convention on Biological Diversity (adopted 1992, entered into force 1993)

Also applicable to this project is the International Cyanide Management Code.

SDGs and ASGM

The Sustainable Development Goals (SDGs) are global problems defined into 17 goals with 169 specific targets. These goals recognize that ending poverty must go hand-in-hand with strategies that build economic growth and address a range of social needs including education, health, social protection, and job opportunities while tackling climate change and environmental protection. They serve as a guidebook to drive a country's specific focus areas, policies, regulations, financing, stimulus programs, and many other activities aimed to achieve sustainable development. The proposed AEHPMP project at Tweapease will establish a CMDC for the development of a sustainable ASGM in the area. The infrastructure of the Tweapease CMDC will ensure that current unsustainable mining methods including mercury use are eliminated ensuring a more economic, financial, social, environmental (including climate resilience), and institutional sustainability over the entire life cycle of the project. The project will impact all the SDG goals especially Goal 1- eliminating poverty of all forms, Goal 3- ensure a healthy working environment by preventing the spread of infectious diseases such as HIV/AIDS, COVID-19 and others as well as diseases due to mercury contamination, Goal 5- to give equal employment opportunity for both men and women, Goal 8- to ensure the employment of youth, consultants and local artisans such as plumbers, electricians and many others, Goal 13- to build a climate change resilient infrastructure, Goal 15- ensure environmental sustainability in the process of construction and goal 17- fostering partnerships between financiers and miners.

Paris Agreement

The Paris Agreement was adopted in 2015 as an international agreement to address climate change that required deeper emissions reduction commitments from all countries both developed and developing. It seeks to hold global warming to below 2.0°C above pre-industrial levels and pursue further to limit this to 1.5°C. The Paris Agreement calls for sustainable development by providing opportunities for the Parties to reduce their emissions through economy-wide and sectoral mitigation actions, in accordance with their state of development, their national circumstances, and in full compliance with the principles and provisions of the UN Framework Convention on Climate Change (UNFCCC) through their Nationally Determined Contributions (NDCs). In their NDCs, countries communicate actions they will take to reduce their Greenhouse Gas emissions in order to reach the goals of the Paris Agreement. Countries also communicate in the NDCs, actions they will take to build resilience to adapt to the impacts of rising temperatures. The lands and natural resources sector which encompasses minerals and mining is one of Ghana's focal areas for climate change mitigation of which the proposed AEHPMP will take cognizance of this agreement.

GHA-Nationally Determined Contributions (NDCs): 2020 – 2030

Ghana's NDCs sought to reduce emissions by 15% to 45% below business-as-usual scenario by 2030 and strengthen climate resilience in close alignment with its development priorities. In all, 20 mitigation and 11 adaptation actions were outlined to take place across seven priority economic sectors - energy, agriculture, industry, transport, waste, and forestry and other land uses. The 20 mitigation measures have strong development imperatives and aim to scale up renewable energy, promote clean cooking and lighting, double energy efficiency in households and industry, promote mass urban transportation, reducing emissions from deforestation and forest degradation (REDD+), and promote alternative solid waste management. The 11 adaptation measures aim to build resilience in vulnerable agriculture landscapes, enhance value addition in the utilization of forest resources, promote resilient infrastructure, promote early warning systems and disaster prevention; manage climate-induced health risk; promote integrated waste management, and address gender considerations. The proposed AEHPMP project at Tweapease will take cognizance of this commitment.

Convention on Biological Diversity (1992)

The Convention of Biological Diversity (CBD) was signed by 150 government leaders at the 1992 Rio Earth Summit, dedicated to promoting sustainable development. Conceived as a practical tool for translating the principles of Agenda 21 into reality, the convention recognize that biological diversity is not only about plants, animals and microorganisms and their ecosystems but also about people and our need for food security, medicines, fresh air and water, shelter and a clean and health environment in which we live in. The objective of CBD is to ensure preserving and sustaining biological diversity.

The Fundamental Conventions on Occupational Safety and Health (OSH): ILO Convention No. 155 (1981) on OSH and 187 (2006) on Promotional Framework for OSH

These Conventions are fundamental rights for a safe and healthy working environment. They express a renewed collective commitment to the protection of life and health at work. The core principles of Conventions Nos. 155 and 187 are fully complementary, and together they constitute a blueprint for progressive and sustained improvements towards the provision of safe and healthy working environments. Conventions Nos. 155 and 187 serve as the basis for additional occupational safety and health measures provided in other specific OSH instruments e.g., Convention No. 148 i.e., Working Environment (Air Pollution, Noise and Vibration). Additionally, to progressively achieve a safe and healthy working environment, Members need to take into account the principles set out in the ILO instruments relevant to the promotional framework for OSH.

Convention Concerning the Protection of Workers Against Occupational Hazards in the Working Environment due to Air Pollution, Noise, and Vibration, 1977 (ILO Convention No. 148)

The Convention encourages employers that in consultation with their workers, they should understand project hazards related to air pollution, noise pollution, and vibrations. Under the Convention No 148, national laws or regulations shall prescribe those measures be taken for the prevention and control of, and protection against, occupational hazards in the working environment due to air pollution, noise and vibration.; and provisions concerning the practical implementation of the measures so prescribed may be adopted through technical standards, codes of practice and other appropriate methods.

The United Nations Convention of the Child

The United Nations Convention of the Child is an important agreement by countries who have promised to protect children's rights. It defines a child as any person under the age of 18 years. The Convention explains who children are, all their rights, and the responsibilities of governments. All the rights are connected, they are all equally important and they cannot be taken away from children. All children have all these rights, no matter who they are, where they live, what language they speak, what their religion is, what they think, what they look like, if they are a boy or girl, if they have a disability, if they are rich or poor, and no matter who their parents or families are or what their parents or families believe or do. No child should be treated unfairly for any reason.

International Cyanide Management Code

The International Cyanide Management Code for the Manufacture, Transport, and Use of Cyanide in the Production of Gold (Cyanide Code) is a voluntary, performance driven, certification program of best practices for gold and silver mining companies and the companies producing and transporting cyanide used in gold and silver mining. It provides a mechanism of assurance for enhancing the protection of human health and reducing the potential for environmental impacts. The objective of the Cyanide Code is to improve the management of cyanide used in gold and silver mining and to improve the protection of human health and the reduction of environmental impacts, while assuring stakeholders of the safe handling of cyanide through the disclosure of results from periodic audits by independent professional auditors.

Based on Principles and Standards of Practice, the Cyanide Code provides a management ystem for the safe management of cyanide throughout its use cycle.

Gap Analysis – Comparison of Ghana's Regulations/ Policies and World Bank ESF for Handling Environmental and Social Risks

From the above discussions, it is clear that significant gaps exist between Ghanaian national regulations and the applicable World Bank ESSs. These are summarized in **Table 2-7**. These gap bridging measures are to ensure compliance with the ESSs.

Table 2-7: Comparison of Ghana's Regulations/ Policies and World Bank ESF for Handling Environmental and Social Risks

Scope/Objective	Description of Bank Policy	Description of Government of Ghana Regulation	Gaps Identified	Gap Bridging Actions
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts				
○ Identify, evaluate and manage the environment and social risks and impacts of the project in a manner consistent with the ESSs. ○ To adopt a mitigation hierarchy approach to: - Anticipate and avoid risks and impacts - Where avoidance is not possible, minimize or reduce risks and impacts to acceptable levels; - Once risks and impacts have been minimized or reduced, mitigate; and - Where significant residual impacts remain, compensate for or offset them, where technically and financially feasible.	The standard provides guidance on assessing the Project's potential environmental and social risks and impacts and addressing potential impacts through planning and mitigation hierarchy approach.	Environmental Assessment. Regulation 1 (2) of LI 1652 mandates that no person shall commence an undertaking which in the opinion of the Agency has or is likely to have adverse effects on the environment or public health unless, prior to the commencement, the undertaking has been registered by the EPA and an environmental permit has been issued by the Agency in respect of the undertaking.	Even though the regulation seeks to anticipate and mitigate/avoid risks and impacts, it does not fully address potential impacts and mitigation hierarchy approach e.g., content wise it does not address impacts on the vulnerable.	○ The capacities of the PIU staff on world bank ESF will also be built at the early stage of project implementation to enable them collaborate effectively in addressing this gap
ESS2: Labor and Working Conditions				
○ To promote safety and health at work, fair treatment, non-discrimination and equal opportunity of project workers including vulnerable workers such as women, persons with disabilities, children etc. ○ To prevent the use of all forms of forced labor and child labor. ○ To support the principles of freedom of association and collective bargaining of project	ESS2 promotes the fair treatment, non-discrimination and provision of equal opportunities for workers engaged on projects it supports. It strongly encourages protection of all project workers, including vulnerable groups such as women, persons with disabilities, children (of working age) and migrant workers, contracted workers and primary supply workers, as appropriate. It provides certain requirements that the project must meet in terms of	○ The Labor Act 2003 (Act 651) provides for the rights and duties of employers and workers; legal or illegal strike; guarantees trade unions the freedom of associations and establishes Labor Commission to mediate and act in respect of all labor issues. Under Part XV (Occupational Health Safety and Environment), the Act explicitly indicates that it is the duty of an employer to ensure	Although the Labor Commission makes provision for anticipated labor-related complaints and redress, beneficiaries' access (distance and processes) to the commission at the district-level may be a challenge.	○ The project will use the Project Grievance Redress Mechanism (GRM) which addresses concerns promptly

Scope/Objective	Description of Bank Policy	Description of Government of Ghana Regulation	Gaps Identified	Gap Bridging Actions
workers in a manner consistent with national law. ○ To provide project workers with accessible means to raise workplace concerns.	working conditions, protection of the work force (especially the prevention of all forms of forced and child labor), and provision of a grievance mechanism that addresses concerns on the project promptly and uses a transparent process that provides timely feedback to those concerned.	the worker works under satisfactory, safe and healthy conditions. ○ The Workmen's Compensation Act 1987 (PNDCL 187) seeks to address the necessary compensations needed to be awarded to workers for personal injuries arising out of and in the course of their employment.		
OHS Hazard identification and right of employees to remove themselves from such workplaces without being punished.	Under ESS 2, workplace processes will be put in place for project workers to report work situations that they believe are not safe or healthy, and to remove themselves from a work situation which they have reasonable justification to believe presents an imminent and serious danger to their life or health. Project workers who remove themselves from such situations will not be required to return to work until necessary remedial action to correct the situation has been taken. Project workers will not be retaliated against or otherwise subject to reprisal or negative action for such reporting or removal.	Regulation 85 and 550 of LI 2182 details some obligations of workmen pertaining to their safety	The law requires an employee to assist others in removing them form an unsafe situation and to assist the manager in performing some relevant duties, but such duties have not been explicitly stated.	
ESS3: Resource Efficiency and Pollution Prevention and Management				
To achieve the sustainable use of resources, including implementing measures that avoids or reduces pollution resulting from project/ activities	The ESS 3 provides requirements for projects to achieve the sustainable use of resources, including energy, water and raw materials, as well as implement measures that avoids or reduces pollution resulting from project activities. The standard places specific consideration on hazardous wastes or materials and air emissions (climate pollutants) given that the current and projected atmospheric concentration of greenhouse gases (GHG) threatens	The Act 490 mandates the EPA to enforce compliance with established EIA procedures among companies and businesses in the planning and execution of development projects, including existing ones.	To achieve the sustainable use of resources, including implementing measures that avoids or reduces pollution resulting from project activities	The ESS3 provides requirements for projects to achieve the sustainable use of resources, including energy, water and raw materials, as well as implement measures that avoids or reduces pollution resulting from project activities. The standard places specific consideration on hazardous wastes or materials and air emissions to be complied with.

Scope/Objective	Description of Bank Policy	Description of Government of Ghana Regulation	Gaps Identified	Gap Bridging Actions
	the welfare of present and future generations.			
ESS4: Community Health and Safety				
○ To anticipate and avoid adverse impacts on the health and safety of project affected communities during the project lifecycle from both routine and non-routine circumstances. ○ To promote quality and safety, and considerations relating to climate change, in the design and construction of infrastructure. ○ To ensure that safeguarding of personnel and property is carried out in a manner that avoids or minimizes risks to the project-affected communities.	This standard recognizes that project activities, equipment and infrastructure increase the exposure of project stakeholder communities to various health, safety and security risks and impacts and thus recommends that projects implement measures that avoids or limits the occurrence of such risks. It provides further requirements or guidelines on managing safety, including the need for projects to undertake safety assessment for each phase of the project, monitor incidents and accidents and preparing regular reports on such monitoring. ESS4 also provides guidance on emergency preparedness and response.	Public Health Act, 2012, Act 851 revises and consolidates all the laws and regulations pertaining to the prevention of disease, promote, safeguard and maintain and protect the health of human and animals, and to provide for related matters. The law has merged all provisions in the criminal code, ordinances, legislative and executive instruments, acts, by-laws of the District Assemblies etc. The Act enjoins the provision of sanitary stations and facilities, destruction of vectors including mosquitoes, protection of water receptacles and the promotion of environmental sanitation. The LI 2182 however, provides for the provision of an Emergency Response Plan (ERP) as part of the mines Mining Operation Plan (MOP).	The Act does not consider assessment of events and measures to deal with occurrences and emergencies. This is however achieved in the Emergency Response Plan (ERP) required under LI 2182.	An Emergency Response Plan has been provided as part of the ESMP
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources				
○ To protect and conserve biodiversity and habitats. ○ To apply the mitigation hierarchy and the precautionary approach in the design and implementation of projects that could have an impact on biodiversity. ○ To promote the sustainable management of living natural resources. ○ To support livelihoods of local communities, including Indigenous Peoples, and inclusive economic development, through the adoption of	ESS 6 promotes the conservation of biodiversity or natural habitats and supports the protection and maintenance of the core ecological functions of natural habitats and the biodiversity they support. It also encourages projects to incorporate into their development, environmental and social strategies that address any major natural habitat issues, including identification of important natural habitat sites, the ecological functions they perform, the degree of threat	The 1994 Forest and Wildlife Policy was revised in 2011 and subsequently approved in 2012 aims at the conservation and sustainable development of forest and wildlife resources for the maintenance of environmental stability and continuous flow of optimum benefits from the socio-cultural and economic goods and services that the forest environment provides to the present and future generations, whilst fulfilling Ghana's commitments under international agreements and conventions.	Adequate provisions have been made under a number of national laws and policies.	The project will take measures to protect and conserve biodiversity and habitats and all requirements specified in the ESS 6

Scope/Objective	Description of Bank Policy	Description of Government of Ghana Regulation	Gaps Identified	Gap Bridging Actions
practices that integrate conservation needs and development priorities.	to the sites, and priorities for conservation.			
ESS8: Cultural Heritage				
○ To protect cultural heritage from the adverse impacts of project activities and support its preservation. ○ To address cultural heritage as an integral aspect of sustainable development. ○ To promote meaningful consultation with stakeholders regarding cultural heritage. ○ To promote the equitable sharing of benefits from the use of cultural heritage.	This standard sets out general provisions on cultural heritage preservation and recommends protecting cultural heritage from the adverse impacts of project activities. It addresses physical or tangible cultural resources, which are defined as movable or immovable objects, sites, structures, groups of structures, and natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. Physical cultural resources may be in urban or rural settings, and may be above or below ground, or underwater. It also addresses intangible cultural heritage such as practices, representations, expressions, instruments, objects and cultural spaces that communities recognize as part of their cultural heritage. Projects involving significant excavations, demolition, movement of earth, flooding, or other environmental changes are to take cognizance of this standard.	The Fourth Republic Constitution (1992) recognizes culture as a necessary tool for national integration and development and, under the Directive Principles of State Policy (Article 39), declares as follows: (1) Subject to clause (2) of this article, the State shall take steps to encourage integration of appropriate customary values into the fabric of national life through formal and informal education and the conscious Introduction of cultural dimensions to relevant Aspect of national planning. (2) The State shall ensure that appropriate customary and cultural values are adapted and developed as an integral part of the growing needs of the society as a whole; and in particular, that traditional practices which are injurious to the health and well-being of the person are abolished. (3) The State shall foster the development of Ghanaian languages and pride in Ghanaian culture. The Ghana cultural policy (2004) enjoins the National Commission on Culture to undertake the following actions to protect and preserves monument, forests reserves, national parks and recreational facilities	The regulations and policies do not address cultural heritage as an integral part of sustainable development and promotion of equitable sharing of benefits	The National commission on culture provides a platform for collaboration with Chiefs, opinion leaders and community representatives and other institutions to protect cultural assets. The project will go by the procedures outlined by the Commission in respect of cultural assets. The project will also go the extra mile to complement this collaboration with stakeholder engagement procedures enshrined in the SEP to educate the project communities to appreciate the role of cultural values and assets in sustainable development and also the need to share benefits accruing from the use of cultural assets. A chance find procedure will be established as part of the ESMP
ESS10: Stakeholder Engagement and Information Disclosure				
○ To establish a systematic approach to stakeholder engagement that will help	ESS10 seeks to encourage open and transparent engagement between the Borrower and the project	○ The key laws most relevant to stakeholder engagement are:	The regulations to the RTI Act, has not been developed to fully operationalize mechanisms for	○ The project has developed a SEP that also includes a GRM based on an existing grievance

Scope/Objective	Description of Bank Policy	Description of Government of Ghana Regulation	Gaps Identified	Gap Bridging Actions
Borrowers identify stakeholders and build and maintain a constructive relationship with them, in particular project-affected parties. To assess the level of stakeholder interest and support for the project and to enable stakeholders' views to be taken into account in project design and environmental and social performance ○ To promote and provide means for effective and inclusive engagement with project-affected parties throughout the project life cycle on issues that could potentially affect them. ○ To ensure that appropriate project information on environmental and social risks and impacts is disclosed to stakeholders in a timely, understandable, accessible and appropriate manner and format. ○ To provide project-affected parties with accessible and inclusive means to raise issues and grievances and allow Borrowers to respond to and manage such grievances.	stakeholders including project-affected parties throughout the project life cycle. The standard establishes a systematic approach to stakeholder engagement that potentially helps the Borrower to identify stakeholders and build and maintain a constructive relationship with them, as well as disclose information on the environmental and social risks and impacts to stakeholders in a timely, understandable, accessible and appropriate manner and format. It recommends that stakeholder engagements are commenced as early as possible in the project development process and continued throughout the lifecycle of the Project. This allows for stakeholders' views to be considered in the project design and environmental and social performance. The Borrower is also expected to implement a grievance mechanism to receive and facilitate resolution of concerns and grievances.	○ Article 21(1) (f) of the 1992 Constitution of Ghana which recognizes the right to information for all citizens as a fundamental human right. To fully operationalize the right to information, people need to be effectively engaged and provided with information on issues that affect their lives. ○ The *Right to Information Act, 2019 (Act 989)* is meant to put into effect the aforementioned article in the constitution of the Republic of Ghana. ○ *Articles 40 to 48 of the Local Governance Act, 2016 (Act 936),* mandate local authorities to create opportunities for residents and other stakeholders to access information and to participate in decision making and for inclusion of marginalized groups. ○ Stakeholder engagement is an integral part of the Environmental Impact Assessment process. The LI 652 requires effective public consultation and participation as an integral component of Environmental Impact Assessment (EIA) in Ghana. ○ Strategic goal 4 of the National Environmental Policy, which focuses on participation and coordination in environmental governance, charges the lead institutions in environmental governance to ensure active participation in all environmental matters.	disclosure or dissemination of information and grievance redress.	redress mechanism for resolving grievances for the project ○ The GRM is a decentralized and transparent system which ensured quick resolution of complaints and disputes, it also has the structure for disclosing vital information to requisite stakeholders ○ It also provides means for effective and inclusive engagement. This instrument which satisfies almost all the requirements of ESS 10 will be applied during the project implementation to bridge the gaps in national regulations and policies

2.6 Institutional Framework

Key institutions involved in in the project include:

- Environmental Protection Agency (EPA)- PIU;
- Metropolitan/Municipal/District Assemblies (MMDAs) and the Physical Planning Department;
- Minerals Commission (MC);
- Lands Commission (LC);
- Office of the Administrator of Stool Lands (OASL);
- Traditional Authorities.

Environmental Protection Agency (EPA)- AEHPMP-PIU

The EPA is established under the EPA Act, 1994 (Act 490) and is responsible for the protection of the environment and this include the human/ socioeconomic environment as well. The Agency is under the Ministry of Environment, Science, Technology and Innovation. Its functions include the following amongst others:

- Advise the Minister on the formulation of policies on all aspects of the environment and in particular make recommendations for the protection of the environment;
- Ensure compliance with any laid down environmental impact assessment procedures in the planning and execution of development projects, including compliance in respect of existing projects;
- Act in liaison and co-operation with government agencies, district assemblies and other bodies and institutions to generally protect the environment; and
- To promote effective planning in the management of the environment.

The EPA is the main government body for receiving and reviewing all Environmental and Social Impact Assessment reports. Currently, Resettlement Plan reports sent to the EPA for review are usually attached to the mainstream Environmental Impact Assessment (EIA) Reports. The Agency is yet to develop a general guideline or format for the preparation of a Resettlement Plans as it has done for the preparation of an EIA report. The EPA has offices in all the previous ten (10no.) regions of Ghana and zonal offices which takes care of a cluster of districts.

MMDAs and the Physical Planning Department

The Local Governance Act 2016, Act 936 establishes and regulates the local government system and gives authority to the Metropolitan, Municipal and District Assemblies (MMDAs) to exercise political and administrative power in the districts, provide guidance, give direction to, and supervise all other administrative authorities in the districts. The MMDAs are under the Ministry of Local Government, Decentralization and Rural Development (MLGDRD).

The MMDAs are mandated to initiate programs for the development of basic infrastructure and provide municipal works and services as well as be responsible for the development, improvement and management of human settlements and the environment in the district.

The Land Use and Spatial Planning Authority (LUSPA) is responsible for sustainable development of land and human settlements through a decentralized planning system, and currently operates at the regional and district levels, with the responsibility for designing plans (planning schemes) and controlling settlements.

LUSPA, as a decentralized institution, forms part of the District Assembly structure as the Physical Planning Departments, which replaced the erstwhile Town & Country Planning Department; and at the regional level as the Regional Land use and Spatial Planning Authority.

The Physical Planning Departments which have the mandate of planning schemes and controlling settlements would lead the DAs in the land acquisition process.

Minerals Commission (MC)

The MC is mandated under the Minerals Commission Act 1993, Act 450 with responsibility for the regulation and management of the utilization of the mineral resources of Ghana and the

coordination and implementation of policies related to mining in the country. As stipulated in Act 450, the MC functions are to:

- formulate recommendations of national policy for exploration and exploitation of mineral resources with special reference to establishing national priorities having due regard to the national economy;
- advise the Minister of Lands and Natural Resources on matters relating to minerals;
- monitor the implementation of laid down Government policies on minerals and report on this to the Minister;
- monitor the operations of all bodies or establishments with responsibility for minerals and report to the Minister;
- receive and assess public agreements relating to minerals and report to Parliament;
- secure a firm basis of comprehensive data collection on national mineral resources and the technologies of exploration and exploitation for national decision making; and
- perform such other functions as the Minister may assign to it.

In fulfilling its functions, the Commission engages in the following activities;

- Investigate the background, process applications for mineral rights and recommend their grant or otherwise to the Minister responsible for Mines;
- Review agreements relating to minerals;
- Collect, collate and analyze data on the operations of mining companies for decision making and for dissemination;
- Organize and attend workshops/seminars/conferences, as well as issue publications to promote mineral sector activities;
- Liaise with other governmental agencies, notably the Bank of Ghana and the Ghana Revenue Authority), to ensure that the spirit of the sector's fiscal regime is maintained; and
- Liaise with other governmental agencies, notably the Geological Survey Authority (GSA) and EPA, to monitor and ensure the adherence of mining companies to the terms and requirements of mineral rights granted to them; etc.

Lands Commission (LC)

The LC currently has the following Divisions:

- Public and Vested Lands Management;
- Land Valuation;
- Land Registration; and
- Survey and Mapping.

Public and Vested Lands Management Division of the Lands Commission

The Public and Vested Lands Management Division of the Lands Commission is the principal land management organization of the government. All public land is vested in the President of Ghana and held in trust by him for the people of Ghana. The Public and Vested Lands Management Division manages all public land on behalf of the President. In each of the regions of Ghana (occur for the previous ten regions and new offices yet to be created for the new 6 regions), a branch, known as the Regional Lands Commission, performs the functions of the Lands Commission. In addition to managing public lands on behalf of government, its other mandates include among others providing:

- Advise the government and local authorities on policy matters, and to ensure that the development of individual parcels of land is consistent with area development plans; and
- Advise on and assist in the execution of a comprehensive program of land title registration.

The acquisition of any rights of exclusive possession over public lands would necessitate discussions with the relevant Regional Lands Commission for a lease over the selected site.

Land Valuation Division (LVD)

It was established in 1986 (PNDC Law 42) as the Land Valuation Board (LVB). However, the LVB was brought under the Lands Commission as the Lands Valuation Division (LVD) with the promulgation of the Lands Commission Act 2008, Act 767. The LVD is responsible for all valuation services for the government, including assessing compensation to be paid as a result of land acquisition or damage to an asset in view of a government project.

The Division keep rates for crops which are applicable nation-wide. The LVD has offices in all sixteen (16no.) regions of Ghana and over 44 district offices. The district offices are involved only in 'rating valuation' and that any valuation taking place has to be undertaken by the Regional offices which have certified valuers. The LVD also keep records of private sector certified valuers.

Land Registration Division of the Lands Commission

It was established in 1986 as the Title Registration Advisory Board under Section 10 of the Land Title Registration Act, 1986. However, it was brought under the Lands Commission as the Lands Registration Division with the promulgation of the Lands Commission Act 2008, Act 767. The Division ensures registration of title to land and other interests in land; maintains land registers that contains records of land and other interests in land; ensures registration of deeds and other instruments affecting land, among other functions.

Survey and Mapping Division of the Lands Commission

It was established in 1962 under the Survey Act 1962, Act 127 as the Survey Department. The Department was brought under the Lands Commission as the Survey and Mapping Division with the promulgation of the Lands Commission Act 2008, Act 767. The Division supervises, regulates and controls the surveys and demarcation of land for the purposes of land use and land registration. It also supervises, regulates, controls and certifies the production of maps. It is responsible for planning all national surveys and mapping among other functions.

Traditional Authorities

In the 1992 Constitution, chieftaincy together with its traditional councils is guaranteed and protected as an important institution in the country. This institution operates in tandem with the Ministry for Chieftaincy and Traditional Affairs, which is the official Ghanaian agency responsible the creation of linkages between the Government of Ghana and the traditional authorities in the country.

In Ghana land is owned predominantly by customary authorities (stools, skins, clans and families). Together they own about 78% of all lands while the State owns about 20% with the remaining 2% owned by the state and customary authorities in a form of partnership (split ownership), (Larbi W O, 2008). Article 267 (1) of the 1992 Constitution avers that all stool lands in the country shall vest in the appropriate stool on behalf of, and in trust of the subjects of the stool in accordance with customary law and usage. All revenue from stool lands are collected and disbursed by the Office of the Administrator of Stool Lands (OASL).

2.7 Project Measures to Ensure Compliance with World Bank Policy

The Ghanaian laws and regulations make provision for environmental assessment and management, however, there are some differences between the World Bank ESS and Ghanaian laws as indicated in Table 2-7 supra.

In order to harmonize such differences and ensure effective management of the environmental and social impacts and risks arising out of the project implementation satisfies the World Bank requirements as well as the national laws.

The site specific ESMPs in addition to the ore characterization and mine reserve estimation aspects will combine the World Bank ESS and the national laws as well as institutional synergies for managing the impacts and risks of the project.

3.0 ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

This chapter presents the environmental and social baseline information of the project area of Tweapease near New Abirem. The project area of influence includes the immediate area of the Tweapease CMDC site. Description of the environmental settings includes the characteristics of the area in which the activity of the project would occur and the cover area likely to be impacted by anticipated environmental and social impacts and risks. The environmental and social information used to draft the baseline has been obtained through literature reviews, publicly available information and observations made during the field visits.

The project is not a greenfield one but in an existing mining area where most of the natural features have been converted/ transformed, also due to farming and grazing. The chapter is subdivided into three major headings as follows:

- Physical Environment;
- Biological Environment; and
- Socioeconomic Environment.

3.1 Physical Environment

Location

The proposed mine is in the Tweapease Community near New Abirem of the Eastern Region of Ghana, about 85km from the regional capital, Koforidua and within 93Km from New Abirem, capital of the Birim North Municipal. The approximate location of the proposed Tweapease CMDC site is given as latitude 06°22'38.4"N and 000°54'35.0"W.

Figure 3-1 is a location map of Birim North Municipal showing the location of Tweapease.

Topography

The topography of the project area is generally undulating with an average height of about 150 meters.

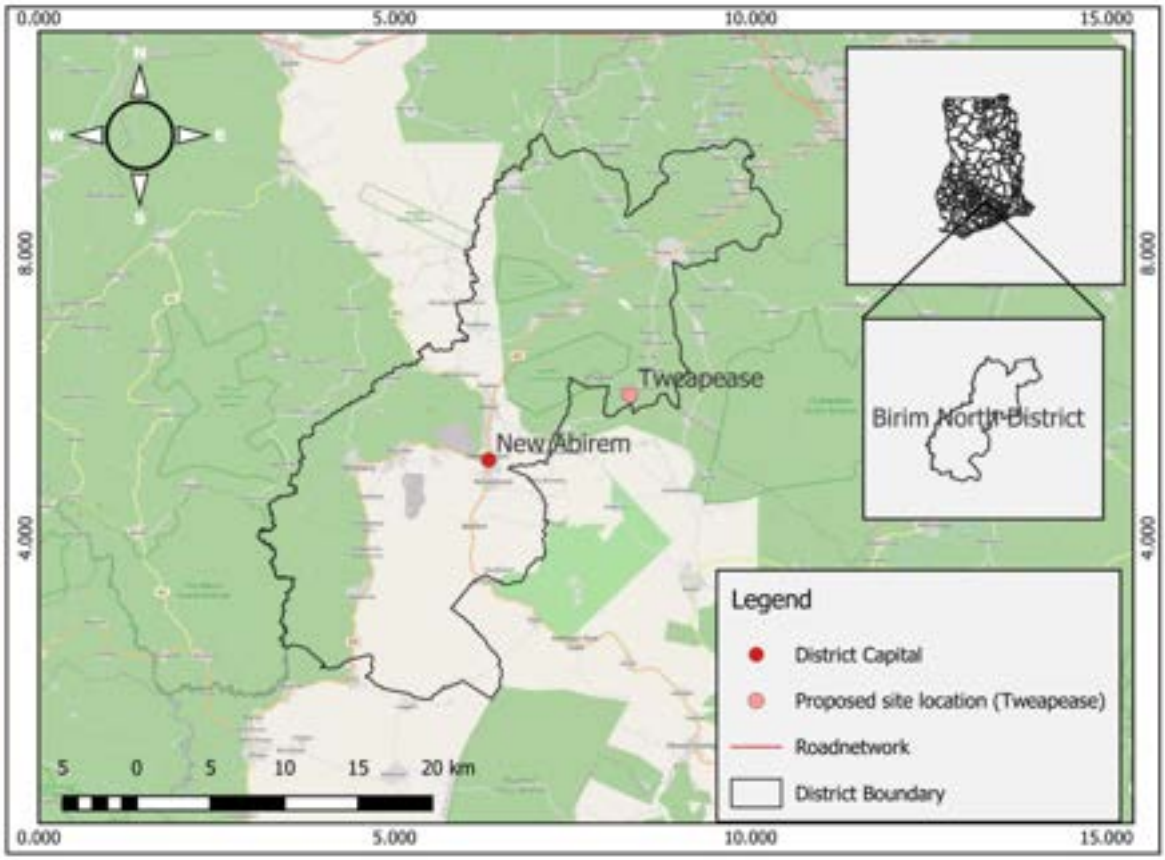

Figure 3-1: Map of the Birim North Municipal Showing Location of Tweapease

The Tweapease Project Site/ Land Use

The Tweapease CMDC site is located approximately on 06°22'38.4"N, 000°54'35.0"W on the global scale. The 0.96 acre land was acquired by GoG through a Voluntary Land Donation (VLD) arrangement with the Tweapease community, led by the Traditional Authority. This land, along with access roads to the site, is within areas designated for Community Mining Scheme (CMS). The designation of a place for Community Mining Schemes (CMS) is done by the Minerals Commission of Ghana, in close consultation and involvement of relevant Traditional Authorities, District Assembly representatives and community people. In practice, such designated areas are free from any other uses and encumbrances, including farming activities. The donation followed the VLD Protocol through which it was confirmed that the donation was completely voluntary, and that the owners (Tweapease community) proceeded to finalize the donation after they were duly informed about their right to refuse the donation and to be compensated for land so donated. Also, it was ascertained that one farmer – Eric Sarkodie – who, although has no recognizable legal claim to the land, had cultivated the land at the time of the donation. Therefore, in accordance with the provisions of ESS 5, Eric Sarkodie was meaningfully engaged on the proposed subproject and how it impacts his continued use of the land. The engagement with Eric Sarkodie culminated in a consensus that: (1) he will be allowed adequate time to harvest his crops, and (2) the Traditional Authority in Tweapease will give him an alternative land of equal productive capacity and size, to continue his farming activities (see Plate 3-1).

Plate 3-1: Pictures Showing a Farm (the Land Use) at the Tweapease CMDC Site

Geology and History of Mining in Tweapease

There is no known mining operations in Tweapease but the general area host some major mining concessions including the Newmont Gold Ghana Limited) NGGL)- Akyem Mine at New Abirem. The Akyem mine is a hard rock operation while the proposed Tweapease scheme is alluvial. Although no mining had commenced at Tweapease, attempts have been made to illegally mine in the valleys which were stopped by the community.

The underlying rock formation is mainly made up of Upper Biriman rocks consisting of predominantly volcanic lava, schist, hyalites and greywacke. The site is underlain by Birimian metasediments. Foliation are generally steeply dipping with a NE strike. It forms part of the Ashanti Belt and borders the Mamang River. Overburden soils of varying thickness overly the thick alluvial gold deposit.

Soils

The soils of the can be classified into five broad categories as follows: (i) Swedru-Nsaba/Ofin Compound Association; (ii) Atewa-Atukrom-Asikuma-Ansum Compound Association; (iii) Juaso-Manso-Debia Association; (iv) Bekwai-Oda Association; and (v) Birim-Chichiwere Association.

Groundwater

In general, there are two types of aquifers in the project area i.e., (i) weathered rock aquifers and (ii) fractured rock aquifers which are either confined or unconfined. The rocks underlying the area lack primary porosity since they are crystalline. Groundwater occurrence is therefore associated with the development of secondary porosity through fissuring and weathering. Groundwater circulation in the study area is mainly localised due to the numerous mountains and hills that act as groundwater divides. Its flow is therefore mostly restricted to joints, fractures or other openings within the crystalline rock formations.

Climate

The climate of the Project Area is determined by the movement of air masses which differ in air moisture and relative stability rather than temperature. Two air masses can easily be identified, the tropical continental air mass which moves from the Sahara Desert towards the sea and the tropical maritime air mass which moves from the South Atlantic Ocean towards the land.

Like most parts of the country, two main physical phenomena, the equatorial trough and the associated Inter Tropical Convergence Zone (ITCZ)/ Inter Tropical Boundary (ITB) influence the climatic conditions of the project area. The ITCZ/ ITB influences the attraction of the alternate air masses from the north and the south called the tropical continental (northeast trade winds) and the maritime continental (southwest monsoon) winds respectively. The tropical continental winds are associated with a dry cool wind known as the harmattan which affects most part of the country during the months of December to February when it's very intense.

Climatic data, comprising monthly rainfall data, monthly temperatures and monthly relative humidity is provided in **Table 3-1.** It is based on 20 years of data obtained from the Ghana Meteorological Agency (GMet) for Akim Oda, which is the nearest weather station 80km south of Tweapease. The climate data is further illustrated in **Figures 3-3 to 3-6** and the highlights are as follows:

- Relative Humidity in the project area is generally high, averaging 79.2%. The average relative humidity ranged from 71.6% in January to 84.6% in June.
- Temperature in the project area is generally high, averaging 27.5°C. Average maximum temperature is 29.0°C and a minimum of 25.9°C. The hottest months are February to May; and
- The rainy season occurs between March to October and peaks in October. The average annual rainfall is 1,338.8mm. The dry season, also known as the harmattan, occurs between December and February. This long period of dryness makes the project area very vulnerable and susceptible to bush fires and drought.

Table 3-1: Climate Data for Akim Oda (2003-2023) 20 Years of Record

Parameter	Unit of Measure	Annual Total	Month											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Precipitation	mm	1,338.8	23.3	66.7	125.8	117.1	173.9	197.2	108.9	67.3	146.2	237.3	142.2	42.1
Average No of Days with Precipitation	Days	141	2	6	11	11	13	17	13	13	17	19	14	5
Average Temperature	°C	-	27.1	29.0	28.8	27.9	28.0	26.9	26.2	25.9	26.8	27.5	27.7	27.7

Parameter	Unit of Measure	Annual Total	Month											
			Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Relative Humidity	%	-	71.6	72.1	75.0	79.0	81.6	84.6	84.1	83.3	82.3	80.7	79.6	76.9

source: GMet

Surface Water (Drainage)

The project is drained by the Mamang River, which is a tributary of the Pra River. The Pra flows southwards and enters the sea near Shama in the Western Region. The Mamang River joins the Pra River near Kotokuom, which is southwest of Tweapease. The Mamang at Tweapease is seasonal and dries up during severe harmattan conditions although certain sections with good vegetative cover downstream of Tweapease could hold contain shallow pools of water and flows are in trickles.

The water is utilised for domestic purposes (mostly for washing) when the boreholes in the town gets damaged. Also, Newmont Akyem Mine and other communities downstream of Tweapease utilize the water for some mine operations and domestic use respectively. The Mamang River watershed covers an area of approximately 475km^2.

Surface Water Quality

Two grab samples from the Mamang River draining the Tweapease area was taken for laboratory analysis of some relevant parameters specified in the GS for the Mining and Quarry Industry- General Mining.

Specified methods as laid in "Standard Methods for the Examination of Water and Wastewater" published jointly by the American Water Works Association (AWWA), American Public Health Association (APHA) and the Water Environment Federation (WEF) 24th Edition, 2017 were followed and the results are shown in **Table 3-2**.

Table 3-2: Stream Water Quality Results

Parameter	Unit	S1	S2	WRC Raw Water Quality Guidelines	GS 1212:2019
pH	-	7.62	6.98		6-9
Conductivity	µS/cm	107.0	110.0		1,500
Turbidity	NTU	22.0	38.0	0 - 1	75
Color	Hz	45.0	50.0	-	150
Total Suspended Solids (TSS)	mg/l	15.0	40.0	-	50
Total Dissolved Solids (TDS)	mg/l	58.9	60.5		1,000
Ammonia (NH_3-N)	mg/l	0.792	0.448	-	1
Nitrate (NO_3-N)	mg/l	0.113	0.183	-	50
Total Phosphorus	mg/l	0.272	0.331	-	2
Sulphate	mg/l	28.3	19.6	0 - 6	300
Fluoride	mg/l	<0.005	<0.005	0 - 1	10
Chloride	mg/l	2.48	2.88		250
Sodium	mg/l	10.80	10.40		200
Potassium	mg/l	2.30	2.20		5
Calcium	mg/l	9.94	9.46	-	250
Magnesium	mg/l	5.92	5.63	-	2
BOD	mg/l	7.68	9.60	-	-
COD	mg/l	38.4	48.0	-	250
Oil/ Grease	mg/l	<0.100	<0.100	-	5
Total Iron	mg/l	1.90	2.59	0 – 0.1	10
Cadmium	mg/l	<0.002	<0.002	-	0.1
Chromium	mg/l	<0.010	<0.010	-	0.1
Zinc (Zn)	mg/l	0.011	0.009	0- 3	10
Copper	mg/l	0.070	0.049	-	5.0
Lead (Pb)	mg/l	<0.005	<0.005	0 - 10	0.1
Manganese	mg/l	0.013	0.047	-	0.2
Nickel	mg/l	<0.010	<0.010		-
Mercury	mg/l	<0.001	<0.001		0.005
Total Arsenic	mg/l	<0.001	<0.001		1.0

The results showed that:

- The water quality results have been compared with the Water Resources Commission (WRC) administered Ghana Raw Water Quality Guidelines and also the Ghana Standard values (GS1212:2019) - Mining and Quarry Industry.
- For the physicochemical parameters, the Mamang River water quality showed compliance with the GS 1212:2019 values except Magnesium for both the upstream and downstream samples.

Sediment Quality

A composite sample from the Mamang stream draining the Tweapease area was taken for laboratory analysis of some relevant parameters especially the heavy metals. The results are shown in **Table 3-3**.

Table 3-3: Stream Sediment Quality Results

Parameter	Unit	Sediment	CEQG Guidelines- TEL	CEQG Guidelines- PEL
pH	-	7.62	-	-
Conductivity	µS/cm	68.0	-	-
Heavy Metals				
Iron	mg/kg	1,239.0	-	-
Cadmium	mg/kg	<0.200	0.6	3.5
Chromium	mg/kg	<0.500	37.3	90.0
Copper	mg/kg	4.91	35.7	197.0
Zinc (Zn)	mg/kg	14.6	123.0	315.0
Lead (Pb)	mg/kg	<0.500	35.0	91.0
Manganese	mg/kg	6.09	-	-
Nickel	mg/kg	0.760	-	-
Arsenic	mg/kg	<0.100	5.9	17
Mercury	mg/kg	<0.100	0.170	0.486

The results have been compared with the Canadian Environmental Quality Guideline (CEQG) values designated as Probable Effect Level (PEL) and Interim Sediment Quality Guidelines (ISQG). It is noted that the ISQG values are same as the USEPA values.

The results show that:

- The composite sediment sample obtained from the Mamang River at Tweapease showed compliance with the CEQG/ USEPA values in terms of the ISQG/TEL and the PEL.
- No sediment quality guidelines have been provided for Nickel, Iron and Manganese in the CEQG/ USEPA. The Nickel, Iron and Manganese concentrations obtained could be attributed to the geological formation of the project area and other anthropogenic activities. Nickel, Iron and Manganese recorded values of 0.760mg/kg, 1,239mg/kg and 6.09mg/kg respectively.

Groundwater Quality

Sampling of groundwater in the project area for quality analysis was carried out in August 2024 from a borehole at Tweapease. The coordinates of the sampling point is 06°22'58.1"N, 000°54'42.4"W. The detail report of the assessment is provided as **Annex 3-1** of this ESMP.

Methodology, Analysis and Results

Grab samples were collected into 1-liter bottles at each sampling location by means of a clean container and kept in an ice chest. The water samples were sent to the Water Research Institute (WRI) of the Council for Industrial and Scientific Research (CSIR) for the analysis. Specified methods as laid in "Standard Methods for the Examination of Water and Wastewater" published jointly by the American Water Works Association (AWWA), American Public Health Association (APHA) and the Water Environment Federation (WEF) 23rd Edition, 2017 were followed. The results of the groundwater quality analysis are as shown in **Table 3-4**.

Table 3-4: Groundwater Quality in Tweapeasee- (sampled on 4th August, 2024)

Parameter	Unit	BHW	GS 175-1	WHO Guidline
Turbidity	NTU	<1.00	5	5
Colour	Hz	<2.500	5	15
Odour	-	-	Inoffensive	Inoffensive
pH	pH Units	5.47	6.5-8.5	6.5-8.5
Conductivity	µS/cm	136.0	-	-
Total Suspended Solids (TSS)	mg/l	<1.00	0	-
Total Dissolved Solids (TDS)	mg/l	81.6	1,000	1,000
Sodium	mg/l	12.0	200	200
Potassium	mg/l	0.80	30	30
Calcium	mg/l	12.0	200	200
Magnesium	mg/l	3.78	150	150
Total Iron	Mg/l	0.131	0.3	0.3
Ammonium (NH_3-N)	mg/l	<0.001	0.00-1.5	0.00-1.5
Chloride	mg/l	29.8	250	250
Sulphate (SO_4)	mg/l	2.23	250	250

Parameter	Unit	BHW	GS 175-1	WHO Guidline
Phosphate (PO_4-P)	mg/l	0.088	-	-
Manganese	mg/l	0.093	0.4	0.4
Nitrite (NO_2-N)	mg/l	0.010	1.0	1.0
Nitrate (NO_3-N)	mg/l	1.36	10	10
Fluoride	mg/l	<0.010	1.5	1.5
Total Hardness (as $CaCO_3$)	mg/l	45.6	500	500
Total Alkalinity (as $CaCO_3$)	mg/l	21.8	-	-
Calcium Hardness (as $CaCO_3$)	mg/l	30.1	-	-
Mag. Hardness (as $CaCO_3$)	mg/l	15.6	-	-
Bicarbonate (as $CaCO_3$)	mg/l	26.6	-	-
Carbonate	mg/l	0.00	-	-

In summary

The results have been compared with the available GS 175-1 and the WHO Guideline values for drinking water.

- All the parameters including Turbidity, TSS TDS, Colour, pH, Calcium, Fluoride, Magnesium, Iron, Manganese, Ammonium, Sodium, Potassium, Chloride, Nitrite, Nitrate, Sulphate and Total Hardness were all below the respective GS 175-1 and WHO Guideline values for drinking water.

Air Quality Assessment

As part of the preparation of the ESMP, ambient air quality assessment was carried out at specified locations in the project area in August 2024 using the Osiris Particulates Monitor for dust and the Aeroqual series 500 for noxious gas measurements (**see Plate 3-1**). The detail report of the assessment is provided as **Annex 3-1** of this ESMP.

(a) The Osiris Particulate Monitor Positioned at Tweapease Proposed Mine Site

(b) The Aeroqual Gas Monitor Positioned at Tweapease Proposed Mine Site

Plate 3-2:The Osiris Particulates Monitor at Location AN2 (Proposed Mine Site)

The main objective of the air quality assessment is to provide a basis for determining the impacts on human health and the environment as a result of the implementation of the project at Tweapease. The sampling locations were so chosen because they were close to the project site and associated facilities- the mine and proposed CMDC. The locations also ensured the safety and security of personnel and equipment. The selected sampling locations/sites are provided in **Table 3-4** and **3-5.** The sampling locations have been shown in **Figure 3-7** and **Figure 3-8.** The parameters of interest were Total Suspended Particles (TSP), PM_{10} and $PM_{2.5}$ (Inhalable particles, diameter <10 µm and diameter <2.5 µm respectively), Sulphur Dioxide (SO_2) and Nitrogen Dioxide (NO_2).

Table 3-5: Ambient Air and Noise Monitoring Locations

AN1	Tweapease L/A Primary School	06°22'52.8"N, 000°54'41.5"W
AN2	Proposed Mining Site	06°21'54.7"N, 000°55'04.4"W
AN3	Demarcated Plant Site	06°22'38.4"N, 000°54'35.0"W

Table 3-5: Stream and Groundwater Quality Sampling Locations

ID	Sampling Site	Coordinates
S1	Mamang Downstream	06°21'51.3"N, 000°55'04.7"W
S2	Mamang Upstream	06°22'45.3"N, 000°54'36.3"W
BHW1	Borehole at Tweapease	06°22'58.1"N, 000°54'42.4"W
A Sediment Sample was taken from Mamang Down Stream (S1)		

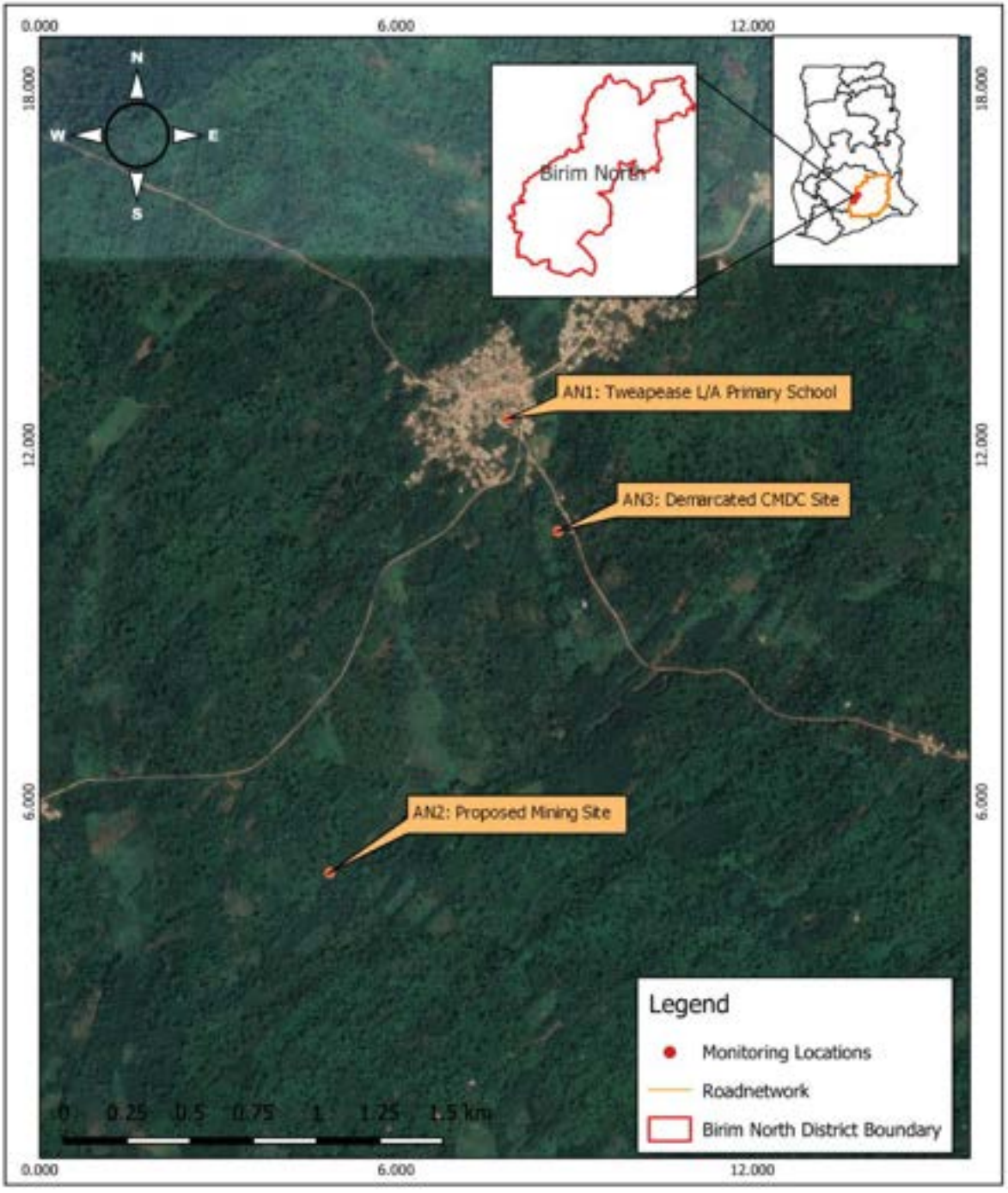

Figure 3-2: Ambient Air, and Noise Monitoring Locations

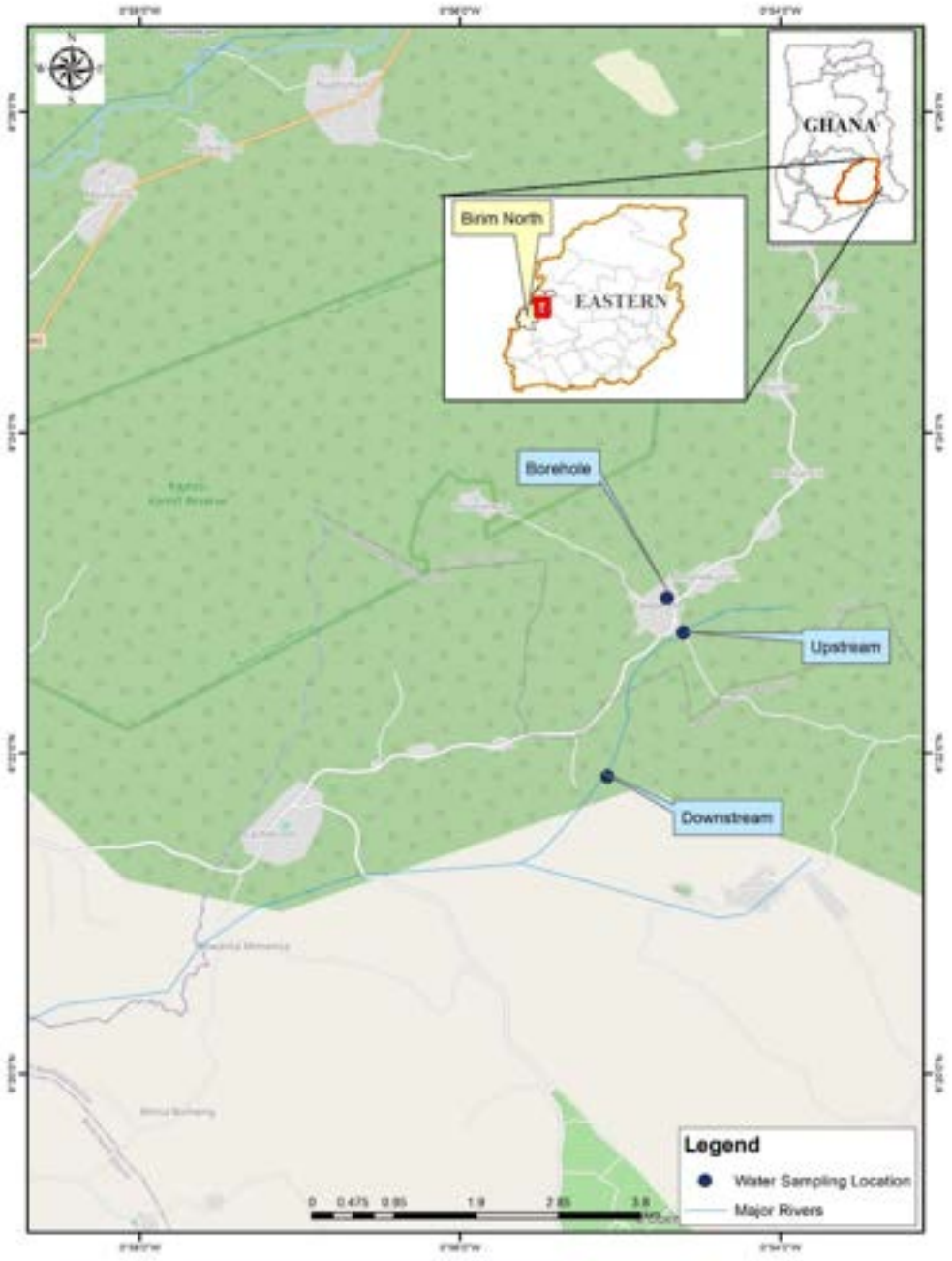

Figure 3-3: Surface and Ground Water Sampling Locations

The results of the air quality monitoring exercise are shown in **Table 3-6.** The prevailing wind direction during the air quality monitoring periods was from South-West to North-East. The detail report of the assessment is provided as **Annex 3-1** of this ESMP.

Table 3-6: Ambient Air Quality- (monitored 4th August, 2024)

ID	Sampling Site	TSP/ µgm^{-3}	PM_{10}/ µgm^{-3}	$PM_{2.5}$/ µgm^{-3}	NO_2/ µgm^{-3}	SO_2/ µgm^{-3}
AN1	Tweapease L/A Primary School	49.2	22.4	4.5	0.871	8.640
AN2	Proposed Mining Site	19.5	10.3	4.4	0.691	0.000
AN3	Demarcated CMDC Site	16.3	7.9	2.8	0.943	7.949
GS 1236:2019- Ambient Air Pollutants		**150.0***	**70.0***	**35.0***	**150.0***	**50.0***
WHO Guideline Value		**na**	**50.0***	**25.0***	**200.0***	**50.0***
WBG Guideline Value		**na**	**50.0***	**25.0***	**200.0****	**20.0***

*…….24 hours averaging time **……..1 hour averaging time
GS 1236:2019 is "Environment and Health Protection- Requirements for Ambient Air Quality and Point Source/ Stack Emissions"

The results show that:

- Dust levels in the ambient air ranged from 16.3µgm^{-3} at the Demarcated CMDC Site to 49.2µgm^{-3} at Tweapease L/A Primary School for TSP compared with the GS value of 150µgm^{-3} and from 7.9µgm^{-3} at the Demarcated CMDC Site to 22.4µgm^{-3} at Tweapease L/A Primary School for PM_{10} compared with the GS value of 70µgm^{-3}. $PM_{2.5}$ values ranged from 2.8µgm^{-3} at the Demarcated CMDC Site to 4.5µgm^{-3} at Tweapease L/A Primary School. Thus the dust levels were all within the respective GS values.
- Noxious gases emission was within the respective GS values. SO_2 ranged from 0.000µgm^{-3} at the Proposed Mining Site to 8.640µgm^{-3} at Tweapease L/A Primary School compared with the GS value of 50.0µgm^{-3}, while NO_2 ranged from 0.691µgm^{-3} at the Proposed Mining Site to 0.943µgm^{-3} at the Demarcated CMDC Site, compared with the GS value of 150.0µgm^{-3}.

Noise Assessment

As part of the preparation of this ESMP, ambient noise assessments were carried out at the air quality monitoring locations in the project area in August 2024.

The noise monitoring was carried out for daytime only. The sampling locations are same for that of the ambient air quality (see **Figure 3-7**).

Noise measurements at the sites were determined using the portable Pulsar Nova Integrated Sound Level Meter which enables real-time monitoring of the noise (**see Plate 3-2**).

Plate 3-3:The Noise Monitor Positioned at AN3 (Demarcated CMDC Site)

Measurements were done in line with GS 1253:2018, and Noise Levels were captured in situ in decibels on the A scale, i.e., dB(A). The noise monitoring results are provided in **Table 3-7**, and compared with the GS value for Mixed Used Areas.

Table 3-7: Noise levels- (monitored 4th August, 2024)- measurements done in line with GS 1253:2018

ID	Sampling Site	L_{eq}	L_{max}	L_{min}	L_{10}	L_{50}	L_{90}
AN1	Tweapease L/A Primary School	55.0	67.8	36.1	58.9	50.9	46.5

ID	Sampling Site	L_{eq}	L_{max}	L_{min}	L_{10}	L_{50}	L_{90}
AN2	Proposed Mining Site	37.9	58.2	28.5	39.9	36.4	33.6
AN3	Demarcated CMDC Site	39.3	49.1	28.2	41.2	38.1	36.6
GS 1222:2018 (Mixed Use)		**60.0**					
WHO Guideline Value (Industrial, Commercial Shopping and Traffic Areas, Indoors and Outdoors)		**70.0**					
WBG Guideline Value (Industrial, Commercial)		**70.0**					

Legend

L_{EQ} Equivalent Sound Level representing the average integrated sound level accumulated during the sampling period
L_{MAX} Maximum Sound Level obtained during the sampling period
L_{MIN} Minimum Sound Level obtained during the sampling period
L_{10} Nuisance noise level during the sampling period
L_{50} Average noise level recorded during the sampling period
L_{90} Background noise level recorded during the sampling period
GS 1222:2018 is "Health Protection- Requirements for Ambient Noise Control"
GS 1253:2018 is "Acoustic- Guide for Measurement of Outdoor A-Weighted Sound Levels"

The results showed that:

- Equivalent Noise Levels (Leq) ranged from 37.9dB(A) at the Proposed Mining Site to 55.0dB(A) at Tweapease L/A Primary School compared with the GS value of 60dB(A) for a mixed use Area and 70dB(A) for WHO Guideline Value (Industrial, Commercial Shopping and Traffic Areas, Indoors and Outdoors) and WBG Guideline Value (Industrial, Commercial).
- The Lmax values recorded ranged from 49.1dB(A) at the Demarcated CMDC Site to 67.8dB(A) at Tweapease L/A Primary School.

3.2 Biological Environment

Terrestrial Flora

The project area lies in the South-East (MSSE) subtype of the Moist Semi-deciduous forest type of Hall and Swaine, 1981, and Taylor's Celtis-Triplochiton Association (Taylor, 1960). The Moist Semi-deciduous forest type is generally characterised by species such as *Leptaspis cochleata* (a forest grass), *Celtis mildbraedii, Nesogordonia papaverifolia*, *Culcasia angolensis, Griffonia simplicifolia, Calycobolus africanus, Microdesmis puberula* and *Baphia nitida*. Some of the trees in this forest type reach between 50 to 60 m in height and it is the most productive forest type in Ghana, with soils ideal for cultivation of cocoa and other food crops. Characteristic species of the South-East subtype are *Turraeanthus africanus, Daniellia ogea, Khaya ivorensis, Illigera pentaphylla, Pteris togoensis, Chytranthus macrobotrys* and *Cola nitida* (edible cola). All the tree species listed above are of economic importance.

The vegetation of the project site is a mosaic of farms, fallows/secondary thickets, secondary forests and riverine and freshwater swamp forests. The vegetation shows various successional stages due to human induced disturbances. Farms and fallows dominate the landscape (**Plates 3-3 and 3-4**). Crops such as Plantain (*Musa paradisiaca*), Cassava (*Manihot esculenta*), and vegetables are usually planted in admixture with the Cocoa. Oil palm (*Elaeis guineensis*) is also cultivated in plantations of varying sizes (**Plate 3-5**). Cola (*Cola nitida*) and Avocado pear (*Persea americana*) are also common in the Cocoa farms. The riverine forest is dominated by Raphia hookeri (**Plate 3-5 and 3-6**).

The Cocoa farms are interspersed with several large trees (most of which are merchantable timbers) making important repositories of flora diversity. Notable among the trees are *Pycnanthus angolensis* (Otie), *Terminalia superba* (Ofram), *Milicia excelsa* (Odum) and *Triplochiton scleroxylon* (Wawa). The fallows and secondary thickets develop on abandoned cocoa farms whereas secondary forest occurs on the slopes of the hills that border the concession. Depressions in the concession have poorly developed freshwater swamp vegetation with species such as *Raphia hookeri*. Appendix 1 shows the sample locations and descriptions of the local vegetation types encountered in the survey.

Plate 3-4:Food Crop Farm (Cassava and Plantain) in the Foreground of the Tweapease CMDC

Plate 3-5:Fallow Land/Secondary Thicket (Foreground) and Cocoa Farm with Isolated Trees (Background-Right)

Plate 3-6:Oil Palm plantation on the mine site

Plate 3-7:Riverine Forest Along the Bank of the Mamang River Dominated by *Raphia hookeri*

The detailed results of the flora survey carried out are summarised as follows:

- The flora survey recorded a total of 68 species in 64 genera belonging to 32 families (see **Annex 3-2**).
- The family Fabaceae dominated the flora with 11 species followed by Poaceae with 7 families, Moraceae with 5 species and Asteraceae and Euphorbiaceae with 4 species each.
- All other families were represented by less than 4 species each. These families together accounted for 45.6% of the species recorded.

Fauna Survey

Deforestation activities and hunting have affected the fauna in the project area. Animal species have depleted over the years although there is some wildlife in the nearby forest reserves. There are however a number of snakes, lizards and frogs. Insects include butterflies, dragonflies and grasshoppers. A few birds including hawks and doves were sighted in the nearby farms.

The interviews with some locals (**see Plate 3-7**) and literature available indicate that some of the common fauna existing in the project area are of national and global conservation concern. Appendix 4 is a list of some of the animals compiled from literature and interviews with farmers and hunters. Common birds encountered in the area include the Common Bulbul, Red-eyed Dove, African Green Pigeon, African Pied Hornbill, Red-bishop Village Weaver, Bronze Mannikin and Ahanta Francolin.

Plate 3-8: Interactions with a Hunter/ Farmer at Tweapease

3.3 Social Environment

This section describes the socio-economic characteristics of the project area.

Socioeconomic Conditions of the Project Community- Tweapease

Brief Profile of Tweapease: The Tweapease community in the Birim North Municipal is a farming community. A brief background history revealed that the land was sold by the Akwanteng's who were under Akyem rule to Shais and Gas. This community as a result has two chiefs, a Ga chief and a Dangbe chief. The town of about 2,000 inhabitants is dominated by Gas and Dangbes who form about 90% of the population. There are other tribes from across the country that form the minority. They migrated to the community purposely to engage in farming. There are Ewes, Akwapims and Northerners. Women here are engaged in the extraction of palm oil, a few others are artisans mostly into dressmaking and hairdressing. Men form about 57% of the population with women making up the other 43%. Christians form 70% of the population with Muslims forming the other 30%. The community has one Kindergarten and two Junior High Schools. These schools though not well resourced, is well attended by children of school going age. The issue of drop outs has also been reduced with the introduction of free school feeding program. Tweapease is bordered by Ntronan, Akaweni, Omanekrom and Akwanteng. Tweapease used to be an active galamsey community in the past but the community members

rejected the idea of the community becoming a galamsey site and thus drove most of the miners out of the community. However, there are others who clandestinely engage in the act in the community.

Demographics: Most of the community members are aged between the ages of 18 to 35 years (51%) depicting a broad base population pyramid which tapers off with a small number of elderly persons (6%).

Household Size, composition and structure: The community has roughly 850 households. The average household size in the community is 5 persons. Children constitute the largest proportion of the household structure.

Literacy and education: Of the population 11 years and older, 53% are literate and 47% are non-literate. The proportion of literate males is higher (52%) than that of females (48%).

Household Structures: People typically have as their primary residence a family home, which serves as the social and residential center of an extended family. Each extended family is typically composed of individuals from more than one related nuclear family, or household. In rural areas near the project, these extended family residences are termed "krom", meaning village and in urban areas near the project, these extended family residences are termed "efihyia" which means urban homestead. Residents of urban homesteads often possess farms in the surrounding rural areas. Sometimes, such persons also have farm houses ("akuraa") which they use seasonally and from time-to-time, for storage, to rest during the heat of midday, or for extended periods of "camping" at the farm. These farm houses are typically used by individuals of a nuclear family, or household. The residents, or habitual users, normally number about five persons.

Poverty level: According to Ghana Statistical Service's 2024 *Multidimensional Poverty* Report (which presents statistics on the proportion of the population that is multidimensionally poor, focusing on household size, sex, age, locality, education level, employment sector, and marital status) Tweapease ranked 17th among 20 communities in the Birim North Municipal[1] with a headcount ratio of 12.5. The proportion of the population living in multidi-mensional poverty in Birim North (18.3%). The dominant forms of deprivations are employment (15.8%), health insurance coverage (8.0%), and school lag (4.9%). It further revealed that households with ten or more members (27.2%) are most likely to experience multidimensional poverty, compared to households with one to four members (17.3%). Multidimensional poverty is also higher among households headed by females (23.2%) compared to males (15.6%).

Utilities: The main sources of lighting in dwelling units in the community is electricity. The main source of fuel for cooking for most households is firewood (70%), charcoal (20%) and gas (10%). The main sources of water in the settlement for domestic use is borehole; the community has 10 boreholes. Individual homes have ventilated pit latrines. The community has designated sanitary sites for open dumping located on the outskirts of settlements.

Agriculture: Palm and cocoa are the main cash crops. All other farming activity is on subsistence basis.

Land Ownership and Use: Land is owned by families, clans and chiefs (in trust for the people). The chiefs are however custodians of uncultivated lands. Thus, migrants will have to gain right to use the land through the chiefs. The family head could however give the right to the use of a relatively small piece of land but if large tracts of land are required the chief with jurisdiction over the entire land area gives the right to use (Dittoh, 2013). Land use rights in the project area vary between landlords and tenants. Generally, a *landlord* is a property holder who has exclusive rights to use or to dispose of use rights to land. Land use rights are typically acquired from traditional rulers and family heads or by inheritance and are disposed of otherwise by sale or to tenants. Tenants are persons or households with use rights to land as negotiated under a private agreement with landlords. Two types of tenants exist

[1] *This refers to the percentage of people who are multidimensionally poor. It is also called the headcount ratio.*

within the district: sharecroppers and caretakers. Sharecropping (the '*abunu*'/'*abusa*' system) is a specific type of land tenancy in which the landlord of a parcel of land extends farming rights for an agreed period of time. In the '*abunu*' system, the crops or revenue thereof is shared evenly between landowner and tenant. In the '*abusa*' system, crops or revenue thereof is shared such that one-third goes to the landowner and two- third to the tenant. This is a common practice determined through negotiation between the tenant and landlord and depends on the type of crops planted. A caretaker is someone who has been employed by either a landlord or sharecropper to take care of a particular farm (e.g., a cocoa plantation). The caretaker usually resides on or near the farm, and in exchange for cultivating the farm, receives a share of the proceeds from the sale of crops.

Mining: Larbi and Ntronang are major galamsey communities which are 20-30 minutes motorbike ride away from Tweapease. A few of the youth from Tweapease commute to these sites to engage in galamsey. Abehinase is another community close to Tweapease where galamsey used to be practiced. Focus group discussions revealed that majority (75%) of the miners are migrants from other regions, besides the Eastern. People from the Volta Region constituted the bulk (33%), followed by Ashanti region with 30%. Participants aged between 16 and 39 years formed 80% of the miners with women making up 10%. They migrated in search for job opportunities that were limited or non-existent in their respective regions of origin. The evidence suggests that only 10% of the mineworkers who double as food crop farmers visit their farms daily while an overwhelming majority (90%) work at the 'galamsey' sites daily.

Women in Mining: Women work at the mining site in two main capacities; those who sell food and those who directly participate in mining operations. The second group of women carry loads of materials on their heads from pits into heaps or trucks, some participate in washing sand. However, at the larger sites, women are found to perform a greater range activities, for example by setting up trading stalls, selling more foodstuff, water, electronic goods, various small items and credit for mobile phones. Some women are found doing washing, cleaning, cooking directly at the sites as well as working along men at pits. The galamsey sites near Ntronang and Noyem are day sites; where the majority of women carry loads of material and a small proportion sell food. At one of the sites near Ntronang, women are aged between 17 and 50, although the vast majority are between 23 and 35. Most have a basic education, few have finished secondary school, and several interrupted their education after primary school or junior secondary school in order to pursue employment. Few women also reported to have gone through vocational training. At some sites, women are organised in groups of 10-15 people to load trucks with ore or sand. Visits to galamsey sites proved that loading trucks with crushed ore and sand is predominantly women's job, while digging, crushing stones and washing is conducted by men. The more arduous and hazardous operations, including underground work and burning of amalgam are conducted by men.

Other economic activities: While men are involved in cash crop farming, many women find employment in petty trading of food stuff and clothing. It was revealed that agricultural labor becomes relatively scarce when the rainy season starts. In other words, agricultural labor force is lost to the mining sector. This was confirmed by responses from mineworkers who also double as food crop farmers. The evidence suggests that majority of the respondents who are also farmers spend more time at the mines than on their farms. The petty traders travel to other districts and towns to purchase products, sometimes as far as Accra and even Togo. There are no large supermarkets or large wholesalers in the area, therefore the prices are fairly high. Some women are also engaged in catering and food processing as means of bringing income to their households. They prepare local food dishes such as banku, fufu, kenkey and cooked plantain for sale at the local markets. With an abundance of palm fruit in the area, a popular engagement amongst women is production of palm oil, which is used in cooking (**see Plate 3-8**). A number of the women also possess skills in knitting, sewing, hairdressing, baking and other food processing.

Plate 3-9:Some Women Involved in Handling Palm Fruits for Processing

Health: It is widely acknowledged that labor in artisanal mines has increased risk of illness, injury and stress due to enhanced level of dust and noise pollution as well as extreme exertion from highly labor-intensive jobs (Hinton et al., 2004). It was observed that hard labor at galamsey camps poses high risk to the health of workers due to a total absence of basic mine safety. Most of them do not have protective gear such as helmets, masks, and gloves. Many of the miners interviewed complained about common problems associated with carrying loads such as headaches, waist, neck and back pains and minor injuries such as cuts and bruises. One of the most potent health risks in small-scale mining is exposure to mercury, which is used in processing the gold. Interviews with miners suggest that even though there is some level of knowledge concerning health hazards associated with mercury, there is overall absence of environmentally safe technologies and methods for recovering gold. The community also has a health center that serves surrounding communities like Sakapia, Domeabra, and Akwetey Shai. The top ten diseases that are reported to the center are malaria, anemia, upper respiratory tract disease, intestinal worm, dysentery, rheumatism and hypertension which are often referred to the district hospital. Medication for treatment of ailments is always in stock. Transporting referred patients remains the biggest challenge of the center.

Community Development Projects: The Hunger Project (THP) a global NGO dedicated to eradicating hunger has an Epicenter in the community. The Hunger Project epicenter is equipped with a clinic (**see Plate 3-9**).

Plate 3-10: The Hunger Project Epicenter and Clinic

Knowledge of the Project: During this engagement, the respondents made reference to an earlier EPA visit to brief the community about the program and also to educate them on the harmful effects of using mercury in the gold extraction process. They reiterated their appreciation and asked that the process of setting up the demonstration center be expedited. Others, however, expressed their apprehension. They claimed that similar exercises had been carried out in the past and nothing has been heard of it.

The Proposed Project Site: The area earmarked for the project is a one-acre land located about half a kilometer from the community. Though it is isolated from the community, there is a Methodist Church building and a residential home a few meters away. The land is currently being used for the cultivation of cassava, cocoyam, beans, maize, pepper, and oil palm (**see Plate 3-10**).

Plate 3-11: Site Earmarked for the Proposed Project

The farm belongs to one Eric Sarkordie, a 48-year-old farmer/herbalist.

Profile of affected Farmer – Eric Sarkordie

Name of PAP	Eric Sarkodie
Age	48 years
Home town	Nkoranza
Household size	9
Level of education	None
Occupation	Farmer/Herbalist
Number of years in community	9 years
Size of affected farmland	1 acre
Crops cultivated	Cocoyam, oil palm, cassava, maize, vegetable, and beans
Number of years farming in affected land	8 years
Land tenure	Usufruct conferred by father-in-law
Alternative farmland	No access to alternative land for farming
Estimated monthly household income	GHS 2,000
Estimated monthly household expenditure	GHS 1,500

4.0 STAKEHOLDER CONSULTATIONS, DISCLOSURE AND GRIEVANCE MANAGEMENT

The World Bank ESS and the Ghana Environmental Assessment Procedures for the conduct of ESIA/ EIA or ESMP/ EMP studies respectively require the involvement of all relevant stakeholders in the process. This is aimed at providing opportunities for especially Interested and Affected Parties (I&AP) e.g., Project Affected Persons (PAPs) and all public and private groups including local Non-Governmental Organizations (NGOs) with interest or concern for various aspects of the project to participate in the successful formulation and implementation of all aspects of the project.

4.1 Stakeholder Engagement Objectives

Stakeholder participation in project planning, design and implementation is now widely recognized as an integral part of ESMP preparation in order to assure project success. Local communities, their representatives, government, national and international NGOs may all be able to contribute to (and benefit from) dialogue directed at identifying and resolving key project-related issues.

The objectives of the engagement exercise are to:

- provide information related to the activities of the proposed project;
- facilitate and maintain dialogue,
- seek participation of all interested parties;
- identify stakeholder interests as well as issues including community concerns and expectations;
- support participation in the project decision-making process and design;
- create solutions for addressing any concerns and integrating them into project design, operations, and management; and
- enhance the project by learning from, and incorporating the expertise of individuals, professionals, communities and organizations.

4.2 Stakeholder Engagements Activities

A number of stakeholders have been identified and engaged (**see Annex 4-1**). Stakeholders engaged thus far included national, regional and district authorities, the Tweapease community mining committee.

4.3 Stakeholder Methodology and Tools

During the stakeholder engagement process the following information dissemination and data gathering tools and methodologies were adopted:

i. **Focus Group Discussions (FGDs):** FGDs were carried out with community members, and District Assembly Officials. Each group was engaged separately and asked a series of questions and requested to raise any issues of concern and expectations of the project.
ii. **Key Informant Interviews (KIIs):** Key informants interviewed included EPA staff at the PIU, Head Office and in the project area- New Abirem,
iii. **Telephone Interviews:** Some of the stakeholders were able to comment on the proposed project by means of telephone conversation e.g., e.g. the coordinator of the community mining project at Tweapease.

4.4 Stakeholder Identification and Engagements Activities

The Consultants identified and met with the relevant stakeholders (mostly the institutions and miners) to gauge their levels of interest as well as their concern for the environment and any social considerations. Both formal and informal discussions were held with individuals representing the institutions. Key Person Interviews (KPI) and Focus Group Discussions (FGD) were also adopted for meetings with miners. In addition, formal correspondences with other stakeholders were used.

The groups consulted include among others officials of:
- Leaders of the Community Mining at Tweapease;
- Environmental Protection Agency – Head Office, Accra;
- Birim North Municipal Assembly at New Abirem; and
- Tweapease Community- miners etc;

It is significant to note that not all the stakeholders consulted:
- provided comments on the proposed project;
- completed a stakeholder engagement form provided;
- could sign the stakeholder engagement form provided; and
- could be captured photographically.

4.5 Stakeholder Analysis and Prioritization

The stakeholders are grouped according to their roles, interests and influence on the project, as well as to the extent to which they will be negatively or positively impacted by the proposed project. The degree to which the identified stakeholders will be impacted by the project/ project and the level of influence of the stakeholders on the project outcome are rated as *low, medium or high* as defined hereunder.

Degree of Project Impact on Stakeholders
The impact of the project on the stakeholder is the extent of benefits or losses/ damages that the affected stakeholder will gain/ suffer due to project implementation, and are categorized as low, medium and high as provided below.

***Low*:** The project is assessed to have an insignificant (positive or negative) impact on the stakeholder.

Medium: The project will have measurable (positive or negative) impact on the stakeholder.

High: The project will have a significant (positive or negative) impact on the stakeholder.

Degree of Stakeholder Influence on Project Outcome
The degree of stakeholder influence on project outcome is the extent, ability or capacity of the stakeholder to positively influence project outcome (i.e., promote, facilitate or enable project implementation etc.) or negatively influence project outcome (i.e., delay, halt, prevent project implementation etc.).

Low: The stakeholder has minimal capability to positively or negatively influence the outcome of the project.

Medium: The stakeholder has measurable capability to positively or negatively influence the outcome of the project.

High: The stakeholder has significant capability to positively or negatively influence the outcome of the project.

The frequency of engagement and management of these stakeholder groups will then depend upon the level of priority placed on them. High priority stakeholders should be properly or carefully managed, engaged more often during project development and implementation than moderate and low priority stakeholders. **Table 4-1** describes the criteria for determining priority levels and **Table 4-2** provides the stakeholder analysis in more detail as far as the establishment of the Tweapease CMDC is concerned.

Table 4-1: Criteria for Determining Level of Priority

		Extent of Project impact on stakeholder		
		Low	**Medium**	**High**
Level of influence of stakeholder	**Low**	*Low priority*	*Moderate priority*	*High priority*
	Medium	*Moderate priority*	*Moderate priority*	*High priority*
	High	*High priority*	*High priority*	*High priority*

4.6 Stakeholder Engagement Strategy

Guiding Principles of the Stakeholder Engagement Strategy

The stakeholder engagement strategy for the proposed project is in accordance with the requirements of WBG's basic principles of good practice in stakeholder consultation, which states that a good consultation process should be:

- Targeted at those most likely to be affected by the project;
- Early enough to scope key issues and have an effect on the project decisions to which they relate;
- Informed as a result of relevant information being disseminated in advance;
- Meaningful to those consulted because the content is presented in a readily understandable format and the techniques used are culturally appropriate;
- Two-way so that both sides have the opportunity to exchange views and information, to listen, and to have their issues addressed;
- Gender-inclusive through awareness that men and women often have differing views and needs;
- Localized to reflect appropriate timeframes, context, and local languages;
- Free from manipulation or coercion;
- Documented to keep track of who has been consulted and the key issues raised;
- Reported back in a timely way to those consulted, with clarification of next steps; and
- Ongoing as required during the life of the project.

Engagement Strategy and Approach

The stakeholder engagement process begins at the preliminary stages during which this ESMP for the proposed project has been prepared, and would continue through to ESMP submission to EPA for permit and during project implementation. **Table 4-3** summarizes the proposed approach for stakeholder engagement.

Table 4-2: Stakeholder Identification and Analysis

No.	Groups of stakeholders	Stakeholder(s)	Role of Stakeholder/ Relation to the Project	Degree of project impact on stakeholder	Level of influence on project outcome	Level of Priority
1.	Project Proponents and Partners	AEHPMP- PIU	❍ Accountable entities responsible for successful implementation of the project including design, construction and operation of the CMDC at Tweapease	High	High	High
2.	Regulatory Agencies	EPA	❍ The Agency will issue a permit for the construction and operation of the facility and will monitor the project to ensure compliance to the permit conditions and adherence to the Environmental Assessment Regulations, 1999 (LI 1652).	High	High	High
		Ghana National Fire Service (GNFS)	❍ To provide fire permit /certificate for the CMDC at Tweapease and any work camp to be established by the contractor	Medium	Medium	Moderate
		Mines Inspectorate Division (MID) of the Minerals Commission (MC)	❍ To provide Mining Service Operating Permit for the CMDC at Tweapease and other service providers during construction and operations of the Project	Medium	Medium	Moderate
3	Relevant Government Agencies/ Institutions	Lands Commission (LC)	❍ Will assist the PIU for registration of the land for the Tweapease CMDC	Medium	Medium	Moderate
4	Right of Way Users/Utility Companies	Electricity Company of Ghana (ECG)	❍ May have to extend power to the Tweapease CMDC	Medium	Medium	Moderate
5	Administrative/Local Government Authorities	The Municipal/ District Assemblies	❍ The proposed sub project is within the jurisdiction of the Birim North Municipal. ❍ The District Assemblies are responsible for the political administration and issuance of development permits. Will provide business registration license for the Contractor to operate in that MMDA. ❍ The Birim North Municipal Assembly will provide development permit for the CMDC at Tweapease during construction and a Business Operating Permit (BOP) during its operations ❍ Will be involved with grievance resolutions	High	Medium	High
6	Traditional Authorities and local communities	Traditional Councils or relevant stools (Paramount chiefs/ community chiefs and elders)	❍ Traditional Councils in the MMDAs/ Towns are the original traditional landowners and have traditional/ cultural oversight of local communities.	Medium	High	High

No.	Groups of stakeholders	Stakeholder(s)	Role of Stakeholder/ Relation to the Project	Degree of project impact on stakeholder	Level of influence on project outcome	Level of Priority
			❍ Traditional Councils facilitates development and resolution of conflicts/ disputes among community members.			
		Local communities	❍ Local people may not get access to the land to be used for the Tweapease CMDC and restrict them from accessing any ecosystem services the land and its resources may offer them.	Low	Low	Low
7	NGOs/ CBOs	NGOs	❍ Support to EPA to ensure implementation of the Tweapease CMDC.	Medium	High	High
		Mass media	❍ Responsible for information dissemination, communication and education of the general public and local communities through electronic and print media	Medium	High	High
		General public/ citizenry	❍ People interested in the Tweapease CMDC	Low	Low	Low
			❍ The portion of the public that will be affected by the proposed project	Low	Low	Low
			❍ The portion of the public that will benefit from the Tweapease CMDC	Medium	Medium	Moderate

Table 4-3: Stakeholder Engagement Strategy/ Plan for the Project

No.	Activity	Identified Stakeholder(s) Groups	Focus of Consultation/ Information to be shared and or discussed	Timelines/ Frequency	Forms of communication/ method of engagement	Facilitator/ Responsibility
1.	Consultations for the preparation of ESMP for the proposed Tweapease CMDC	❍ Environmental Protection Agency (EPA) ❍ LVD of Lands Commission ❍ Project affected persons/ institutions ❍ Birim North Municipal Assembly ❍ Selected opinion leaders from the Tweapease area ❍ Selected NGOs	❍ Potential environmental and social issues of concern from the proposed Tweapease CMDC implementation ❍ Compliance with EPA and WB requirements ❍ Suggestions for mitigating the potential adverse impacts and successful maintenance of the project facilities during operation ❍ Public and occupational health and safety at construction sites	During the ESMP study period	❍ One on one Interviews ❍ Focus group discussions (FGD) ❍ Field visitations ❍ Sharing and review of relevant reports ❍ Email and phone calls	ESMP Consultant
2.	Draft ESMP Consultations and Disclosure	❍ Opinion Leaders from Tweapease Area ❍ Project Affected Persons (PAPs)/ I&APs	❍ Feedback on issues and concerns raised during the ESMP preparation ❍ Changes in the project designs	After Submission of draft ESMP to EPA- PIU	❍ Draft ESMP notification in a national daily newspaper	ESMP Consultant EPA- PIU

No.	Activity	Identified Stakeholder(s) Groups	Focus of Consultation/ Information to be shared and or discussed	Timelines/ Frequency	Forms of communication/ method of engagement	Facilitator/ Responsibility
		❍ Key institutional stakeholders engaged during the preparation of the ESMP ❍ Birim North Municipal Assembly ❍ Traditional Authorities	❍ Presentations on findings from the ESMP study including proposed mitigation measures, grievance redress arrangements ❍ Receiving of comments from participants and potentially affected people/I&APs and responding to comments.		❍ Public engagement forum	
3.	Disclosure of the final ESMP.	❍ Birim North Municipal Assembly ❍ Relevant Regulatory Bodies ❍ Traditional authorities/ councils ❍ Mass Media ❍ Selected NGOs	❍ Make available copies of the approved ESMP	After Issuance of the environmental permit for the Project by EPA	❍ Publication of the approved ESMP to inform the public where they can access the document ❍ Deliver hard and/or soft copy of the approved ESMP to relevant stakeholders	ESMP Consultant EPA- PIU
4.	Pre – mobilization/ Site preparation prior to construction	❍ Birim North Municipal Assembly ❍ Relevant Regulatory bodies including MID of MC and GNFS ❍ Utility companies e.g., ECG ❍ PAPs/ I&APs ❍ Traditional authorities/ local communities ❍ Selected NGOs	❍ Information on schedule of preparation and construction works ❍ Awareness creation on the potential impacts and remedial measures to PAPs/ I&APs) ❍ Integration of the ESMP into planning for construction (impacts and mitigation measures) ❍ Grievance redress procedures	At least 2- 3 months prior to construction	❍ Sharing of relevant reports ❍ Institutional / PAPs notifications via mass media.	EPA- PIU
5.	Start of construction	❍ Birim North Municipal Assembly ❍ Relevant Regulatory bodies including MID of MC and GNFS ❍ Utility companies e.g., ECG ❍ PAPs ❍ Traditional authorities/ local communities ❍ Selected NGOs ❍ Contractor	❍ Information on Schedule of construction works, activities and progress of construction ❍ Awareness creation on the potential impacts and mitigation measures ❍ Sensitization on ESMP Implementation (impacts and mitigation measures) ❍ Code of Conduct for Contractor ❍ Grievance redress mechanism	Throughout the construction period	❍ General stakeholder meetings for Consultants and Contractor ❍ Notification and sensitization via mass media.	AEHPMP- PIU
6.	End of construction /	❍ Birim North Municipal Assembly	❍ Information on Schedule of decommissioning works, activities and progress of decommissioning	Decommissioning phase	❍ General stakeholder	AEHPMP- PIU

No.	Activity	Identified Stakeholder(s) Groups	Focus of Consultation/ Information to be shared and or discussed	Timelines/ Frequency	Forms of communication/ method of engagement	Facilitator/ Responsibility
	Decommissioning of construction equipment and machinery	❍ Relevant Regulatory bodies including MID of MC and GNFS ❍ Utility companies e.g., ECG ❍ PAPs/ I&APs ❍ Traditional authorities/ local communities ❍ Selected NGOs ❍ Contractor	❍ Awareness creation on the potential impacts and mitigation measures to stakeholders ❍ Grievance redress mechanism		meetings for Contractor and EPA- PIU ❍ Community/ ❍ Institutional notification and sensitization via mass media.	
7.	Commissioning and handing over	❍ Birim North Municipal Assembly ❍ Relevant Regulatory bodies including MID of MC and GNFS ❍ Utility companies e.g., ECG ❍ PAPs/ I&APs ❍ Traditional authorities/ local communities ❍ Selected NGOs	❍ Relevance of the project ❍ Roles and responsibilities during operation and maintenance (O&M)	Commissioning	❍ Public durbar / meeting	AEHPMP- PIU

4.7 Stakeholder Engagements Held, Issues or Concerns Raised and Information Received

A number of public stakeholders have been consulted for the establishment of the CMDC at Tweapease. As much as possible, the community/ opinion leaders, EPA officials and officials of the Municipal/ District Assembly were interviewed/ consulted. **Plate 4-1** show consultations with the Community Mining Leaders at Tweapease among others. The detailed consultation outcome with names, contact of persons engaged, designation etc. has been provided in **Annex 4-1**.

The following are highlights of the key issues/concerns raised by stakeholders/ I&APs during the consultations:

- The opinion leaders wanted to establish whether compensation will be provided for the chiefs for use of the land for the project.
- The loss of agricultural land to small scale mining.
- The role of health professionals in the project.
- The youth are eager to have employment in the CMDC to be established at Tweapease and concerns about crime rate in the town when the project takes off.

Adequate responses to the consultees were provided by the Consultant as much as possible. A summary of how the issues have been addressed in the ESMP is provided hereunder:

- The need for the project to be taken through environmental assessment leading to the acquisition of an Environmental Permit from EPA and for the project to have a no objection from the World Bank is provided in sections 5.1 and 7.5 as well as in Tables 5-5, 6-1 and 7-1. That these processes require some time for construction of the project to commence.
- Tables 5-6 and 5-7 in the section on identification of potential environmental and social issues (Section 5.3) provides adequate assessment of the impacts/ risks.

Social Acceptability of Project

The Tweapease Mine is yet to start pending the establishment of the CMDC at Tweapease to enable them process the ore without mercury use. They are thus generally receptive and open for discussion on the need to eliminate mercury in their mining operations. All stakeholders from both government agencies and local groupings and community leaders the consulting team interacted with showed strong need for improvement of their mining and gold processing needs and are very willing to work and cooperate with the AEHPMP-PIU to implement the proposed interventions. They are therefore prepared to make concessions and sacrifices that may be necessary during the project construction and operation.

(a) Meeting with Opinion Leaders of Tweapease

(b) Meeting with Oppinion Leaders of Tweapease

(c)Engagement with the Opinion Leaders at the proposed Tweapease Mine Site

(d) Engagement with Opinion Leaders at Tweapease

Plate 4-1:Consultation with community mining leaders and miners at Tweapease

5.0 ASSESSMENT OF POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS AND RISKS, AND ALTERNATIVE ANALYSIS

This chapter presents environmental and social impacts and risks that are likely to result from the implementation of the CMDC at Tweapease as a result of the interaction between the project components and the environmental and social elements. The method employed for the impacts and risk assessment/ evaluation has also been provided under this chapter.

Overall, the preconstruction, construction, operation and decommissioning phases of the proposed project at the Tweapease may result in a number of potential environmental and social impacts and risks. These potential impacts could be positive, negative or neutral for which the adverse ones should be mitigated and the positive ones enhanced, and they have all been addressed in this ESMP.

5.1 Specific Project Activities of Environmental and Social Concern

The potential environmental and social impacts and risks are evaluated under the four phases of activities and interventions. The phases are as follows:

- Pre-construction Phase;
- Construction Phase;
- Operational Phase; and
- Decommissioning Phase.

Preconstruction Phase

The activities to be carried out at the preparatory or pre-construction phase prior to the implementation of the project include:

- Clearing of the Tweapease project site (0.96 acres) including site preparation, collection and disposal of vegetal wastes to make way for the actual construction and related activities;
- Mobilization of construction materials and equipment to the construction site;
- Continued stakeholder engagement and sensitization activities;
- Acquisition of statutory permits e.g., Environmental Permit from EPA, Developmental Permit from Birim North Municipal Assembly and ting activities; and
- Pegging the exact boundaries of the project site.

Constructional Phase Activities

The major constructional phase activities to potentially impact on the biophysical and social environments include the following among others:

- Removal of tree stumps and further clearing of the project site;
- Excavation and civil works for the foundation of the CMDC structure and facilities;
- Haulage of construction materials to the project site;
- Collection, transportation, and disposal of construction waste- i.e., vegetal waste and spoil;
- Environmental and social impacts mitigation measures implementation and monitoring including health and safety measures, Gender Based Violence (GBV) and Code of Conduct for the construction workers; and
- Grievance redress.

Operational Phase Activities

The operational activities that have potential to result in environmental and social impacts include the following:

- Handling and disposal of wastewater/ effluent generated during the process in accordance with the applicable Ghana Standards for the Gold Mining Sector- Quarry and Mining Industry;
- Environmental quality assurance/monitoring (effluent quality monitoring, water quality monitoring of the Mamang stream;
- Dust
- Facility Maintenance and repair works;

- Insects/ Pest management e.g., termites;
- Materials management and storage;
- Provision of security services; and
- Solid waste management including hazardous waste

Decommissioning Phase

The main decommissioning phase activities to potentially impact on the environment consist of the following:

- Post-construction activities including the demobilisation of construction equipment, dismantling of construction site offices/ work camps, etc, and
- Post operational activities including abandoning or removal of the CMDC at Tweapease.

Decommissioning of the CMDC at Tweapease following the expiration of its design life or for massive improvements may impact on public and occupational health and safety, noise and air quality.

5.2 Impact Assessment/ Evaluation Approach

Impact Identification and Characterization

Impacts are described in terms of their characteristics, including the impact's type and the impact's spatial and temporal features (extent, duration, scale and frequency). The definitions of the terms used are described in **Table 5-1.**

Table 5-1: Impact Characteristics

	Definition	Terms
Type	A descriptor indicating the relationship of the impact to the project (in terms of cause and effect).	**Direct** - Impacts that result from a direct interaction between the project and a resource/receptor (e.g., between occupation of a plot of land and the habitats that are affected). **Indirect** - Impacts that follow on from the direct interactions between the project and its environment as a result of subsequent interactions within the environment (e.g., viability of a species population resulting from loss of part of a habitat as a result of the project occupying a plot of land). **Induced** - Impacts that result from other activities (which are not part of the project) that happen because of the project. **Cumulative** - Impacts that arise because of an impact and effect from the project interacting with those from another activity to create an additional impact and effect.
Duration	The time over which a resource/ receptor is affected.	**Temporary** - (period within 1 year -negligible/associated with the notion of reversibility) **Short term** - (period of up to 3 years i.e., construction period or production ramp up period) **Medium term** -(period of more than 3 years to 10 years) **Long term** - (period of more than 10 years and less than 20 years i.e., life of facility) **Permanent** - (a period that exceeds the life of the facility – i.e., irreversible. Or may last for a very long time)
Extent	The reach of the impact (i.e., physical distance an impact will extend to)	**On-site** - impacts that are limited to the project site. **Local** - impacts that are limited to the project site and adjacent properties. **Regional** - impacts that are experienced at a regional scale, i.e., beyond adjacent properties, covering the district and beyond **National** - impacts that are experienced at a national scale. **Trans-boundary/International** - impacts that are experienced outside of Ghana
Scale	Quantitative measure of the impact (e.g., the size of the area damaged or impacted; the fraction of a resource that is lost or affected, etc.). or the professional viewpoint of the measure of impact	Quantitative measures as applicable for the feature or resources affect/ professional viewpoint of expert as applicable for the feature or resource in terms of severity of impact measure (i.e., minor, moderate, severe)

	Definition	Terms
Frequency	Measure of the constancy or periodicity of the impact.	No fixed designations; intended to be a numerical value or a qualitative description, e.g., intermittent, once, daily, annually, continuous etc
Likelihood	Characteristic that pertains to unplanned events determined either qualitatively or quantitatively estimated on the basis of experience and/or evidence that such an outcome has previously occurred.	**Unlikely** – The event is unlikely but may occur at some time during normal operating conditions. **Possible** – The event is likely to occur at some time during normal operating conditions. **Likely** - The event will occur during normal operating conditions (i.e., it is essentially inevitable).

Determining Impact Magnitude

Once an impact's characteristics are defined, the next step in the impact assessment phase was to assign each impact a 'magnitude'. Magnitude is typically a function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

- Extent;
- Duration;
- Scale; and
- Frequency.

Magnitude (from small to large) is in practice a continuum, and evaluation along the spectrum, requires the exercise of professional judgment and experience. Each impact was evaluated on a case-by-case basis, and the rationale for each determination noted. The universal magnitude designations, for negative effects, are: negligible, small, medium and large. The magnitude designations themselves are universally consistent, but the definition for the designations varies by issue.

Determining Receptor Sensitivity

The other principal step necessary to assign significance for a given impact is to define the sensitivity of the receptor. There are a range of factors taken into account when defining the sensitivity of the receptor, which may be physical, biological, cultural or human. The sensitivity of receptor used is low, medium and high as shown in **Table 5-2**.

Table 5-2: Sensitivity Criteria

Value / Sensitivity	Low	Medium	High
Biological and Species Value / Sensitivity Criteria			
Criteria	Not protected or listed as common/ abundant; or not critical to other ecosystem functions (e.g., key prey species to other species).	Not protected or listed but may be a species common globally but rare in Ghana with little resilience to ecosystem changes, important to ecosystem functions, or one under threat or population decline.	Specifically protected under Ghana legislation and/or international conventions e.g., CITES listed as rare, threatened or endangered e.g., IUCN
Socio-Economic Sensitivity Criteria			
Criteria	Those affected are able to adapt with relative ease and maintain pre-impact status.	Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.	Those affected will not be able to adapt to changes and continue to maintain-pre-impact status.
Physical Sensitivity Criteria			
Criteria	The resource remains unaffected and maintains pre-impact status.	Pre-impact status is temporarily altered. May be restored over time naturally or through specific interventions.	Pre-impact status is permanently altered by the development. Receptor or resource is held in high-esteem by stakeholders

Assessing Significance

Once magnitude of impact and sensitivity of a receptor have been characterised, the significance can be determined for each impact. The impact significance rating was determined, using the matrix provided in **Table 5-3.** The definitions or explanations of the impact significance assessment rating is provided in **Table 5-4.**

Table 5-3: Impact Significance Rating Matrix

		Sensitivity / Vulnerablity of Resource / Receptor		
		Low	Medium	High
Magnitude of Impact	Negligible	Negligible	Negligible	Negligible
	Small	Negligible	Minor	Moderate
	Medium	Minor	Moderate	Major
	Large	Moderate	Major	Major

Table 5-4: Definition of the Impact Significance Assessment Rating

Rating	Impacts
Negligible	○ Impacts that are hardly distinguishable from background conditions and expected development in a no-project situation ○ Impacts very unlikely to happen
Minor	○ Impacts of low intensity, limited in scale (site-specific) and low/medium duration (temporary) ○ Impacts unlikely to happen and/or the sensitivity of the receiving environment is very low and/ or project designs have installed sufficient control mechanisms ○ impacts can be mitigated and minimized to a negligible level through the adoption of good practice, continuous improvement and optimization measures
Moderate	○ adverse impacts on people and/or environment of medium intensity, which may have a regional spatial scale of influence or a long-term duration ○ impacts that are measurable and able to change some characteristics of the receptor/ resource, but not to generate irreversible, unprecedented or multiple adverse effects or damage ○ impacts can be avoided, managed and/or mitigated with relatively uncomplicated accepted measures
Major	○ significant adverse impacts on human populations and/or environment, high in intensity and/or spatial extent (e.g. large geographic area, large number of people, transboundary impacts, cumulative impacts) ○ permanent and/or irreversible impact ○ areas impacted include areas of high value and sensitivity (e.g. valuable ecosystems, critical habitats) ○ impacts may give rise to significant social conflict ○ impacts may not always be reduced by implementing mitigation measures. In this case, further options have to be considered in order to avoid any critical significance driven by the project (analysis of alternative strategy). Therefore, significant resources or fundamental changes in the activities and systems are required where necessary.

5.3 Identification of Potential Environmental and Social Impacts

Identified potential environmental and social impacts are outlined under the four main phases of the project activities; preconstruction, construction, operation and decommissioning phases.

Potential Positive Environmental and Social Impacts for the Pre-construction Phase

The positive impacts from the preparatory phase activities include:

- Awareness on impacts and risks of mercury use in ASGM in Tweapease area;
- Employment and business opportunities in ASGM in Tweapease area;

- Improvement in local economy; and
- Improved institutional revenue.

The positive impact assessment for the pre-construction phase is summarised in **Table 5-5**.

Positive Environmental and Social Impacts of Construction Phase

The potential positive impacts from the construction phase activities include:

- Construction health and safety education and awareness in Tweapease;
- Employment opportunities;
- Improvement in local economy;
- Improved Institutional coordination in the mining sector; and
- Increase in institutional and national revenue.

The positive impact assessment summary for the construction phase is provided in **Table 5-6**.

Positive Operational Phase Environmental and Social Impacts

The positive impacts or benefits from the operational phase activities include but not limited to the following:

- Enhanced Image of Tweapease as a model mercury free mining area;
- Improved health of miners and community members;
- Employment of some community members at the CMDC at Tweapease; and
- Improvement in local and national economy.

The positive impact assessment for the operational and maintenance phase is summarized in **Table 5-7**.

Table 5-5: Positive Impacts and Risks Assessment Matrix for the Pre-Construction Phase

Impact / Risks	Description of Risks and Impact	Impact Characteristics							Receptor	Sensitivity	Significance of Impact
		Type	Duration	Extent	Frequency	Likelihood	Scale	Magnitude			
Environment and Social											
Awareness on impacts and risks of mercury use in ASGM in the Tweapease area	The consultation process will create awareness on the risks and impacts in ASGM on the Tweapease CMDC site	Direct	Long-term	Local	Once	Likely	Moderate	Medium	Stakeholders	Medium	Moderate
Employment and business opportunities in ASGM in the Tweapease area	Some local consultancy companies as well as individual Ghanaian specialists will be contracted to carry out various studies/surveys (e.g. topographic surveys, geotechnical investigations, architectural and engineering designs, ESIA study etc) and these will create jobs for local firms or Ghanaian individuals.	Direct	Long-term	National	Once	Likely	Moderate	Medium	Local Firms involved in the project	Medium	Moderate
Improvement in local economy	The hospitality industry as well as the car rental service providers will also benefit, which will improve their businesses.	Direct	Long-term	Local	Once	Likely	Moderate	Medium	Birim North Municipal	Medium	Moderate
Improved institutional revenue	The various regulatory bodies will charge processing and permit fees (e.g., EPA, Lands Commission, GNFS, Municipal Assemblies etc) in providing approvals or permits for project facilities and implementation. These fees will improve the revenue base of these institutions.	Indirect	Long-term	National	Once	Likely	Moderate	Medium	Institutions involved in the project	Medium	Moderate

Table 5-6: Positive Impacts and Risks Assessment Matrix for the Construction Phase

Impact / Risks	Description of Risks and Impact	Impact Characteristics							Receptor	Sensitivity	Significance of Impact
		Type	Duration	Extent	Frequency	Likelihood	Scale	Magnitude			
Environment and Social											
Construction health and safety education and awareness in the Tweapease area	The construction workers will gain knowledge from the project on construction health and safety through awareness creation workshops/ talks	Direct	Long-term	Local	Once	Likely	Moderate	Medium	Stakeholders	Medium	Moderate
Employment and business opportunities	The contractor will employ some local labor for the works	Direct	Long-term	National	Once	Likely	Moderate	Medium	Local Firms involved in the project	Medium	Moderate
Improvement in local economy	The contractor will be encouraged to purchase some materials from the local market to shorten the supply time and reduce cost of materials such as sand, aggregates, stones, rocks, cement, fuel, water and spare parts of equipment. Local individuals/traders will also bring their goods and food items near construction sites to sell and this will generate income for the local people.	Direct	Long-term	Local	Once	Likely	Moderate	Medium	Birim North Municipal	Medium	Moderate
Improved Institutional Coordination in the Mining Sector	The coordination between institutions in the mining sector e.g., EPA, Minerals Commission, and those responsible for contractor registration etc is expected to improve	Direct	Long-term	National	Once	Likely	Moderate	Medium	Birim North Municipal	Medium	Moderate
Improved institutional revenue	Revenue will accrue to the State in the form of tax deductions from wages of workers and Contractor fees.	Indirect	Long-term	National	Once	Likely	Moderate	Medium	Institutions involved in the project	Medium	Moderate

Table 5-7: Positive Impacts and Risks Assessment Matrix for the Operation and Maintenance Phase

Impact / Risks	Description of Risks and Impact	Impact Characteristics							Receptor	Sensitivity	Significance of Impact
		Type	Duration	Extent	Frequency	Likelihood	Scale	Magnitude			
Environment and Social											
Enhanced Image of the Tweapease area as a model mercury free mining area	The activities of the CMDC at Tweapease will enhance the image of the Tweapease area as a mercury free mining area as other small scale miners will embrace the mercury free technology in their operations	Direct	Long-term	Local	Once	Likely	Moderate	Medium	Stakeholders	Medium	Moderate

Improved health of miners and community members	The miners who hitherto uses mercury in their operations will avoid any health impact from mercury usage	Direct	Long-term	National	Once	Likely	Moderate	Medium	Local Firms involved in the project	Medium	Moderate
Employment of some community members at the CMDC at Tweapease	Some community members in the project area will gain employment at the Tweapease CMDC	Direct	Long-term	Local	Once	Likely	Moderate	Medium	Birim North Municipal	Medium	Moderate
Improvement in local and national economy	Revenue will accrue to the State in the form of tax deductions from wages of workers of the Tweapease CMDC.	Indirect	Long-term	National	Once	Likely	Moderate	Medium	Institutions involved in the project	Medium	Moderate

5.4 Potential Negative/Adverse Environmental and Social Impact Evaluation

The potential negative/adverse impact evaluations for the preparatory/pre-construction, construction, operational and decommissioning phases of project implementation are assessed in **Tables 5-8, 5-9 and 5-10.**

Table 5-8: Adverse Impacts and Risks Assessment Matrix for the Pre-Construction Phase

Impact / Risks	Description of Risks and Impact	Impact Characteristics							Receptor	Sensitivity	Significance of Impact
		Type	Duration	Extent	Frequency	Likelihood	Scale	Magnitude			
Environment and Social											
Preconstruction Waste Generation and Management	Site preparation for construction to start	Direct	Short-term	Local	Once	Possible	Moderate	Medium	Technical and Consulting Teams	Medium	Moderate
Project Landtake/ Ease of Access to Project Land	The CMDC at Tweapease is a 0.96 acre site and restricted to only one location on the site. The land is currently being farmed and compensation payment is expected by the landowner and the chiefs	Direct	Long-term	Local	Once	Likely	Moderate	Medium	Users of the land	Medium	Moderate
Anxiety on the part of Miners, Institutions and Potential Users of the CMDC at Tweapease	Lack of awareness and anxiety on the part of Miners, Institutions and Potential Users of the CMDC at the Tweapease site as preconstruction activities e.g., surveys, assessments, stakeholder engagements etc are ongoing	Indirect	Short-term	Regional	Intermittent	Possible	Moderate	Medium	Landowners/ Tweapease Community	Medium	Moderate
Risk of Not Acquiring all Permits	The project is funded by the World Bank, hence there should be a "No Objection" from the bank. The project is required to obtain an Environmental Permit for the project and also a developmental permit from the Birim North Municipal Assembly among others. However, the preparation of this ESMP is to provide the basis of obtaining the World Bank "No Objection" and also an Environmental Permit from EPA	Indirect	Short-term	National	Annually	Possible	Moderate	Medium	Contractor, World Bank, Government and People of Ghana	Medium	Moderate
Occupational Health and Safety Concerns/ Risks	Exposure of technical teams carrying out topographical, geotechnical, and environmental baseline surveys to stepping on sharp objects e.g., broken nails and bottles, and bites from insects and dangerous reptiles e.g., snakes, scorpions and insects e.g., tsetse flies, bees and ants is possible	Direct	Short-term	Regional	Intermittent	Possible	Moderate	Medium	Technical/ Consulting Teams	Medium	Moderate

Table 5-9: Adverse Impacts and Risks Assessment Matrix for the Construction Phase

Impact / Risks	Description of Risks and Impact	Impact Characteristics							Receptor	Sensitivity	Significance of Impact
		Type	Duration	Extent	Frequency	Likelihood	Scale	Magnitude			
Environment and Social											
Air Quality Deterioration	Emissions from machinery and vehicles is expected to deteriorate the air quality in the project area, which may affect the health of workers and the community members. However, the site is not close to any residential facility	Direct	Short-term	Local	Intermittent	Likely	Moderate	Medium	Workers, Community Members	High	Major
Vibration and Noise Nuisance	Excavation, construction and installation works in general and transportation activities to and from the site will all create noise nuisance due to site preparation, transportation of materials/ equipment, piling, blowing of horns from vehicles/ equipment etc. However, the site is not close to any residential facility	Direct	Short-term	Local	Intermittent	Likely	Moderate	Medium	Users of the land	High	Major
Loss of Vegetation and Effect on Flora and Fauna	The clearing, excavation and construction activities will destroy/displace limited habitats of fauna such as small mammals, rodents, reptiles, insects and nesting birds. No large mammals will be affected.	Direct	Temporary	Local	Once	Likely	Minor	Small	Flora and Fauna	Medium	Minor
Surface Water Pollution	The Mamang stream draining Tweapease area is perennial and carries runoff water from the Tweapease community and its environs. It is circa 50m from the project site. There is the potential for silt to be carried from the project site into the stream channel during construction	Direct	Short-term	Local	Intermittent	Likely	Minor	Small	Mamang stream	Medium	Minor

Impact / Risks	Description of Risks and Impact	Impact Characteristics							Receptor	Sensitivity	Significance of Impact
		Type	Duration	Extent	Frequency	Likelihood	Scale	Magnitude			
	if works are carried out during rain events/ rainy season										
Fire Outbreaks	Aside electrical fires and arson, fire outbreaks will be less encountered	Direct	Short-term	Local	Once	possible	Minor	Small	Flora and Fauna, Tweapease Facilities	Medium	Minor
Land degradation and effect on soil resources	Without adequate protection measures, during heavy rainfalls and windy occasions, soil erosion could occur on the excavated Tweapease CMDC site for construction. Soil contamination will occur if spillages of fuel/oil occur from construction equipment during the works.	Direct	Temporary	Local	Intermittent	Likely	Moderate	Medium	Tweapease CMDC site	Medium	Moderate
Waste Generation and Sanitation Concerns	Waste to be generated includes spoil or excavated material from the Tweapease CMDC site, biomass from clearing activities within the site, general waste including food wastes, water and food packaging/ containers, waste from maintenance of equipment/machinery such as waste oils, scrap metals, concrete waste among others. The construction activities will lead to significant generation of solid waste. In addition to solid waste, the construction workers will also generate liquid waste/ wastewater in the form of urine and faecal matter. The generation and management of both solid and liquid waste during the construction period is of significant sanitation concern. The use of containers for the CMDC will however lessen the construction waste to be generated.	Direct	Temporary	Local	Daily	Likely	Moderate	Medium	Tweapease CMDC Site and Waste Disposal Site at Tweapease	Medium	Moderate
Visual Intrusion/ Attraction	Site preparation and civil works/ general construction activities, movement of materials and equipment/machines to and from the project site and the presence of vehicles, trucks, construction equipment, and workers will attract the attention of locals. Heaps of excavated material, stockpiles of aggregates, sand and gravels, as well as the parking of construction machinery and trucks will intrude into the visual quality of the area. However, the location of the Tweapease site will be such that visual intrusion will be lessened.	Direct	Temporary	Local	Once	Likely	Moderate	Small	Miners, Tweapease Community Members	Medium	Minor
Labor Influx	Job seekers, mainly unskilled youth and some skilled persons will throng the Tweapease CMDC Site to look for employment and may end up engaging in illicit behaviors in the communities as the character of these people may not be known. However, being a major mining area, such labor influx impacts may not be significant	Direct	Short Term	Local	Intermittent	Likely	Moderate	Small	Tweapease community and surroundings	Medium	Minor
Occupational Health and Safety and Labour Issues	Workers will be exposed to risks during construction works. The risks include hazards from operation of construction machinery/ equipment, transportation of construction materials, inhalation of dust and fumes, noise from machinery, accidents from falling objects, cuts, slips, fall from high heights etc. Unhygienic working conditions, discriminatory practices, engagement of child labor could bring about social and labor conflicts and may trigger labor rights concerns. Poor management of waste and improper housekeeping could significantly affect safety in the workplace. The improper handling of hazardous materials such as lubricants is also a health threat to workers.	Direct	Short Term	Local	Daily	Likely	Moderate	Medium	Construction workers	High	Major

Impact / Risks	Description of Risks and Impact	Impact Characteristics							Receptor	Sensitivity	Significance of Impact
		Type	Duration	Extent	Frequency	Likelihood	Scale	Magnitude			
	There is also risk of exposing the workers to dangerous reptiles such as snakes. However, construction workers will be provided with appropriate Personal Protective Equipment (PPE) such as hard boots, gloves, hard hats, etc. to wear to safeguard their health and safety during the works. Furthermore, the contractor will be required to prepare and implement a health and safety strategy for the works which will be enforced by the supervising consultant and the AEHPMP-PIU										
Community Health, Safety and Security	Dust and noise impacts on residents may be minimal as no residences are close to the Tweapease site. Construction activities may result in the movement of workers, mainly able-bodied young men, to the project area in search of job opportunities. The influx of these workers during the construction period may promote irresponsible sexual behavior which could lead to teenage pregnancies, HIV/AIDS and other STD infections and serve as a public health concern. The influx of labor into the Tweapease community will be a security concern for the local people. Thieves may take advantage as job seekers to also come into the community to steal or rob residents and workers.	Direct	Short Term	Local	Intermittent	Likely	Moderate	Small	Tweapease community and the miners/ construction workers	High	Moderate
Impact on socioeconomic norms or taboos	Field investigations indicate that no shrine, cemeteries or sacred groves will be affected under this project.	Direct	Short-term	local	-	Likely	Moderate	Medium	Tweapease Community	High	Major
Emergency events such as fires and workplace accidents	The use of construction machinery, presence of fuel, and misconduct of workers such as improper disposal of cigarette butts after smoking, or creating naked fire or burning at or near the construction sites can cause unfriendly fires. Vehicular accidents can occur during transport of materials to the project site. Workplace and vehicular accidents can cause serious injurious to workers or medical emergencies for that matter.	Direct	Temporary	Local	Intermittent	Possible	Moderate	Medium	Workers, road users, miners	Medium	Moderate
Sexual Exploitation and Abuse (SEA)/ Sexual Harassment (SH) Risks	SEA/ SH pose significant risk especially for the project in a typical mining area. SEA involves the exploitation of vulnerable individuals through coercive or manipulative behaviors, leading to severe psychological and physical harm. In contrast, SH creates a hostile work environment through unwelcome advances or demeaning conduct, compromising the dignity and well-being of workers. These behaviors can undermine morale, cause emotional distress, and damage professional relationships, ultimately leading to decreased productivity and increased turnover. Additionally, failure to address SEA and SH can tarnish a project's reputation, lead to legal liabilities, and incur financial penalties. Addressing these risks is crucial to maintaining a safe and respectful workplace environment and upholding ethical standards in construction projects of this nature.	Direct	Short term	Local	Intermittent	Possible	Low	Small	Tweapease Community	High	Moderate

Table 5-10: Adverse Impacts and Risks Assessment for the Operation and Maintenance Phase

Impact / Risks	Description of Risks and Impact	Impact Characteristics							Receptor	Sensitivity	Significance of Impact
		Type	Duration	Extent	Frequency	Likelihood	Scale	Magnitude			
Environment and Social											
Emergency Events and Impacts on Businesses	The occurrence of natural disasters such as earthquakes/ tremors may be unlikely due to the location of Tweapease site. Although flooding may be a possibility but its occurrence on the site may be unlikely due to the location of the CMDC site. However, emergencies such as power failure, accidents spillages etc may result is shutting down the center for some time which may impact the fortunes of other businesses that may be depending on it.	Direct	Long-term or permanent	local	Intermittent	Unlikely	Minimal	Small	Miners	Medium	Minor
Air Quality Deterioration	The baseline air quality assessment at the Tweapease CMDC was below the permissible GS and WHO guideline values. However, during the harmattan season the baseline dust levels could exceed the GS and WHO guideline values. Generally, the operations of the CMDC at Tweapease would not cause a deterioration of the air quality in the project area	Direct	long-term	Local	Intermittent	Likely	Moderate	Medium	Users of the Tweapease CMDC, workers	Medium	Moderate
Noise Nuisance	The operation of the Tweapease CMDC will generate some noise, which is expected to be contained in the production area. Fenceline noise is therefore expected to be below the GS value of 60dB(A) for a mixed use area. Higher noise from other operations may be intermittent and short lived	Direct	temporary	Local	Intermittent	Likely	Moderate	medium	Tweapease CMDC/ Workers	Medium	Moderate
Waste Generation	There is possibility of inappropriate management of waste from the Tweapease CMDC. Inappropriate disposal of the wastes will result in insanitary conditions at the center. Maintenance and repair works, and office duties will also generate wastes that must be disposed of appropriately. Furthermore, improper handling of waste water can lead to the infection of water sources, soil and human health.	Direct	Short-term	local	Daily	Likely	Moderate	Medium	Tweapease CMDC and surroundings	High	Major
Fire Outbreaks	During the operation and maintenance phase of the Tweapease CMDC, various fire risks could arise e.g., overheat from the smelting furnace, electrical fires from faulty wiring or overloaded circuits.	Direct	Short-term	Local	Intermittent	Likely	Moderate	Medium	Tweapease CMDC	Medium	Moderate
Occupational Health and Safety Concerns	During the operation and maintenance phase of the Tweapease CMDC, occupational health and safety issues can be substantial if not properly managed. Workers may face exposure to dust, noise and hazardous/ toxic substances if the right PPEs have not been supplied for use. Poor ergonomic conditions on the part of workers may result in pain.	Direct	Temporary	Local	Intermittent	Likely	Moderate	Medium	Tweapease CMDC	Medium	Moderate
Labor Influx and conflicts with locals	During the operation and maintenance phase of the Tweapease CMDC, job seekers may visit the center in search of non-existing jobs. This may create tension between them and the natives/ locals. Also, the labor influx could lead to increased demand for housing, services, and infrastructure in the Tweapease Community.	Direct	Temporary	Local	Intermittent	Likely	Moderate	Medium	Tweapease community/ residents	Medium	Moderate

Impact / Risks	Description of Risks and Impact	Impact Characteristics							Receptor	Sensitivity	Significance of Impact
		Type	Duration	Extent	Frequency	Likelihood	Scale	Magnitude			
Community Health, Safety and Security	The Tweapease CMDC when operational will provide job opportunities for some youth from outside the project area exposing the natives/ locals to such youth. The influx of these workers during the operation and maintenance phase may promote irresponsible sexual behavior which could lead to teenage pregnancies, HIV/AIDS and other STD infections and serve as a public health concern. The influx of labor into the Tweapease community will be a security concern for the local people. Thieves may take advantage as job seekers to also come into the area to steal or rob residents and workers.	Direct	Short Term	Local	Intermittent	Likely	Moderate	Medium	Tweapease Community	High	Major
Sexual Exploitation and Abuse (SEA)/ Sexual Harassment (SH) Risks	SEA/ SH pose significant risk especially being in a rural community. During the operation and maintenance phase of the Tweapease CMDC, potential risks of SEA/ SH may arise from diverse workplace dynamics such as extended working hours, interactions with external stakeholders, insufficient training on appropriate code of conduct, and cultural norms that may not prioritize respect and equality.	Direct	Short term	Local	Intermittent	Possible	Low	Small	Tweapease Community	High	Moderate
Process Impacts Due to Winnowing, Cyanidation and Direct Smelting of Gold	**Winnowing:** This technique uses controlled airflow to separate lighter waste particles from heavier gold concentrates. This process can create significant dust and need to be properly managed. Inadequate ventilation or containment can lead to worker health risks and local air pollution.	Direct	Long-term	local	Daily	Possible	Moderate	Medium	Tweapease CMDC	High	Major
	Cyanidation: This technique applies a sodium cyanide solution to dissolve gold from ore. The use of cyanide in gold extraction presents risks such as cyanide spills, cyanide-laden tailings, and the potential release of hydrogen cyanide gas.	Direct	Long-term	local	Daily	Possible	Moderate	Medium	Tweapease CMDC	High	Major
	Direct Smelting: Direct smelting heats gold concentrates (plus fluxes such as borax, soda ash, and silica) until molten, separating waste from the metal without using mercury. This process avoids mercury hazards but involves high temperatures, toxic fumes, and burn risks if not properly controlled.	Direct	Long-term	local	Daily	Possible	Moderate	Medium	Tweapease CMDC	High	Major

5.5 Alternative Analysis

This project is intended to establish a Clean Mine Demonstration Centre at Tweapease to eliminate mercury use in ASGM in the project area. The alternative analysis centers on the following:

- Site Selection Option;
- Choice of Building Materials for the Tweapease CMDC;
- Choice of Technology; and
- Do nothing scenario.

Site Selection Option

Two sites were considered for the Tweapease project. They included the chosen site and another site within the mining concession. However, the site within the mining concession was avoided since it is in a valley and prone to flooding and also due to its closeness to the Mamang stream (circa 25m).

The site selected at Tweapease lies at the outskirts of the Tweapease community. The site is currently farmed with beans. The site is easy to access by vehicle and centrally placed between the mining areas. Although the road is not developed, the site is well positioned to receive ore from the mining site.

Choice of Building Materials for the Tweapease CMDC

Two main materials were considered for the construction of the Tweapease CMDC and they are (i) the use of typical brick/block and mortar and (ii) prefabricated containerised structures.

The containerized structures have been proposed for Tweapease site due to limitation of land space, requiring a compact structure although the height and need for cladding the inside of the container presents some limitations. Again, the containers are readily available at the New Abirem due to the presence of Newmont in the area and the ease of access to the Tweapease unlike in other project sites where trees will have to be cut to create access in order to reach the site.

Choice of Technology for the CMDC

According to the May 2024 Draft Report on the Technology Road Map and Access Finance for ASGM in Ghana by Projekt Consult of Germany and University of Mines and Technology (UMaT) of Tarkwa, Ghana, the processing of gold can be divided into three main steps, each of which is critical and should be tailored to the specific characteristics of the raw material to ensure a high yield linked to efficient use of resources (water, electricity, fuel, chemicals etc.) and a manageable environmental impact. The steps are:

- **Comminution** of gold-bearing material in order to liberate the fine-grained gold particles from the gangue mineral and other waste material in the feed.
- **Gravimetric concentration** of gold due to its very high relative density compared to other minerals from crushed and milled material to obtain the most enriched concentrate possible, which often still contains large amounts of other heavy minerals such as Fe-Ti oxides.
- **Gold separation** in order to finally extract the gold from the concentrate is mainly carried out by mercury amalgamation, (cyanide) leaching or, depending on the fraction of gold in the final concentrate, by applying direct smelting methods.

In terms of alternative processing methods that completely dispense with mercury, the Project Consult/ UMaT consortium provides the following technologies as explained hereunder.

Winnowing

In the application of winnowing, air is blown across the concentrate at a controlled velocity to remove the waste material which is lighter than the gold, thereby leaving free gold particles behind. Winnowing requires that the gold particles be coarse and thus cannot be applied to all types of concentrates.

Improved Gravity Separation Techniques

Some advanced gravity separation techniques have the potential to produce a gold concentrate virtually free from black sands. Some centrifugal concentrators, such as the Knelson and Icon concentrators, can produce relatively clean concentrates depending on how they are used. Other varieties of equipment such as the ANT and Gold Kachas also produce clean concentrates that can be smelted without recourse to amalgamation.

A comparison between winnowing and gravity separation techniques suggests the following making winnowing the preferred method due to its environmental advantage although winnowing may be less efficient than gravity separation:

- Winnowing a simple sustainable gold extraction method has minimal environmental impact while Gravity Separation requires water, which may lead to sedimentation issues.
- Winnowing is best for dry, loose materials where gold is relatively coarse while Gravity Separation works well for placer and hard rock gold deposits, especially when gold is fine.

Intensive Leaching Using Chlorides

Intensive leaching is applied to concentrates because the gold particles are relatively coarse. The two main chemicals used in intensive leaching are cyanide and hydrochloric acid/hypochlorite. High cyanide concentrations in the region of 2,000mg/l may be used while for ores, the normal concentration could be 250mg/l. Leaching with hydrochloric acid and hypochlorite is much faster than cyanide. However, this combination is very corrosive.

In the case of cyanide, the steps involved include leaching, adsorption, elution, pre-cipitation/electro-winning and smelting while for hydrochloric acid/ hypochlorite the steps are leaching, precipitation, filtration, calcination and smelting. These steps are too many and may not be embraced by small-scale miners.

Cyanide Leaching

Gold may be recovered from ore or tailings by leaching with sodium cyanide and the process is referred to as cyanidation. The process requires a high dissolved oxygen concentration, usually above 12mg/l and pH between 10.5 and 11.0. The high pH is necessary to stabilize cyanide in solution and also prevent the evolution of hydrogen cyanide gas, which is toxic. Sodium cyanide dissolves gold according to the following Equation:

$$4Au+8NaCN+O_2+2H_2O \rightarrow 4N[Au(CN)_2]+4NaOH$$

The cyanidation process could be conducted in agitation systems or non-agitation systems. In agitation systems, the ore is milled very fine in water (below 106 μm) and cyanide is introduced into the slurry after pH modification with lime. Leaching may be conducted in tanks for about 24 hours. In the non-agitation processes, the crushed or milled ore may be piled in vats or on impervious floors (heap leaching) and leached over several weeks by ponding or spraying with the leaching reagent.

Also, a comparison between Leaching using chlorides and cyanidation suggests the following making cyanidation the preferred method for gold extraction:

- Cyanide Leaching is highly efficient, with gold recovery rates often exceeding 90% while Chloride Leaching although it can be effective, it may require higher temperatures and stronger oxidizers to achieve comparable recovery rates.
- Cyanide Leaching although toxic has established protocols to make its use safe while Chloride Leaching may be less toxic but can lead to corrosion issues and also requires careful handling.
- Cyanide Leaching is a well-established gold extraction method, with existing infrastructure in most gold-processing plants while Chloride Leaching requires specialized equipment and may have higher operational costs.

Direct Smelting

Direct smelting is a mercury-free process that is applied to the secondary gravity concentrate. This small mass of concentrate, usually less than 100g, is heated with some chemicals known as fluxes and while in the molten state the waste and gold are separated into different layers which are maintained when they solidify.

For direct smelting to be efficient all iron or steel pieces that were abraded from the grinding equipment during grinding should be removed. Low intensity magnets such as those available in the magnetic alphabet set (educational toy for children) have been found to have the right intensity to remove the abraded material without robbing gold particles.

There are variations in the application of direct smelting. One version, referred to as the 'borax method' uses borax for smelting the concentrate. The borax, which is about three times the mass of concentrate, is mixed with the concentrate and smelted in a furnace. Another version uses the oxy-acetylene flame to smelt gold particle. The version is applied to gold particles that have been cleaned of virtually all the waste material. The flux used is borax and smelting is conducted in shallow crucibles. Due to the very high temperatures generated by the oxy-acety-lene flame, smelting is very fast and can be completed within 15 minutes.

A version of direct smelting which was developed in Ghana applies borax and soda ash to concentrates before smelting. The ratio of concentrate: borax : soda ash : silica sand = 1:1:2:0.1. Due to crucible sizes available, about 50g of concentrate containing a minimum of 0.5g of gold is ac-ceptable. The concentrate is mixed with the flux in the ratios indicated and introduced into a furnace. After some 30 minutes, the crucible is picked from the furnace and poured into a mould, the melt solidifies and the gold can then be separated from the glassy slag.

Borax Method

The 'borax method' uses borax for smelting the concentrate. Borax, which is about three times the mass of the concentrate, is mixed with the concentrate and smelted in a furnace. Smelting can also be conducted using the oxy-acetylene flame. It is applied to gold particles that have been cleaned of virtually all the waste material. Due to the very high temperatures generated by the oxy-acetylene flame, smelting is very fast and can be completed within 15 minutes.

International Experiences from Mercury Reduction Technologies

Any process that can potentially replace mercury must necessarily produce the final gold in a fast, transparent and cheaper way. Considering the mercury-free technologies discussed, winnowing and direct smelting are more suited to the recovery of gold from concentrates. Winnowing is more suitable for coarse gold particles as occurs in some alluvial deposits, but direct smelting can be applied to all.

For the Tweapease CMDC, a combination of Winnowing, Cyanidation, Borax Method and Direct Smelting will be used.

Do Nothing Scenario

This will mean maintaining the status quo, which is no CMDC will be established at Tweapease and mercury use in in the capturing the gold through amalgamation will continue. The existing use of mercury will persist with its attendant impact on health of miners in the community and the citizens at large.

6.0 RECOMMENDED MITIGATION MEASURES FOR ADVERSE IMPACTS

This chapter presents a description of enhancement measures for the positive impacts and the various mitigation and management measures for adverse impacts and risks, which were characterized as moderate and major in chapter 5. These measures cover the preconstruction, construction, operations and maintenance, and decommissioning phases of the establishment of the Tweapease CMDC.

6.1 Proposed Enhancement of Potential Positive Impacts

The implementation of the Tweapease CMDC will create employment opportunities for some Ghanaians in general and residents of the Tweapease community. The contractor will put in measures to enhance local employment and business opportunities in the project area. The contractor will continue with the stakeholder engagement and involvement programmed during the construction phase to enhance better relationships between the contractor and the local people.

The AEHPMP PIU will encourage the project contractor to adopt a recruitment policy that is geared towards giving priority to residents of Tweapease community in its recruitment of labor and to some extent those residing in the Birim North Municipality. Employment of the youth of the project area would be prioritized in the hiring of unskilled labor. The recruitment policy will seek to promote gender equality and guard against GBV/ SEA/ SH. Qualified women will not be discriminated against and would be encouraged to apply for suitable vacancies when they become available.

The positive impacts of the Tweapease CMDC on the local and national economy will continue to be sustained through sourcing of materials and equipment from local or Ghanaian suppliers and employment of local subcontractors if required in the delivery of the interventions. With elimination of mercury use in the community, a healthy and conducive environment would be created for individuals and organizations to operate their mining businesses.

6.2 Proposed Adverse Environmental and Social Impacts Mitigation and Management

This section presents a description of various mitigation and management measures for adverse environmental and social impacts which were identified as moderate and major in the preceding chapter. These measures provided in **Table 6-1** cover the preconstruction, construction, operation and maintenance, and decommissioning phases of the project.

Table 6-1: Proposed Mitigation and Management Measures of Potential Adverse Environmental and Social Impacts for Tweapease CMDC Project

Anticipated Environmental & Social Impacts/ Risks	Source of Impact	Receptor(S)	Proposed Mitigation and Management Measures	Responsibility	Estimated cost of implementation **(GHS)**
PRE-CONSTRUCTION PHASE					
Waste generation and disposal	Clearing of solid waste materials i.e. tree stumps, pieces of wood, vegetal waste etc at the Tweapease CMDC site	Tweapease CMDC site and the construction environment	○ Provide bins to store solid waste and ensure a waste management contractor convey solid waste/ vegetal waste from the Tweapease CMDC site. ○ personnel engaged in site preparation should deposit all waste generated into the bins provided ○ a waste management contractor should convey solid waste to the approved waste dump in the Tweapease community	Supervising consultant, contractor	15,000.00
Project Landtake/ Ease of Access to Project Land	The 0.96 acre land is at the outskirts of Tweapease which has been permanently taken by AEHPMP from the community for the project denying the one farming on it access to the piece of land	Tweapease community	○ document agreement on Voluntary Land Donation ○ Obtain necessary permits	AEHPMP PIU	25,000.00
Anxiety on the part of Miners, Institutions and potential users of the Tweapease CMDC	Lack of involvement/engagement of the local people, Miners and other stakeholders' during the project planning phase.	Tweapease community members and I&APs	○ Hold consultative meetings with key stakeholders i.e., miners, promoters of the community mining scheme i.e., RMG during project planning phase. ○ Implement the Stakeholder Engagement Plan (SEP).	AEHPMP PIU, project Consultants	12,000.00
Risk of halting the Project construction by regulatory authorities and the World Bank for not acquiring all permits	Non-compliance with national and other relevant laws and regulations triggered by the proposed project at Tweapease i.e. LI 1652 (1999), World Bank ESSs among others Absence of environmental permit and Birim North Municipal Developmental Permit for the works.	AEHPMP PIU	○ Identify and engage relevant regulatory bodies during the project planning stage. ○ Prepare the relevant instruments necessary for obtaining environmental permit and other relevant authorization permits. ○ Obtain Environmental Permit from EPA and other relevant permits prior to commencement of the construction works	AEHPMP PIU	Included in project cost
Public health and safety concerns	Surveying and pegging of Tweapease CMDC site	Project Engineers/ PIU Staff, Contractor, Consultants and RMG representatives	○ Provide personnel engaged in survey and pegging with appropriate PPEs (nose masks, hard hats, hard boots, reflective jackets etc.) ○ Appoint a contractor and for preparation of Contractor's Health and Safety Plan and ESMP to guide the implementation of	AEHPMP PIU, Project Engineers, Contractor	30,000.00

Anticipated Environmental & Social Impacts/ Risks	Source of Impact	Receptor(S)	Proposed Mitigation and Management Measures	Responsibility	Estimated cost of implementation **(GHS)**
			environment, health and safety measures for the construction works ○ Educate personnel and engineers engaged in the survey works on the health and safety plan/ code of conduct. ○ Provide first aid box stocked with relevant first aid drugs to treat emergency injuries before transfer of the injured to the nearest health facility for treatment i.e., the New Abirem Government Hospital. ○ Installation of appropriate safety signage at appropriate sections of the works area and at other vantage points.		
SUBTOTAL					**82,000.00**
CONSTRUCTION PHASE					
Air Quality Deterioration (Dust & exhaust emission generation)	Excavations at the Tweapease CMDC site	Tweapease community	○ Watering of active construction areas to suppress dust generation. ○ Cover construction materials in haulage trucks to construction site (sand, stone, cement, chippings) with tarpaulin ○ Cover construction waste materials during haulage to disposal site ○ Set and enforce speed limits of 20km/hr for haulage and construction trucks on routes to and from the Tweapease CMDC site ○ Provide adequate speed limit signage ○ Maintain construction equipment (trucks, concrete mixers, etc.) to minimize exhaust fume emissions ○ Enforce zero-tolerance for burning of construction waste at construction site. ○ Provide construction workers with nose masks during dusty construction activities. ○ Avoid delivery of sand and aggregates during windy conditions ○ Implement the manufacturer recommended engine maintenance programs for all construction equipment and vehicles to	Supervising consultant, Contractor, contractor's safeguards Officer	15,000.00

Anticipated Environmental & Social Impacts/ Risks	Source of Impact	Receptor(S)	Proposed Mitigation and Management Measures	Responsibility	Estimated cost of implementation (**GHS**)
			minimize the emission of fumes into the environment.		
Vibration and noise nuisance	Use of construction equipment (backhoe, concrete mixer, etc	miners working in the environs of Tweapease	○ Deploy light duty construction equipment for the works. ○ Employ standard noise abatement measures (e.g. turning off engine of machinery/ equipment when not in use) and engineering good practices to ensure that the impacts are minimized and reduced to acceptable limits. ○ Ensure that all equipment/ machinery are regularly maintained and operated in accordance with appropriate industry and equipment standards including specifications for noise levels and manufacturer's specifications (including regular checks and maintenance). ○ Shut down idle construction equipment not in us. ○ All construction and earthworks should be carried out during the daytime to avoid disturbing the serene nights of residents. ○ Set speed limit of 20km/hr for construction vehicles/equipment and monitor over speeding. ○ Provide construction workers with earplugs and earmuffs to wear during noisy activities.	Supervising Consultant	5,000.00
Loss of Vegetation and Effect on Flora and Fauna	Clearing of the vegetation, excavation and construction activities	Tweapease CMDC Site and environs	○ Remove trees/ plants on only the designated 0.96 acre site ○ Replant only indigenous plant species in place of cut trees within the environs of the Tweapease CMDC	Supervising Engineer	5,000.00
Fire Outbreak	General construction activities	Tweapease CMDC Site and environs	○ create fire belt around the Tweapease CMDC site ○ obtain fire permit from GNFS prior to construction ○ educate construction workers to avoid throwing away cigarette butts indiscriminately ○ appoint a fire team to fight any fires	Contractor, Supervising Engineer	15,000.00

Anticipated Environmental & Social Impacts/ Risks	Source of Impact	Receptor(S)	Proposed Mitigation and Management Measures	Responsibility	Estimated cost of implementation (**GHS**)
Land degradation and effect on soil resources	Clearing of the Tweapease CMDC site in an aggressive weather condition and oil spillages or exposure of the cleared site to the elements of the weather- rain and wind	Tweapease CMDC site and environs	○ Backfill all trenches for foundation work as quickly as possible ○ Avoid excavation activities during stormy weather conditions. ○ Avoid indiscriminate excavation of land at the construction site and excavations should be within the perimeter of the demarcated site	Supervising consultant; contractor	Included in construction cost
Waste generation and disposal	General construction activities	Contractor's site camp, Tweapease CMDC site and the construction environment	○ Provide bins for collection of solid waste only at the Tweapease CMDC site. ○ Ensure solid waste is disposed of at the approved dump site at Tweapease ○ Resort to the use of toilet facilities at Tweapease or a mobile toilet should be provided for the construction workers.	Supervising consultant, contractor	50,000.00
Labor Influx and related impacts and risks- theft, labor unrest etc	Job seekers, mainly unskilled youth and some skilled persons. Contractor resorting to the use of cheap labor	Tweapease CMDC site	Although labor influx issues for Tweapease CMDC has been assessed to be minor, the following mitigation should be implemented ○ Minimize labor influx by prioritizing engagement of unskilled labor from within the Tweapease community ○ The contractor must exercise due diligence in the hiring of labor from outside the Tweapease community, including background checks where necessary by involving local opinion leaders and employment agencies ○ Contractor should provide code of conduct of good ethics for construction workers. The Code of conduct must be prepared and approved by the supervising consultant prior to the commencement of the construction works. ○ Train construction workers to be familiar with the code of conduct. ○ Enforce the code of conduct during the construction activities. ○ The Code of Conduct must include zero-tolerance for the construction company, foremen, associates and representatives from mistreating women, children and pedestrians and to accord them with respect	Supervising consultant, contractor	Included in construction cost

Anticipated Environmental & Social Impacts/ Risks	Source of Impact	Receptor(S)	Proposed Mitigation and Management Measures	Responsibility	Estimated cost of implementation (**GHS**)
			regardless of dialect, religion, political opinion, ethnic, nationality, social origin or disability status. o The Code of Conduct should be made a part of employment contracts and include sanctions for non-compliance. o The construction company must monitor and enforce the Code of Conduct. o Proactively, engage and implement all grievance redress actions required		
Occupational Health and Safety- risk of injury and harm to construction workers	Handling of construction materials while unprotected; Handling of faulty construction equipment; slip and fall at construction site; injury from obstructions at construction site; vehicular accidents; noisy construction environment	Construction workers	o Prepare contractor's Health and Safety Plan to provide guidance for ensuring health and safety of construction workers o Educate construction workers on the Health and Safety Plan o Employ only experienced workers to handle construction equipment o Deploy only well serviced construction equipment for the works o Ensure regular maintenance of the construction equipment o Provide construction workers with appropriate PPEs and enforce their use. o Provide safety inductions for construction workers o Provide First Aid Box at the construction site stocked with first aid drugs and kits o Provide portable toilets at construction site for construction works o Provide signage at construction site to caution construction workers of potential dangers at the site	Supervising consultant, Contractor.	40,000.00
Community Health and Safety including community safety and security including impacts on community norms and taboos (risk of social conflict)	All construction activities Disrespect towards community people and community norms	Tweapease community (locals and natives)	o Enforce speed limit of 20km/hr for construction vehicles o Educate staff on taboos and norms in the Tweapease community including the code of conduct for construction workers o community entry engagement should be held with the Traditional Authorities and in line with the Project's SEP o Proactively, engage and implement all grievance redress actions required	Contractor, supervising consultant	30,000.00

Anticipated Environmental & Social Impacts/ Risks	Source of Impact	Receptor(S)	Proposed Mitigation and Management Measures	Responsibility	Estimated cost of implementation (GHS)
Emergencies such as vehicular accidents	Occurrence of accidents during transport of materials, handling of construction equipment/ machinery/fuel/ naked fires, excavation/trenching etc	Tweapease community (Locals and Natives), workers, visitors, road users, soil, drains/water bodies	○ Implement Emergency response plan included in Section 7.9. ○ Educate workers on the emergency response plan	Contractor, supervising engineer	30,000.00
Risk of Gender Based Violence (GBV) i.e., Sexual Exploitation and Abuse (SEA) during the project construction	Discrimination or abuse of worker based on the gender of the worker	Construction labor including women and the elderly	○ The contractor must prepare and submit Code of conduct with sanctions for non-compliance. ○ The Code of conduct must acknowledge a zero-tolerance for SEA/ SH on agents, subcontractors, and construction workers. ○ The code of conduct must be submitted and approved by the client through the supervising consultant prior to commencement of the construction works. ***Applicable to code of conduct issues supra (see labor influx impacts)***	Contractor, supervising consultant	Included in the construction cost
Risk of Sexually Transmitted Diseases (STD) including HIV/ AIDS	Promiscuous attitude of some construction workers	Construction workers, Tweapease community	○ Provide STD, HIV/AIDS education and awareness for the construction workers and the general public ○ Provide construction workers with condoms, for their use. ○ The contractor's code of conduct should prohibit sexual promiscuity among some construction workers	Contractor, supervising consultant	30,000.00
SUBTOTAL					**220,000.00**
OPERATIONAL PHASE					
Air Quality Deterioration	Processing of the ore, vehicular movement	Tweapease community and Tweapease CMDC	○ ensure filters and other equipment function appropriately and at all times	Management of Tweapease CMDC	48,000.00
Noise Nuisance	Processing of the ore, equipment repairs, vehicular movement etc	Tweapease community and Tweapease CMDC	○ equipment manufacturer to integrate noise abating mechanisms in the CMDC equipment and to ensure it is functional at all times ○ equipment including vehicles not in use to be turned off as appropriate	Management of Tweapease CMDC	24,000.00
Waste Generation	Workers of the Tweapease CMDC and equipment maintenance team	Tweapease CMDC and Birim North Municipal Waste Dump	○ Immediately collect and dispose of all wastes generate during normal operations and also during maintenance. ○ Do not abandon the maintenance waste generated at the CMDC. ○	Management of Tweapease CMDC/ Management of RMG	36,000.00

Anticipated Environmental & Social Impacts/ Risks	Source of Impact	Receptor(S)	Proposed Mitigation and Management Measures	Responsibility	Estimated cost of implementation (**GHS**)
			○ Ensure that an accredited waste management service provider works along with the maintenance team to immediately collect and transport the wastes to appropriate dump site while recyclables are given to licensed agents. ○ Prepare and implement CMDC facility management plan		
Emergencies including Fire Outbreaks	Vehicular accidents and electrical fires	Tweapease community roads, Tweapease CMDC and surroundings	○ use only experience drivers to operate project vehicles ○ ensure drivers obey speed limit of 50km/hr while driving in communities ○ obtain and renew fire permits obtained from GNFS ○ provide fire extinguishers including fire hydrant for the Tweapease CMDC ○ create fire belt around the Tweapease CMDC ○ Form fire teams in conjunction with GNFS and ensure their regular training ○ maintain fire teams to fight any fires	Management of Tweapease CMDC	30,000.00
Waste water management	Ore processing at Tweapease CMDC site	Tweapease community and Tweapease CMDC	○ monitor waste water quality to ensure that the waste water discharged from the site complies with relevant standards ○ Using appropriate methods of treatment such as physical, chemical or biological ○ Using treated water for non-potable purposes like dust suppression	Management of Tweapease CMDC	20,000.00
Occupational health & Safety as well as labor concerns	Work at the Tweapease CMDC site	Tweapease CMDC workers/ RMG Staff	○ Provide all staff with appropriate PPEs (boots, hard hats, reflective jackets) ○ Engage only experienced personnel for any maintenance works; including qualified HSE officer ○ Provide regular health screening for staff. ○ Provide clinic at the Tweapease CMDC stocked with First Aid facilities	Management of Tweapease CMDC/ Management of RMG	60,000.00
Labor Influx and related impacts and risks- conflicts with locals	Tweapease CMDC workers	Tweapease CMDC workers/ RMG Staff	○ Minimize labor issues by developing a labor management plan for the Tweapease CMDC ○ The management of the Tweapease CMDC must exercise due diligence in the hiring of labor from outside the Tweapease	Management of Tweapease CMDC/ Management of RMG	60,000.00

Anticipated Environmental & Social Impacts/ Risks	Source of Impact	Receptor(S)	Proposed Mitigation and Management Measures	Responsibility	Estimated cost of implementation (**GHS**)
			community, including background checks where necessary by involving local opinion leaders o Workers shall be provided with a code of conduct assuring of good ethics for workers. The Code of conduct must be prepared and approved by the management of Tweapease CMDC. o All the staff must be trained on the code of conduct and be familiar with it. o Enforce the code of conduct throughout the operations of the center. o The Code of Conduct should be made a part of employment contracts and include sanctions for non-compliance. o Management must monitor and enforce the Code of Conduct. o Proactively, engage and implement all worker grievance redress actions required o Provision of adequate water and sanitation facilities for workers		
Community Health and Safety including community safety and security including impacts on community norms and taboos (risk of social conflict)	Disrespect towards community people and community norms	Tweapease community	o Enforce speed limit of 50km/hr when driving in a community for staff/ operational vehicles o Educate staff on taboos and norms in the Tweapease community including the code of conduct for workers o Proactively, engage and implement all worker or community grievance redress actions required	Management of Tweapease CMDC	30,000.00
Risk of Gender Based Violence (GBV) i.e., Sexual Exploitation and Abuse (SEA) during operation of the Tweapease CMDC site	Discrimination or abuse of worker based on the gender of the worker	Staff of Tweapease CMDC site and Tweapease community members	o Management must ensure availability of Code of conduct with sanctions for non-compliance for all staff o The Code of conduct must acknowledge a zero-tolerance for SEA/ SH on agents, and maintenance subcontractors. o All staff should receive briefing on their norms and taboos	Management of Tweapease CMDC	60,000.00
Process Impacts Due to Winnowing, Cyanidation and Direct Smelting of Gold	Winnowing Processing of the ore	Staff of Tweapease CMDC	o The processing equipment should have dust suppression systems and filter bags affixed to it for dust collection o Also to be provided are screens to help	Management of Tweapease CMDC	120,000.00

Anticipated Environmental & Social Impacts/ Risks	Source of Impact	Receptor(S)	Proposed Mitigation and Management Measures	Responsibility	Estimated cost of implementation (GHS)
			contain fugitive dust o Filter bags should be emptied and cleaned regularly o Workers are to be provided with appropriate nose masks		
	<u>Cyanidation</u> Processing of the ore		o A secure area for cyanide storage should be established with the provision of a secondary containment of capacity 1.5 times the storage capacity of the cyanide solution o There should be continuous pH monitoring to confirm no cyanide leakages from the plant, o Training on cyanide handling should be established for operators with reference to the International Cyanide Management Code for best practices in its handling and disposal. o Provide Cyanide Antidote Kits at the CDMC		
	<u>Direct Smelting</u> Processing of the gold		o The smelting area should have good ventilation o Operators should be provided with appropriate PPE for heat exposure o Operators should be provided training on flux mixing, furnace operation, and emergency procedures		
SUBTOTAL					**488,000.00**
		DECOMMISSIONING PHASE			
Breach of environmental regulatory compliance pertaining to decommissioning of the Tweapease CMDC site	Lack of conforming to national laws and international regulations regarding decommissioning of the Tweapease CMDC site	Regulatory bodies and funding agency i.e., EPA, World Bank	o Prepare a comprehension ESMP including health and safety plan for decommissioning of the Tweapease CMDC o Obtain all necessary permits and approvals prior to decommissioning of Tweapease CMDC	Management of Tweapease CMDC	Cost to be provided by Management of Tweapease CMDC
Injury, harm and accident to personnel engaged in decommissioning	All decommissioning works, use of equipment	Construction workers and supervisors engaged in decommissioning	o Provide decommissioning personnel with PPE (boots, hard hats, reflective jackets) o Engage only experienced workers. o Provide the workers with portable toilets on site. o Provide workers with First Aid Box	Management of Tweapease CMDC	Cost to be provided by Management of Tweapease CMDC

Anticipated Environmental & Social Impacts/ Risks	Source of Impact	Receptor(S)	Proposed Mitigation and Management Measures	Responsibility	Estimated cost of implementation (**GHS**)
			○ Provide appropriate signage on the decommissioning		
Waste generation and management	Wastes generated from decommissioning	Management of RMG and other Miners in the Tweapease community	○ Prepare a Waste Management Plan to manage the decommissioning solid and liquid wastes. ○ Immediately collect and dispose of all wastes generated during decommissioning ○ Dispose of all municipal solid waste at Tweapease dump site and release recycleables to agents for reuse/ recycle. ○ Do not dispose decommissioned waste into a water bodies	Management of Tweapease CMDC	Cost to be provided by Management of Tweapease CMDC
Occupational health and safety/ Community safety issues		(Similar to construction phase)		Management of Tweapease CMDC	Cost to be provided by Management of Tweapease CMDC
Air pollution and Noise			(apply mitigation measures for construction phase)	Management of Tweapease CMDC	Cost to be provided by Management of Tweapease CMDC
All other environmental and social impacts		Bio-physical and social environments	A detailed ESIA/ ESMP will be carried out for approval and permitting before final decommissioning of facilities and to confirm impacts and appropriate mitigation measures for implementation	Management of Tweapease CMDC	Cost to be provided by Management of Tweapease CMDC

7.0 ENVIRONMENTAL AND SOCIAL ACTION PLANS AND MONITORING PROGRAMS

7.1 Environmental Monitoring Plan

The monitoring of various environmental and social parameters will help to confirm any impacts or risks and assess the effectiveness of the implementation of the mitigation measures outlined. By way of monitoring, a change in a predicted impact can be reviewed. Where observed impact levels exceed the expected levels, additional appropriate mitigation measures will then be instituted. Monitoring will also identify and confirm any residual impacts, which are normal with the development of such a project and ensure that these do not escalate to significant adverse levels.

Monitoring Objectives

The AEHPMP- PIU is committed to ensuring effective protection of the environment, the construction site, workers and the general public. The objectives of the monitoring program are to:

i. Confirm any predicted impact or otherwise made from the environmental and social assessment during the Tweapease CMDC project implementation;
ii. Ensure that all mitigation and control measures are operating efficiently and with desired effect;
iii. Provide information to develop improved practices and procedures for environmental protection, community health/safety and worker safety, if necessary;
iv. Detect changes in the receiving environment and enable analysis of their causes; and
v. Enable effective liaison with stakeholders and community members, including addressing complaints and concerns.

The Plans are also expected to provide useful guidance for the successful planning and implementation of similar projects that will be undertaken by the AEHPMP PIU.

Environmental Monitoring Program

A monitoring programme will be instituted and carried out and relevant records will be kept to ensure compliance with sound environmental and social practices. The major environmental and social issues for which monitoring will focus on include:

- Ambient air quality, in conformity with the Ghana Standards on Ambient air Quality Requirements GS 1236: 2019;
- Ambient noise levels, in conformity with the Ghana Standards on Ambient Noise Control Requirements GS 1212:2018
- Effluent Quality, in conformity with the Ghana Standards on Effluent Discharge Requirements GS:1212: 2019
- Surface water quality monitoring of the Mamang stream draining the Tweapease area;
- Biodiversity monitoring- Loss of vegetation/habitat and impact on fauna;
- Waste generation and disposal;
- Use of personal protective equipment (PPE);
- Accidents, worker injury and health/safety;
- Labour issues such as engaging underage persons and labour influx at the Tweapease construction site;
- Emergency situations such as accidents and electrical fires;
- Community safety/health/ security and traffic; and
- Stakeholder engagement and community complaints.

The environmental monitoring program/plan for the Tweapease CMDC is set out in **Table 7-1**.

Table 7-1: Environmental and Social Impacts and Risks Mitigation Measures Implementation Monitoring Plan for Tweapease CMDC

Anticipated Environmental & Social Impacts/ Risks	Proposed Mitigation and Management Measures	Parameters for monitoring	Monitoring location	Method	Frequency of monitoring	Responsibility	Estimated cost of implementation (GHS)
PRE-CONSTRUCTION PHASE							
Anxiety on the part of potentially affected persons/ stakeholders	○ Hold consultative meetings with key stakeholders i.e. Tweapease community mining committee, I&APs during project planning phase. ○ Implement Stakeholder Engagement Plan (SEP). ○ Put in place Grievance Redress Mechanism and involve local residents and key stakeholders in the grievance resolution processes	○ Record of stakeholder meetings ○ Availability of SEP for the project ○ Availability of GRM for the project	Tweapease CMDC. Tweapease community.	Review of relevant Reports or records	Monthly	AEHPMP PIU	Included in Tweapease CMDC project cost
Risk of halting the project construction by regulatory authorities and the World Bank	○ Identify and engage relevant regulatory bodies during the project planning stage. ○ Prepare the relevant instruments necessary for obtaining environmental permit and other relevant authorization permits. ○ Obtain Environmental Permit from EPA and other relevant permits prior to commencement of the construction works	○ Availability of EPA Environmental permit and other developmental permits for the works and ensure they remain valid at all times	AEHPMP PIU	Inspections of relevant plans and reports including validity of permits/licences	Yearly	AEHPMP PIU,	Included in Tweapease CMDC project cost
Occupational/ Community health and safety concerns	○ Provide personnel engaged in survey and pegging with appropriate PPEs (hard hats, hard boots, reflective jackets etc.) ○ Prepare Contractor's Health and Safety Plan to guide the implementation of health and safety measures for the construction works ○ Educate personnel and construction workers engaged in the survey works on the health and safety plan.	○ Availability of Contractor's Health and Safety Plan. ○ Knowledge of workers on the Contractor's Health and Safety Plan ○ Personnel wearing appropriate PPEs. ○ Availability of first aid box stocked with relevant drugs	AEHPMP PIU	Inspections of health and safety plan, and review of incident and other relevant records and reports	Inspection of contractor's health and safety plan will be done one time, prior to commencement of construction. Education of workers will be done at induction, semi-annually, and	AEHPMP PIU	Included in Tweapease CMDC project cost

Anticipated Environmental & Social Impacts/ Risks	Proposed Mitigation and Management Measures	Parameters for monitoring	Monitoring location	Method	Frequency of monitoring	Responsibility	Estimated cost of implementation (GHS)
	○ Provide first aid box stocked with relevant first aid drugs to treat emergency injuries before transfer of the injured to the nearest health facility for treatment				refreshers after major incidents Weekly inspection of first aid box, PPE and signage		
Waste generation and disposal	○ Provide bins for disposal of waste, spoil wood etc. ○ Personnel engaged in site preparation should gather and deposit all waste generated into the bins ○ Engaged a waste management contractor to transport the waste to the approved waste dump in the Birim North Municipal	○ Availability of dust bins to personnel to store waste ○ All construction waste deposited in appropriate and labelled waste	AEHPMP PIU	Inspections	Quarterly	AEHPMP PIU	Included in Tweapease CMDC project cost
CONSTRUCTION PHASE							
Air Quality Deterioration (Dust & exhaust emission generation)	○ Watering of active construction site to suppress dust generation. ○ Cover construction materials in haulage to construction site (sand, stone, cement, chippings) with tarpaulin ○ Cover construction waste materials during haulage to disposal sites ○ Set and enforce speed limits of 20km/hr for haulage and construction trucks in the Tweapease community. ○ Provide adequate speed limit signages. ○ Maintain construction equipment (trucks, concrete mixers, etc.) to minimize exhaust fume emissions ○ Switch off idle construction machinery and equipment	○ Absence of observable particulate matter and exhaust fumes in air within the construction site ○ Record of watering at construction site ○ Construction workers wearing nose masks ○ Availability of signages showing speed limits for construction vehicles and machinery ○ Record of maintenance of construction equipment/trucks deployed for the construction	Tweapeasee CMDC site	Visual monitoring	Weekly	Contractor, contractor's safeguards Officer, Supervising consultant	70,000.00

Anticipated Environmental & Social Impacts/ Risks	Proposed Mitigation and Management Measures	Parameters for monitoring	Monitoring location	Method	Frequency of monitoring	Responsibility	Estimated cost of implementation (GHS)
	○ Enforce zero-tolerance for burning of construction waste at the construction site. ○ Provide construction workers with nose masks during dusty construction activities. ○ Avoid delivery of sand and aggregates during windy conditions ○ Implement the manufacturer recommended engine maintenance programs for all construction equipment and vehicles to minimize the emission of fumes into the environment.						
Vibration and noise nuisance	○ Deploy light duty construction equipment for the works. ○ Employ standard noise abatement measures (e.g. turning off engine of machinery/ equipment when not in use) and engineering good practices to ensure that the impacts are minimized and reduced to acceptable limits. ○ Undertake earthworks and other noise and vibration making activities in phases to reduce noise generation during construction. ○ Ensure that all equipment/ machinery are regularly maintained and operated in accordance with appropriate industry and equipment standards including specifications for noise levels and manufacturer's specifications (regular checks and maintenance).	○ Record of maintenance of construction equipment/machinery ○ Complaints by the Tweapease community about excessive noise from the construction ○ Construction workers wearing earplugs during noisy activities	Tweapease CMDC site	Inspection of Grievance reports	Weekly	Contractor, contractor's safeguards Officer, Supervising consultant	15,000.00

Anticipated Environmental & Social Impacts/ Risks	Proposed Mitigation and Management Measures	Parameters for monitoring	Monitoring location	Method	Frequency of monitoring	Responsibility	Estimated cost of implementation (GHS)
	○ Shut down idle construction equipment not in use. ○ Set speed limit of 20km/hr for construction vehicles/ equipment and monitor over speeding. ○ Provide construction workers with earplugs and earmuffs to wear during noisy activities.						
Soil erosion of excavated land at Tweapease CMDC site	○ Backfill all trenches for foundation work as quickly as possible ○ Avoid excavation activities during stormy weather conditions. ○ Avoid indiscriminate excavation of land at the construction site and excavations should be within the perimeter of the demarcated site	○ Backfilling observed at the CMDC site and well compacted ○ All excavated areas reinstated and landscaped.	Tweapease CMDC site	Site inspections	Weekly	Contractor, contractor's Safeguards Officer, Supervising consultant.	Included in construction cost
Risk of injury and harm to construction workers (Occupational Health and Safety)	○ Prepare contractor's Health and Safety Plan to provide guidance for ensuring health and safety of construction workers ○ Educate construction workers on the Health and Safety Plan ○ Employ only experienced workers to handle construction equipment ○ Deploy only well serviced construction equipment for the works ○ Ensure regular maintenance of the construction equipment ○ Provide construction workers with appropriate PPEs and enforce their use. ○ Provide safety inductions for construction workers ○ Provide First Aid Box at the construction site stocked with first aid drugs and kits	○ Availability of contractor's Health and Safety Plan ○ Awareness of construction workers of the Contractor's Health and Safety Plan ○ Observable availability of PPEs for construction workers ○ First Aid Box available at construction site stocked with appropriate kits ○ Construction workers wearing appropriate PPEs. ○ Record of induction trainings for workers ○ Toilet facility provided at construction site for construction workers use. ○ Appropriate signage at construction site. ○ Workers understanding of each signage ○ Number of construction workers	Tweapease CMDC site	Inspection of plan, and review of incident and other relevant records and reports	Inspection of contractor's health and safety plan will be done one time, prior to commencement of construction. Education of workers will be done at induction, semi-annually, and refreshers after major incidents Weekly inspection of first aid box, PPE and signage.	Contractor, contractor's Safeguards Officer, Supervising consultant.	Included in construction cost

Anticipated Environmental & Social Impacts/ Risks	Proposed Mitigation and Management Measures	Parameters for monitoring	Monitoring location	Method	Frequency of monitoring	Responsibility	Estimated cost of implementation (GHS)
	○ Provide portable toilets at construction site for construction works or an appropriate pit for their use ○ Provide signage at construction site to caution construction workers of potential dangers at the site	injured					
Community Health and safety	○ Enforce speed limit of 20km/hr for construction vehicles ○ Educate staff on taboos and norms in the Tweapease community including the code of conduct for construction workers ○ community entry engagement should be held with the opinion leaders and in line with the Project's SEP ○ Proactively, engage and implement all grievance redress actions required	○ Absence of unauthorized persons within the inner perimeter working area ○ Observable availability of appropriate signage at the construction site ○ Observable absence of construction materials and construction wastes stockpiled at the construction site ○ Construction drivers observing 20km/hr speed limit. ○ Number of members of the public injured/harmed at the construction site	Tweapease CMDC site	Site inspections and review of incident reports	Weekly	Contractor, contractor's Safeguards Officer, Supervising consultant.	Included in construction cost
Emergencies such as fires, and vehicular accidents	○ Implement Emergency response plan included in Section **. ○ Educate workers on the emergency response plan	○ records of emergencies e.g., accidents, fire incidents ○ number of engagements/ training conducted	Tweapease CMDC site	Review of incident and training reports/records	Monthly	Contractor, contractor's Safeguards Officer, Supervising consultant.	Included in construction cost
Waste generation and disposal	○ Provide a bins for collection of solid waste only at the Tweapease CMDC site. ○ Ensure solid waste are disposed of at the approved dump site at the Birim North Municipal. ○ Mobile toilet should be established for the construction workers	○ Availability of contractor's Waste Management Plan ○ Observable availability of bins to store waste and collection by an approved waste management contractor for disposal at approved dump site. ○ Construction workers disposing construction solid waste and housekeeping waste into bins at a designated area on site	Tweapease CMDC site	Inspections and record keeping of waste manifest	Weekly	Contractor, contractor's Safeguards Officer, Supervising consultant.	Included in construction cost

Anticipated Environmental & Social Impacts/ Risks	Proposed Mitigation and Management Measures	Parameters for monitoring	Monitoring location	Method	Frequency of monitoring	Responsibility	Estimated cost of implementation (GHS)
		○ Regular transfer of waste to approved waste dump ○ Absence of stockpile of construction waste at construction site ○ Record of disposal of construction waste to approved sites					
Labor Influx and related impacts and risks- theft, labour unrest etc	○ Minimize labor influx by prioritizing engagement of unskilled labor from within the Tweapease community ○ The contractor must exercise due diligence in the hiring of labor from outside the Tweapease community, including background checks where necessary by involving local opinion leaders ○ Contractor should provide code of conduct of good ethics for construction workers. The Code of conduct must be prepared and approved by the supervising consultant prior to the commencement of the construction works. ○ Train construction workers to be familiar with the code of conduct. ○ Enforce the code of conduct during the construction activities. ○ The Code of Conduct must include zero-tolerance for the Construction Company, foremen, associates and representatives from mistreating women, children and pedestrians and to accord them with respect regardless of dialect, religion, political opinion, ethnic,	○ Record on code of conduct training held for the workers. ○ Number of labour related complaints reported ○ Complaints by residents	Tweapease CMDC site	Inspections and reports of violations/incidents	Weekly	Contractor, contractor's Safeguards Officer, Supervising consultant.	Included in construction cost

Anticipated Environmental & Social Impacts/ Risks	Proposed Mitigation and Management Measures	Parameters for monitoring	Monitoring location	Method	Frequency of monitoring	Responsibility	Estimated cost of implementation (GHS)
	nationality, social origin or disability status. ○ The Code of Conduct should be made a part of employment contracts and include sanctions for non-compliance. ○ The construction company must monitor and enforce the Code of Conduct. ○ Proactively, engage and implement all grievance redress actions required						
Risk of Gender Based Violence (GBV) i.e., Sexual Exploitation and Abuse (SEA) during the project construction	○ The contractor must prepare and submit Code of conduct with sanctions for non-compliance. ○ The Code of conduct must acknowledge a zero-tolerance for SEA/ SH on agents, subcontractors, and construction workers. ○ The code of conduct must be submitted and approved by the client through the supervising consultant prior to commencement of the construction works. ***Applicable to code of conduct issues supra (see labor influx impacts)***	○ Availability of contractor's code of conduct ○ Number of workers who signed the Code of conduct as condition for their employment. ○ Records of sanctions for workers who abused the code of conduct. ○ Record of periodic sensitization of construction workers on GBV issues ○ Number of construction workers charged with GBV offence	Tweapease CMDC site	Incident reports Signed copies of CoCs Training reports	Weekly	Contractor, contractor's Safeguards Officer, Supervising consultant.	Included in construction cost
Risk of Sexually Transmitted Diseases (STD) including HIV/ AIDS	○ Provide STD, HIV/AIDS education and awareness for the construction workers and the locals/ natives of the Tweapease community to drum home the implications of illicit sex ○ Provide construction workers with condoms, for their use. ○ The contractor's code of conduct should prohibit sexual promiscuity among some construction workers	○ Record of HIV/STD education and awareness campaigns ○ Availability of condoms for construction workers ○ Contractor's code of conduct prohibiting sexual promiscuity.	Tweapease CMDC site	Engagement and incident reports	Monthly	Contractor, contractor's Safeguards Officer, Supervising consultant.	Included in construction cost

Anticipated Environmental & Social Impacts/ Risks	Proposed Mitigation and Management Measures	Parameters for monitoring	Monitoring location	Method	Frequency of monitoring	Responsibility	Estimated cost of implementation (GHS)
SUBTOTAL							**85,000.00**
OPERATIONAL PHASE							
Air Quality Deterioration	○ ensure filters and other equipment function appropriately and all the time	○ Availability of air quality monitoring records ○ Air quality measurements meeting GS1236: 2019 limits for NOx, COx, SOx, $PM_{2.5}$, PM_{10} and TSP. measurements	Tweapease CMDC	Insitu Measurement	Monthly measurements in line with GS 1236:2019	Tweapease CMDC Management	95,000.00
Noise nuisance	○ equipment manufacturer to integrate noise abating mechanisms in the Tweapease CMDC equipment and to ensure it is functional all the time ○ equipment including vehicles not in use to be turned off as appropriate	○ Leq, Lmax, Lmin (dBA) measurements meeting GS 1222: 2018 limits ○ Complaints by the Tweapease community about excessive noise from the operations ○ Workers wearing earplugs in designated areas in the CMDC	Tweapease CMDC	Insitu Measurement	Monthly measurements in line with GS 1222:2018	Tweapease CMDC Management	18,000.00
Waste Generation and Management	○ Immediately collect and dispose all wastes generate during normal operations and also during maintenance. ○ Do not abandon the maintenance waste generated at the CMDC. ○ Ensure that an accredited waste management service provider works along with the maintenance team to immediately collect and transport the wastes to appropriate dump site while recyclables are given to licensed agents. ○ Prepare and implement CMDC facility management plan	○ Absence of stockpiled waste at the Tweapease CMDC ○ Availability of waste bins at Tweapease CMDC ○ Availability of Facility management plan ○ Record of disposal of maintenance waste at approved disposal site	Tweapease CMDC	Insitu Measurement	Weekly	Tweapease CMDC Management	54,000.00

Anticipated Environmental & Social Impacts/ Risks	Proposed Mitigation and Management Measures	Parameters for monitoring	Monitoring location	Method	Frequency of monitoring	Responsibility	Estimated cost of implementation (GHS)
Management of Hazardous Chemicals including Cyanide	Winnowing ○ The processing equipment should have dust suppression systems and filter bags affixed to it for dust collection ○ Also to be provided are screens to help contain fugitive dust ○ Filter bags should be emptied and cleaned regularly ○ Workers are to be provided with appropriate nose masks	○ Dust measurements meeting GS1236: 2019 limits for $PM_{2.5}$, PM_{10} and TSP	Processing Plant at Winnowing	Insitu Measurement Insitu Measurement of pH and Lab analysis for Cyanide	Monthly Monthly	Tweapease CMDC Management	36,000.00
	Cyanidation ○ A secure area for cyanide storage should be established with the provision of a secondary containment of capacity 1.5 times the storage capacity of the cyanide solution ○ There should be continuous pH monitoring to confirm no cyanide leakages from the plant, ○ Training on cyanide handling should be established for operators with reference to the International Cyanide Management Code for best practices in its handling and disposal.	○ Monitoring of wastewater quality discharges for Cyanide and pH	Recycling Ponds	Heat Stress Monitoring Instrument	Quarterly	Tweapease CMDC Management	24,000.00
	Direct Smelting ○ The smelting area should have good ventilation ○ Operators should be provided with appropriate PPE for heat exposure ○ Operators should be provided training on flux mixing, furnace operation, and emergency procedures	○ Monitoring of Heat Stress	Smelting Plant			Tweapease CMDC Management	30,000.00

Anticipated Environmental & Social Impacts/ Risks	Proposed Mitigation and Management Measures	Parameters for monitoring	Monitoring location	Method	Frequency of monitoring	Responsibility	Estimated cost of implementation (GHS)
Fire Outbreaks and other emergencies	○ obtain and renew fire permits obtained from GNFS ○ provide fire extinguishers including fire hydrant for the Tweapease CMDC ○ create fire belt around the Tweapease CMDC ○ Form fire teams in conjunction with GNFS and ensure their regular training ○ maintain fire teams to fight any fires	○ Validity of Fire Permit ○ availability of fire extinguishers at the Tweapease CMDC ○ evidence of fire belt ○ records of training of staff by GNFS of fire safety ○ evidence of fire team at the Tweapease CMDC	Tweapease CMDC	○ Inspect Permits ○ Confirm adequacy of fire extinguishers ○ Review effectiveness of fire belts, fire trainings and responsiveness of fire teams	Yearly	Tweapease CMDC Management	24,000.00
Occupational Health & Safety issues	○ Provide all staff with appropriate PPEs (boots, hard hats, reflective jackets) ○ Engage only experienced personnel for the maintenance works; ○ Provide regular health screening for staff. ○ Support stocking of clinic at the Tweapease CMDC with First Aid facilities	○ Tweapease CMDC personnel wearing appropriate PPEs at work ○ Record of regular health screening for personnel ○ Availability of first aid stock at the Tweapease clinic	Tweapease CMDC	○ Impromptu checks ○ Inspection of health screening records ○ Inspection of first aid facilities	Monthly	Tweapase CMDC Management	60,000.00
Labour Influx and related impacts and risks- conflicts with locals	○ Minimize labor issues by developing a labor management plan for the Tweapease CMDC ○ The management of the Tweapease CMDC must exercise due diligence in the hiring of labor from outside the community, including background checks where necessary by involving local opinion leaders ○ Workers shall be provided with a code of conduct assuring of good ethics for workers. The Code of conduct must be prepared and approved by the management of Tweapease	○ Evidence of a labor management plan and being implemented ○ Availability of signed Code of Conduct by all staff	Tweapease CMDC	○ Review labour management reports ○ Review hiring reports ○ Review record on infractions or breaches to the Code of Conduct ○ Review training records ○ Assess effectiveness of GRM structures	Quarterly	Tweapease CMDC Management	60,000.00

Anticipated Environmental & Social Impacts/ Risks	Proposed Mitigation and Management Measures	Parameters for monitoring	Monitoring location	Method	Frequency of monitoring	Responsibility	Estimated cost of implementation (GHS)
	CMDC. ○ All the staff must be trained on the code of conduct and be familiar with it. ○ Enforce the code of conduct throughout the operations of the centre. ○ The Code of Conduct should be made a part of employment contracts and include sanctions for non-compliance. ○ Management must monitor and enforce the Code of Conduct. ○ Proactively, engage and implement all worker grievance redress actions required						
Community Health and Safety including community safety and security including impacts on community norms and taboos (risk of social conflict)	○ Enforce speed limit of 50km/hr for staff/ operational vehicles ○ Educate staff on taboos and norms in the Tweapease community including the code of conduct for workers ○ Proactively, engage and implement all worker or community grievance redress actions required	○ Record of accidents/ incidents involving community people	Tweapease CMDC	○ Inspection of accident records ○ Inspection of training records	Monthly	Tweapease CMDC Management	60,000.00
Risk of Gender Based Violence (GBV) i.e., Sexual Exploitation and Abuse (SEA) during the operation of the Tweapease CMDC	○ Management must ensure availability of Code of conduct with sanctions for non-compliance for all staff ○ The Code of conduct must acknowledge a zero-tolerance for SEA/ SH on agents, and maintenance subcontractors. ○ All staff should be introduced to the opinion leaders in the Tweapease community and for briefing on their norms and taboos	○ Availability of code of conduct and signed by all staff	Tweapease CMDC	○ Review record on infractions or breaches to the Code of Conduct ○ Review GBV-SEA/SH training records	Monthly	Tweapease CMDC Management	36,000.00
SUBTOTAL							**497,000.00**

Key Responsibilities for the Monitoring Program

The primary responsibility for implementation of the environmental and social monitoring program during the construction phase is the Contractor. The Contractor will be required to hire an Environment, Health and Safety (EHS) Officer or Manager (Environmental and Social Safeguards Officer) responsible for implementing the Environment, Social, Health and Safety (ESHS) mitigation and management actions, including the schedule to the environmental permit (permit conditions) and other lending covenants of the World Bank.

Through the Safeguards Officer, the Contractor must ensure day-to-day monitoring of all environmental and social impacts mitigation measures implementation by the workers and provide regular standalone bi-weekly safeguards monitoring reports to the Client including violation of any approved procedures i.e., Code of Conduct, etc.

All the reports should capture progress and status on implementation of the mitigation measures arising from the ESMP implementation, considering the monitoring indicators but not limited to the following:

- Contractors' performance on implementing environmental and social safeguards;
- Progress on mitigation measures in relation to identified risks and impacts;
- Emerging impacts and proposed mitigation measures (if encountered);
- A presentation on parameters monitored in the reporting period;
- Activities to be taken in the following period;
- Capacity building needs that may be required

Relevant pictures should be included in the report.

Supervising Consultant

Staff of the Inspectorate Division of the Minerals Commission and the Regional EPA Office will provide oversight responsibility to ensure that the contractor is fulfilling the mitigation measures implementation responsibility under this ESMP. The contractor will submit their monitoring reports through the supervising consultant who will validate and forward them to the PIU through any of the safeguards persons at the PIU. The supervising consultant will coordinate the day-to-day monitoring of the implementation of the ESMP, Permit Conditions, and the contractors' safeguards commitment documents.

AEHPMP Safeguards Specialists

The AEHPMP-PIU Safeguards Focal Person(s) will regularly conduct monitoring field visits to the construction site at Tweapease to inspect activities and verify the reports presented by the contractor and supervising consultant and make their own findings. They will provide guidance for any remedial actions where there is the need to prevent non-compliance and recurrence of inaction on the part of any stakeholder. The ESMP monitoring results will be continuously evaluated by the AEHPMP PIU as part of the project supervision and this will allow for corrective actions to be taken when needed. The AEHPMP PIU will compile a regular safeguard monitoring reports for submission to the World Bank and EPA in line with environmental permit conditions requirement.

It is proposed to establish an ESHS committee for the purposes of the following:

- Hold regular meetings where representatives from contractor and the client can discuss progress, challenges, and mitigation efforts.
- Ensure that schedules, activities, and resource requirements are prioritized to minimize conflicts and maximize efficiency.
- Review and ensure that the contractor is adhering to the environmental and social management plans developed and the monitoring of their implementation.
- Share best practices, lessons learned, and strategies for mitigating potential impacts on the environment and social norms at the local level.
- Identify and assess potential risks and impacts that may arise from the implementation of the project at Tweapease.
- Develop strategies to mitigate and manage risks effectively, including emergency response protocols and contingency plans.

- Coordinate community engagement efforts to ensure consistent messaging and outreach across all project components.
- Address community concerns, feedback, and grievances to enhance transparency and trust.
- Establish health and safety protocols and standards to promote a safe working environment for all workers involved in the project.
- Share information on safety incidents, near misses, and lessons learned to enhance safety performance across other projects.

The ESHS committee so constituted will not be limited to representatives from the Contractor, Project Engineer and/ or Supervising Consultant, Safeguards Officer, Tweapease community mining committee and the Birim North Municipal Assembly:

By addressing the above-mentioned key issues through the ESHS committee in regular coordination meetings, the AEHPMP PIU will foster collaboration, synergy, and alignment with the contractor to ensure performance across all the components of the project, and greater overall efficiency in project implementation.

Although the primary responsibility for the implementation of the monitoring program during the construction phase is the Contractor, it is preferable that the Contractor engages an independent specialist or company to undertake the air quality, noise level and water/ wastewater quality monitoring to ensure objectivity of the results/recommendations.

The Management of the Tweapease CMDC has the primary responsibility for ESHS monitoring during the operational and maintenance phase of the project.

During the construction and operational phases, the EPA will periodically carry out site visits and review monitoring reports received from the AEHPMP-PIU to verify compliance with the monitoring program and the schedule to the environmental permit (permit conditions).

7.2 Contractors Environmental and Social Safeguards Commitment Strategy

Documents Requirements

Prior to their selection and commencement of the construction works and in line with international good practices, the Contractor will be required to prepare a few safeguards commitment documents which will provide the contractor's specific strategies for dealing with the potential environmental and social impacts mitigation requirements as provided in this ESMP document. The documents shall be reviewed and assessed for their adequacy by the supervising consultant. Together with this ESMP, the contractor's strategies will be monitored for compliance during the construction period. The strategies shall describe the resources allocated to and the personnel responsible for the execution of each task and requirements contained therein, roles and responsibilities of key construction staff including construction supervisors, the EHS Officer/ and the Project Manager in the monitoring and management of key environmental and social impacts mitigation activities. These documents are outlined below:

Contractor's Health and Safety Plan/Strategy

The contractor's health and safety plan will provide information on the contractor's procedures relating to occupational health and safety of his workers and community health and safety for the work they are responsible for under the contract. The Plan shall be guided by the World Bank's Health and Safety Guidelines as well as the Ghana Factories, Offices and Shops Act 328 (1970), etc.

The Contractor shall appoint an Environment Social Health and Safety (ESHS) Manager for the project, who will report to the Project Manager (PM) of the PIU. The responsibilities of the ESHS Manager include, among other things:

- Implement the environmental, health and safety measures on the project.
- Enforce the environmental permit conditions and mitigation, monitoring and management measures.

- Liaise with the PM to ensure all required PPEs, waste bins and other logistics are provided for the works;
- Identify appropriate training programs in ESHS for the workers.
- Ensure all machinery and equipment are in good working condition and are well serviced;
- Ensure all operators adhere to environment, health and safety procedures;
- Liaise with regulatory institutions such as EPA on all ESHS matters relating to the execution of the proposed project at Tweapease;
- Keep records and reports of all incidents/accidents and illnesses.
- Report all complaints from the community and other stakeholders/workers concerning environmental, social, health and safety issues to the PM of the AEHPMP PIU;
- Report all non-compliances of environmental, social, health and safety procedures to the PM of the PIU for appropriate action; and
- Enforce disciplinary actions against workers who don't comply with health and safety procedures.

Contractor's Environmental and Social Management Plan (C-ESMP)

The C-ESMP shall be based on this ESMP with a focus on construction activities. The C-ESMP shall, among other things, identify the construction phase activities, risks/impacts, take into consideration the mitigation and monitoring measures and their management arrangements captured in the ESMP, describe resource allocation and assign roles and responsibilities for the execution of each task.

Contractor's Waste Management Plan

The contractor's Waste Management Plan should cover both solid and liquid waste that will be generated during the construction activities to ensure environmental protection and a clean environment. The Plan should include specific procedures for tracking of loads of solid waste, disposal site and protocols for the maintenance of records of the quantities of wastes generated, reused, and disposed.

Contractor's Traffic Management Plan

The Contractor's Traffic Management Plan should address issues including strategies for ensuring safety of workers, pedestrians, and other motorists. Traffic may not be a major concern but the nature of the road to Tweapease requires trucks to move below the 50km/hr mark.

Contractor's Code of Conduct/Ethics

The contractor's Code of Ethics/Conduct shall contain obligations on the company to foster a well-organized, respectful, and collaborative environment at the workplace and in the Tweapease community during the period of the contract. Code of Conduct shall be provided to include but not limited to the following:

i.Compliance with applicable laws, rules, and regulations of the jurisdiction;

ii. Compliance with applicable health and safety requirements (including wearing prescribed personal protective equipment (PPE), preventing avoidable accidents and at duty to report conditions or practices that pose a safety hazard or threaten the environment.

iii. Zero tolerance to the use of illegal substances (such as alcohol and narcotics during working hours);

iv. Non-Discrimination (e.g. on the basis of family status, ethnicity, race, gender, religion, language, disability, or political conviction);

v. Attitude of respect and non-discrimination during interactions with community members (e.g. to convey an attitude of respect and non- discrimination);

vi. Sexual harassment, sexual exploitation (e.g. to prohibit use of language or behavior, in particular towards women or children, that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate);

vii. Violence or exploitation (e.g. the prohibition of the exchange of money, employment, goods, or services for sex, including sexual favors or other forms of humiliating, degrading or exploitative behavior);

viii. Protection of children (including prohibitions against abuse, defilement, or otherwise

unacceptable behavior with children, limiting interactions with children, child labor and ensuring their safety in the project area);

ix. Protection and proper use of property (e.g., to prohibit theft, carelessness or waste);

x. Duty to report violations of this Code;

xi. No retaliation against workers who report violations of the Code, if that report is made in good faith;

xii. The Code must include sanctions against violations of the Code; and

xiii. Provision that all Company Managers and individual construction workers shall sign the Code of Conduct Declaration Form as below:

Code of Conduct Declaration Form

I hereby acknowledge receipt of my copy of the Contractor's code of ethics/conduct which has been written in plain language and explained to me. I acknowledge that adherence to this Code of ethics/conduct is a condition of my employment and I understand that violation of this code can result in serious consequences, up to and including dismissal, referral to legal authorities, forfeiting payments, termination of contract and eventually may have debarments implications.

- ***Name of Employee***
- *Name……..……..…….Position*
- *Signature……..……*
  Date……

In addition to the Contractor's own Code of Ethics/Conduct, they shall adopt wholly and implement the requirements of the Client's own Code of Conduct for Preventing Gender- Based Violence (GBV)/Sexual Exploitation and Abuse (SEA)/Sexual Harassment (SH) and Violence Against Children (VAC) provided in **Annex 7-1** of this document. All requirements therein are obligatory and bidding on the Contractor under the contract of the works he/she is responsible for.

7.3 Environmental Committee for the Operational Phase

The PIU will constitute an ESHS committee comprising safeguard staff and representatives of relevant regulatory institutions such as EPA, Birim North Municipal Assembly, GNFS at the District among others. The main task of this committee is to formulate and implement policies to address environmental and social impacts during the operational phase.

7.4 Annual Environmental and Safety Audit and Reviews

The AEHPMP PIU will in collaboration with consultants undertake an annual environmental, social, health and safety audit of the AEHPMP interventions at Tweapease. Issues or gaps identified will be referred and for redress by the AEHPIU PIU, who will carry out quarterly reviews of its safeguards performance. The monitoring program will also provide relevant information for effective auditing and reviews.

7.5 Compliance with Statutory Obligations

The PIU and the Management of Tweapease CMDC will comply with all relevant statutory obligations including:

i. Obtaining an Environmental Permit from the EPA, through submission of this ESMP and paying the relevant processing and permit fees.

ii. Compliance with the schedule/ conditions to be attached to the EPA's environmental permit for Tweapease CMDC including.
   a. Submitting necessary monthly/quarterly monitoring reports to EPA or as provided in the permit schedule to be issued.
   b. Submitting an Annual Environmental Report (AER) of the Tweapease CMDC activities after 12 months from the commencement of works in accordance with Regulation 25 of LI 1652.

iii. Complying with the requirements of the Birim North Municipal Assembly/ by-laws.

Submission of EMP During Operations in Line with LI 1652

The AEHPMP PIU will submit an Environmental Management Plan (EMP) of Tweapease CMDC activities to the EPA within 18 months of commencement of operations in accordance with Regulation 24 of LI 1652.

The AEHPMP PIU/ Management of Tweapease CMDC and Contractor will also be required to comply with all WB monitoring and reporting requirements.

7.6 Document Control and Tracking

Documentation

The AEHPMP PIU/ Management of Tweapease CMDC will keep records on all environmental, social health and safety (ESHS) data including, environmental emergencies. The ESHS data will be kept in both electronic and hard copy formats. A format for documentation of information in electronic form will be developed to capture daily/weekly information on environmental sampling/monitoring, environmental quality results, waste generation and disposal, environmental incidences and emergencies, training and awareness creation programs such as community fora/ workshops and meetings.

Document Tracking and Control

PIU/ Management of Tweapease CMDC will establish and maintain procedures to control all documents and permits that are required to ensure compliance and to make sure that:

- All documents and permits are easily traceable;
- All statutory documents are periodically reviewed, revised as necessary and approved as adequate by the relevant regulatory agencies;
- All permits and approvals are renewed as and when necessary; and
- Current versions of relevant documents are available on site.

7.7 Project Facilities Management

The facilities will be maintained and managed in accordance with international good practices. The potential environmental/technical concerns that will be addressed include:

i. quality of the construction materials to ensure the safety and security of their usage;
ii. provision of quality assurance backstopping by the Supervising Engineer/ consultant; and
iii. response to emergencies.

Measures adopted to manage these concerns include:

i. Monthly Inspections and Damage Control;
ii. Quality Assurance and Security; and
iii. Provisional Emergency Response Action.

Monthly Inspections and Damage Control

The AEHPMP PIU will carry out its monthly inspections with the aim of correcting any defects at every stage of construction.

Quality Assurance

In order to avoid any substandard construction works, all materials/facilities will be pretested to the required standard before approval for installation/ construction.

Housekeeping

A disorderly or dirty workplace can introduce its own hazards in addition to those associated with the construction works. Good housekeeping is the first principle of health, safety and fire prevention. The following measures will be ensured to ensure good housekeeping at the works site:

i. All areas will be kept clear of non-essential equipment and materials;
ii. All equipment will be kept clean and leakages sealed;
iii. Management will ensure that all equipment and materials are in their assigned place and that no loose or unnecessary tools are left lying about in the workplace; and

iv. Caution notices such as "Do Not Litter" will be provided at vantage areas.

7.8 Continued Public Participation

The AEHPMP PIU and the Management of Tweapease CMDC will always open its doors to the general public for complaints, suggestions and advice on environmental and social related issues and they will be quickly addressed.

7.9 Emergency Response Action

Responsibility
The proposed emergency response plan for the construction phase is provided. Emergency situations will be managed by the EHS Unit of the Contractor. The EHS Manager or Supervisors can declare an emergency.

Emergency Service Providers and Communication Channels
After declaration of an emergency, the following organizations or emergency service providers will be notified immediately, depending on the type of emergency:

i. GNFS- call 999 or 192
ii. Ghana Police Service -call 18555 or 191
iii. Ghana Ambulance Service- call 112

Emergency services (e.g. fire services, medical services, etc) can be contacted by phone call, using the contact numbers supra. The EHS Manager or Supervisors can contact emergency services and provide them with all appropriate information. Contact with the emergency services provider must be kept until they arrive on site.

Stakeholder Communication Roles
All information on the emergency to the media and other stakeholders will be sent from one focal person who is the responsible person for emergency coordination. This will be the Project Manager or in his absence the EHS Manager.

In case of all emergencies, all workers are to note the following:

- DO NOT CALL the local media to report the emergency (It is the responsibility of the Project Manager and in his absence the EHS Manager)
- DO NOT CALL the family or friends of the persons involved in the emergency (It is the responsibility of the Project Manager and in his absence the EHS Manager)

System for Raising Alarm
Construction workers will be informed and educated on the system for raising alarms at the workplace. Generally, workers are expected to shout at least three times using the nature of the emergency. Example if the emergency is fire, the worker who first sees or observes it will shout FIRE! FIRE! FIRE! If the emergency is an accident, worker will shout ACCIDENT! ACCIDENT! ACCIDENT! If the emergency is spillage, worker should shout SPILLAGE! SPILLAGE! SPILLAGE!. If the emergency occurs offsite, the worker is expected to call the Project Manager or EHS Manager immediately if he/she is able to do so.

Emergency Assembly Point at the Treatment Plant Site
The contractor for the Tweapease CMDC site will create an emergency assembly point at the site. The Emergency Assembly Point (EAP) is where all staff and visitors will assemble during the occurrence of an emergency which requires all workers and visitors to be accounted for.

Equipment and Resources
The contractor will ensure that there are adequate equipment and resources as well as appropriate measures in place for its preparedness for an emergency. The equipment/resources and measures to be put in place include:

- Availability of PPEs including safety googles, hand gloves, reflective jackets, raincoats, life jackets, wellington boots/safety shoes;

- Provision of fire extinguishers;
- Availability of equipment/tools (e.g. vehicle, wheel barrows, shovels etc) for emergencies;
- Creation of an emergency response team;
- Provision of mobile phones to supervisors to enable relevant stakeholders to be promptly informed and reached during emergencies.

Specific Emergency Situations

Fuel will not be stored on site. In the event of accidental spillage of construction materials, a recovery truck will be dispatched to the scene quickly to recover the product. **Table 7-2** provides specific emergency situations envisaged and the response measures proposed, while a general emergency response flow chart has been developed for use as shown in **Figure 7-1.**

Table 7-2: Specific Emergency Situations and Proposed Responses

WORKPLACE FIRES	
Response	**Any discovering fire should shout FIRE! FIRE! FIRE!** Assess fire before contacting GNFS immediately. Isolate fire where possible using appropriate extinguishers. Call the Fire Service emergency number 192 or general emergency line 999 if extinguishers are not helpful Evacuate all items and equipment in danger and ensure workers move to safe place Assist Fire Service if needed to control fire If there are injuries, provide first aid and send victims to nearest clinics/hospital Complete an incident report.
Preventive and control measures	Have strategically placed and properly serviced firefighting equipment especially fire extinguishers at vantage points at the construction at Tweapease CMDC site. Remove or protect combustible or flammable materials from heat sources. Suppress and control sparks on site. Suppress and control heat/fire (e.g. no burning or naked fire on or around the site; idling engines should be put off etc.). Routing checking and supervision of works/site.
PERSONAL ACCIDENT/INJURY	
Response	Work to be stopped if accident occurs at work camp/ construction site. Apply first aid. Assess condition of the injured, and contact the New Abirem Government Hospital ambulance if required. Complete accident report.
Prevention and control measures	Well-stocked first aid kits to be maintained. Provide clear signage onsite. Provide appropriate PPEs for workers and ensure its use. Educate and train workers on the use of PPEs and relevance of signages. Evaluate hazards at workplaces. Carry out regular inspection of work activities and workers behaviour
FLOOD	
Response	Where possible move machinery and workers to higher ground.
Prevention and control measures	Monitor weather data and flood warnings for advice. Inspect nearby drains close to Tweapease CMDC (Mamang stream) that drains the Tweapease community.
SPILL QUARRY DUST, AGGREGATES AND CONCRETE	
Response	Remove remaining quarry dust, aggregates and/ or concrete from spill area. Clean up spillage. Rectify the source of spillage. Complete incident report.
Preventive and control measures	Regularly inspect potential points of spills. Monitor levels of storage of products Do not sweep or hose concrete spillage or aggregates into storm water drains Do not stockpile spill aggregates on roads or walkway/ paths
VEHICLE ACCIDENT	
Response	EHS Manager must be informed immediately by staff available or the driver of the vehicle who will intend report to the Project Manager/ Supervising Engineer Driver or staff on board vehicle should erect reflective triangles at a safe distance in front and behind vehicle The EHS Manager shall visit the scene of the accident, inform and invite the Police to the accident scene or spot. The EHS Manager shall investigate the cause of the accident and submit a report on the incident/ accident. Where casualties are involved, the EHS Manager must ensure they are sent to the nearest clinic or hospital.

	Complete an accident report
Prevention and control measures	All drivers shall observe the specified speed limits of 20 km/h - 50km/h on the New Abirem – Tweapease road. All drivers on major roads shall observe a highway speed limit of 60km/h and the mandatory speed limit of 50km/h in communities. Make sure the accident area is safe and be alert for physical dangers such as fires or smoke and if fire is suspected call fire service on 192 immediately. Ensure cars are parked safely and well away from the accident spot. Make vehicles safe by switching off the ignition of all damaged and affected cars Call emergency line 999 or 112 for ambulance service if there are injuries or medical emergencies. Assess the casualties quickly and provide first aid if possible
ELECTRIC SHOCK AND ASSOCIATED INJURIES	
Response	Isolate power line/ power, if safe to do so. If not, use a dry, non-conducting object made of cardboard, plastic or wood to move the source away and from the injured person. Provide injured from shock with first aid and then to nearest clinic/ hospital for medical care or call ambulance on 112 Complete incident report
Prevention and Control Measures	Ensure all electrical power sources and cables are properly insulated Avoid loose hanging wires Never use a damaged extension cord or defective electrical device. Keep wet hands away from electrical outlets. Check and report all electrical hazards. Train employees on electrical safety.

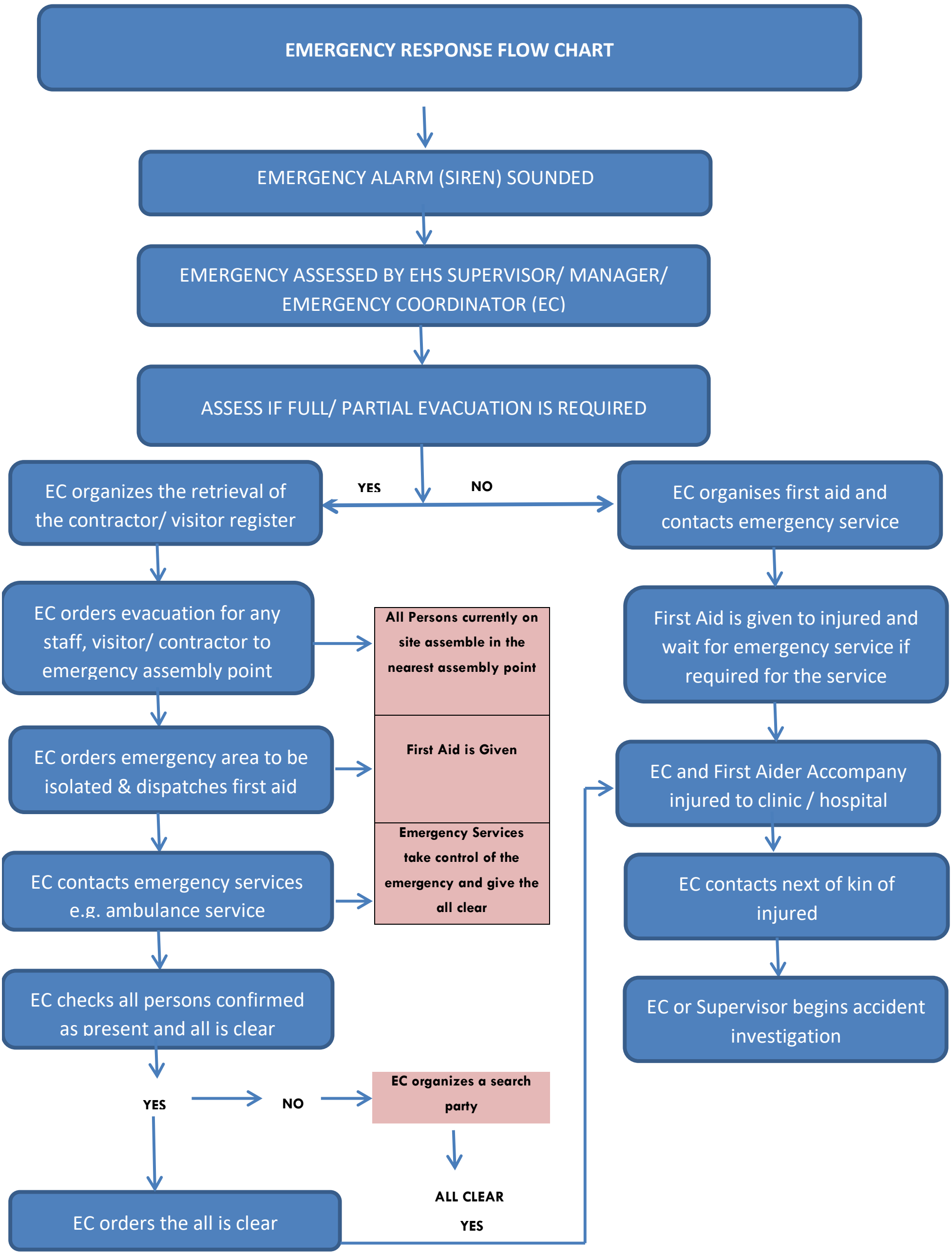

Figure 7-1: Emergency Response Flow Diagram for Managing Emergencies at the Construction Site

7.10 Key Roles and Responsibilities of Major Actors

A summary of the roles and responsibilities of key stakeholders in the implementation of the ESMP are provided in **Table 7-3**.

Table 7-3: Key Roles and Responsibilities of Major Actors

#	Key Actor	Key Roles and Responsibilities
1.	Environmental Protection Agency – Zonal Office, New Abirem and Head Office, Accra	❍ Offering guidance for screening, scoping, review of draft report, receiving comments from stakeholders, public hearing. ❍ Issue environmental permit with a schedule/ conditions to the permit for project implementation ❍ Monitoring of ESA/EMP and compliance with environmental permit schedule/ conditions ❍ Environmental liability investigations ❍ Site visits and follow-ups ❍ Promote environmental awareness
2.	Ministry of Environment, Science Technology and Innovation	❍ Has overall responsibility for the AEHPMP and compliance with the World Bank Safeguards Policies applicable to the project ❍ In conjunction with the EPA/ AEHPMP PIU, Has overall responsibility for successful implementation of the ESMP.
3.	AEHPMP PIU	❍ Liaise closely with the EPA and other regulators to obtain the needed permits and approvals for project implementation. ❍ Disclose the approved ESMP document to the public ❍ Coordinate and ensure the implementation of the project and the environmental/social requirements. ❍ Identify and liaise with all stakeholders involved with the environmental/social related issues of the project. ❍ Establish partnerships and liaise with organizations, stakeholders and civil society groups to ensure successful implementation of the project. ❍ Promote environmental, social, health and safety awareness ❍ Coordinate and present project implementation E&S monitoring report to EPA and World Bank on regular basis.
4.	Minerals Commission	❍ Has overall responsibility for the Community Mining Scheme at Tweapease ensuring they have a valid Mining Operating Permit at all times. ❍ Provide a Mining Services Operating Permit for the Tweapease CMDC. ❍ Liaise closely with the EPA and other regulators to supervise the operation of the CMDC at Tweapease
5.	Contractor	❍ Compliance with BOQ specifications. ❍ Provide their strategies on management of Health and Safety, Waste Management, Traffic Management, Code of Conduct ❍ Engage in grievance redress during project implementation ❍ Implement mitigation/monitoring program captured in the ESIA/ESMP and permit schedules related to the construction phase during project implementation. ❍ Periodically review construction activities and ensure compliance with ESHS regulations and laws. ❍ Prepare and submit relevant ESHS reports to regulatory agencies. ❍ Ensure workplaces are safe and construction workers are provided with appropriate PPEs. ❍ Comply with traffic management plan provisions. ❍ Promote environmental awareness among workers.
6.	Supervising Engineer/ Consultant	❍ Supervise contractor and ensure compliance with BoQ specifications. ❍ Ensure that Contractor and subcontractors comply with their Environmental, Health and Safety plans and monitoring programs. ❍ Review and approve all construction method statements from the contractor
7.	Birim North Municipal Assembly	❍ Provide development and building approvals for project buildings and structures. ❍ Provide suggestions and concerns to ensure smooth implementation of the project during stakeholder meetings. ❍ Participate in the EA processes and in the project decision-making that helps prevent or minimize impacts and to mitigate them. ❍ Assist in resolving community complaints or grievances that are beyond the Contractor. ❍ Approve disposal sites for construction wastes and other wastes generated during the construction phase.

#	Key Actor	Key Roles and Responsibilities
8.	Community opinion leaders, Assemblymember Residents, including Miners	❍ Partnering in project stakeholders' awareness creation ❍ Support the project implementation and follow due process in addressing grievances and complaints. ❍ Reporting grievances through the established GRM structures for the project ❍ Provide comments, advice and/or complaints on issues of nonconformity. ❍ Attend public meetings organized for stakeholders on Environmental and Social Safeguards. ❍ Provide feedback to Contractor/ AEHPMP PIU on complaints from locals on construction activities creating environmental/social nuisance or problems to the community or individuals in the community.
9.	NGOs/CSOs	❍ Promote ESHS awareness ❍ Provide feedback to AEHPMP PIU on complaints from locals on construction activities creating ESHS nuisance or problems to the community or individuals in the community. ❍ Publicize GRM arrangements for the project. ❍ Act as an environmental/social mobilizer and mediator when required.
10.	World Bank	❍ Provide adequate funding for the project implementation. ❍ Overall supervision and provision of technical support and guidance. ❍ Recommend additional measures for strengthening the management framework and implementation performance.
11.	Media	❍ Publicize or discuss the project information approved by AEHPMP PIU ❍ Identify issues that could derail the project implementation and bring them to the attention of stakeholders. ❍ Promote environmental and safety awareness on the project.
12.	Ghana National Fire Service GNFS)	❍ Be involved with emergency response situations that is beyond the capability of the Contractor.
13.	Ghana Police Service	❍ Be involved with any violations of national laws and order, GBV/ SEA/ SH and human right abuses by construction personnel and community members.
14.	Medical facilities	❍ Help in treating accident victims with major injuries that occur onsite or offsite involving either construction personnel or community members during the implementation of the project.

7.11 Grievance Redress Mechanism

Basis of Grievance Redress Mechanism

Even though during this ESMP preparation processes, stakeholder consultation was carried out in a consultative and participatory manner, experience has shown that grievances are further raised sometimes by project-affected persons/ I&APs during the project implementation. In the light of this, grievance resolution procedures for projects and projects are necessary to resolve disputes that may arise from an aggrieved person.

A Grievance Redress Mechanism (GRM) is a system by which queries or clarifications or problems that arise out of implementation of a project are resolved and addressed efficiently and effectively. When addressed, the grievances are expected to ensure support, as well as help achieve results and sustainability of project activities.

As part of this ESMP, a GRM with multiple avenues or channels for lodging complaints and their resolution in a way that is transparent, prompt and timely and with clear procedures is established hereunder. The establishment of the GRM on all the AEHPMP projects is a requirement by the World Bank to ensure resolution of project related conflicts or complaints.

Objectives of the Grievance Redress Mechanism

The objectives of the Grievance Redress Mechanism among others is to:

- ❍ Resolve grievances or complaints from affected persons, groups and institutions promptly, fairly and in a manner, that to extent possible acceptable to all parties;
- ❍ Provide affected people with avenues for making a complaint or resolving any dispute that may arise during the implementation of the project;

- Ensure that appropriate and mutually acceptable redress actions are identified and implemented to the satisfaction of complainants; and
- Avoid the need to resort to judicial proceedings.

The Grievance Redress Structure

The grievance redress structures uses the already existing EPA Grievance Redress framework to address complaints that may arise as a result of the proposed construction of the Tweapease CMDC (Grievance Redress Mechanism (GRM) | Environmental Protection Agency, Ghana (epa.gov.gh).

The Safeguards Specialist or a dedicated staff at the PIU would be responsible for management the central Grievance Redress System relating to the Tweapease CMDC project of AEHPMP. The proposed GRM recommends four key steps as follows:

- Receive and register grievances or complaints;
- Acknowledge, assess and assign (Acknowledge receipt of grievance, outline how grievance will be processed, assess eligibility and assign responsibility);
- Propose Response; and
- Agreement on Response.

If agreement is reached, implement agreement. If agreement is not reached, review case and if no agreement is reached under the review process, then the case can be referred to the law courts.

Steps of the Grievance Process

Table 7-4 presents the recommended time frames for addressing a grievance or dispute.

Table 7-4: Proposed GRM Time Frame

Step	Process	Timeframe
1	Receive and register grievance	Within 24 hours
2	Acknowledge the grievance	Within 24 hours
3	Assess the grievance	Within 24 hours
4	Assign responsibility	Within 2 Days
5	Develop a response	Within 7 Days
6	Implement response if agreement is reached	Within 7 Days
7	Close the grievance	Within 2 Days
8	Initiate grievance review process if no agreement is reached at the first instance	Within 7 Days
9	Implement review recommendations and close grievance	Within 14 Days
10	Grievance taken to court by complainant if no agreement is reached	-

Grievance Documentation and Reporting

Resolved and escalated grievances/cases would be documented daily (as tickets) into the EPA centralized GRM system by the assigned grievance Officer. The Safeguards Specialist or a dedicated staff at the PIU would exercise oversight over the system and track the resolution of all grievances/cases.

Monthly case/ grievance reports will be generated from the system by the Safeguards Specialist or a dedicated staff at the PIU and report to the Project Coordinator to inform management decisions. Quarterly reports would also be generated and reported to the MESTI as part of the Project's Progress Reporting to the World Bank. Periodic reports will also be generated within a reasonable time frame for stakeholders upon request irrespective of the period (e.g. bi-annual, annual etc.).

8.0 INSTITUTIONAL CAPACITY REQUIREMENTS FOR ESMP IMPLEMENTATION

To effectively implement this ESMP document, training will be undertaken by the AEHPMP PIU to equip key stakeholders who will be involved in the implementation, monitoring, and reporting on the ESMP. The capacity building will be carried out prior to the commencement of the civil works and subsequently prior to operations. The training is aimed at providing knowledge and understanding on the ESMP requirements, the skills required, and the roles and responsibilities. A proposed plan for the capacity building is presented in **Table 8-1**. The Plan is estimated to cost Eight Hundred and Twenty-Five Thousand Ghana Cedis (GHS825,000.00) for the construction period and Four Hundred and Twenty Thousand Ghana Cedis (GHS420,000.00) for the first year of operations.

Table 8-1: Training Plan for the ESMP Implementation

Training Required	Targeted Participants	Duration	When	Estimated training cost (GHS)
Overview of World Bank and EPA Policies triggered by the Project.	**Contractor Key Staff**-Project Engineer, Foreman, Safeguards Officer, Clerk of Works, Health and Safety Manager. **Supervising Consultant staff-** Project Engineer, Safeguards Officer, Clerck of Works. **Birim North Municipal Assembly**- District Chief Executive, Metropolitan Coordinating Officer, Metropolitan Planning Officer Metropolitan Social Development & Gender Officer, Waste Management Engineers, Metropolitan Works Engineer, Elected Assemblymember of the project communities	1 day	Prior to commencement of civil works	165,000.00
Overview of the ESMP, Potential E&S impacts, Mitigation and management measures, E&S monitoring, Roles and Responsibilities	**Contractor Key Staff**-Project Engineer, Foreman, Safeguards Officer, Clerk of Works, Health and Safety Manager. **Supervising Consultant staff-** Project Engineer, Safeguards Officer, Clerk of Works. **Birim North Municipal Assembly** - District Chief Executive, Metropolitan Coordinating Officer, Metropolitan Planning Officer, Metropolitan Social Development & Gender Officer, Waste Management Engineers, Metropolitan Works Engineer, Elected Assemblymember of the project communities **Other Stakeholders**- Community Opinion Leaders/NGOs/CBOs/ Project Affected Persons, Miners and other stakeholders.		Prior to commencement of civil works	165,000.00
Health and Safety (Occupational & Public Health & Safety)	**Contractor Key Staff**-Project Engineer, Foreman, Safeguards Officer, Clerk of Works, Health and Safety Manager, other construction workers. **Supervising Consultant staff-** Project Engineer, Safeguards Officer, Clerk of Works. **Birim North Municipal Assembly** - District Planning Officer, Metropolitan Social Development & Gender Officer, Waste Management Engineers, Metropolitan Works Engineer, Elected Assemblymember of the Tweapease community **Other Stakeholders**- Community Opinion Leaders/NGOs/CBOs/ Project Affected Persons, Miners and other stakeholders.	1 day	Prior to commencement of civil works	165,000.00
Code of Conduct for construction workers (integrating GBV and SEA/ SH issues)	**Contractor Key Staff**-Project Engineer, Foreman, Safeguards Officer, Clerk of Works, Health and Safety Manager, other construction workers. **Supervising Consultant staff-** Project Engineer, Safeguards Officer, Clerck of Works. **Other Stakeholders**-Representatives of Community Opinion Leaders/NGOs/CBOs/ Project Affected Persons, Miners and other stakeholders	½ day	Prior to commencement of civil works & during construction period	82,500.00

Training Required	Targeted Participants	Duration	When	Estimated training cost (GHS)
	Birim North Municipal Assembly District Planning Officer, Metropolitan Social Development & Gender Officer, Waste Management Engineers, Metropolitan Works Engineer, Elected Assemblymember of the project community			
Construction Waste Management	**Contractor Key Staff**-Project Engineer, Foreman, Safeguards Officer, Clerk of Works, Health and Safety Manager, other construction workers. **Supervising Consultant staff- P**roject Engineer, Safeguards Officer, Clerck of Works. **Birim North Municipal Assembly** - District Planning Officer, District Social Development & Gender Officer, Waste Management Engineers, Metropolitan Works Engineer, Elected Assemblymembers of the project communities	½ day	Prior to commencement of civil works & during construction period.	82,500.00
Grievance Redress Mechanisms	**Contractor Key Staff**-project Engineer, Foreman, Safeguards Officer, Clerk of Works, Health and Safety Manager. **Supervising Consultant staff-** Project Engineer, Safeguards Officer, Clerk of Works. **Birim North Municipal Assembly** - District Coordinating Officer, Metropolitan Planning Officer, Metropolitan Social Development & Gender Officer, Waste Management Engineers, Metropolitan Works Engineer, Elected Assemblymembers of the project communities **Grievance Redress Committee Members:** **Other Stakeholders**-Representatives of Community Opinion Leaders/NGOs/CBOs/ Project Affected Persons, Miners and other stakeholders	1 day	Prior to commencement of civil works	165,000.00
Subtotal (construction)				**825,000.00**
ESMP Implementation for Operational Phase	**Staff of Tweapease CMDC**-4 management team. **Management of Tweapease Community Mining Scheme-** 4 staff. **Birirm North Municipal Assembly** **Grievance Redress Committee Members:** **Other Stakeholders**-Representatives of Community Opinion Leaders/NGOs/CBOs/ Project Affected Persons, Miners and other stakeholders	1 day	During Operations and Maintenance Phase	180,000.00
Requirements of Ghana EPA	**Staff of Tweapease CMDC**-4 management team. **Management of Tweapease Community Mining Scheme-** 4 staff.	1 day but twice in a year	During Operations and Maintenance Phase	120,000.00
Hazardous Materials/ Chemicals Management	**Staff of Tweapease CMDC**-4 management team. **Management of Tweapease Community Mining Scheme-** 4 staff.	1 day but twice in a year		120,000.00
Subtotal (operation)				**420,000.00**
Grand Total				**1,245,000.00**

9.0 DECOMMISSIONING PLAN

9.1 Post-Construction Phase

Equipment and other Site Facilities

The Contractor will dismantle and relocate all equipment and other facilities and leftover materials such as pieces of wood, iron rods, spent concrete and chipping, broken manholes, scrap metals, debris, obsolete construction equipment, etc., at the project sites upon completion of the construction works. Besides wastes that can be given out or sold out for reuse or recycling, all other wastes generated will be disposed of at an approved waste disposal site in the Tweapease community after the decommissioning.

Decommissioning of the equipment and other facilities will take into consideration the intended use and in compliance with both Ghanaian and international policies governing decommissioning of such facilities.

Guidelines to help in decommissioning any site office and other project installations are presented in **Table 9-1**.

Table 9-1: Guidelines for Decommissioning Site Offices and other Installations

ITEM	DECOMMISSION ACTIVITY	SAFETY MEASURE	MATERIALS REQUIRED
Superstructures			
Pieces of wood, iron rods, metal scraps, corrugated iron sheets, etc	Reuse or sold/given out to accredited recycling providers	PPE for workers, including leather gloves (potential for the sheets to injure the handler).	Claw hammer
Plastic Sheets	Plastic sheets that will be re-used should be removed and washed with disinfectant, dried and stored safely. Other sheets that will not be reused should be disposed of properly at the community's approved dumpsite.	Workers should be allowed to work only after wearing their PPE. Ensure that after cleaning, the workers shall take a bath and wash themselves with disinfectant and bathing soap	Disinfectant, Chlorine solution, Brushes, Bathing Soap, PPE's for workers (Gloves, reflective Overall, Safety boots, Head cover).
Timber	The timber should be sprayed with disinfectant for reuse. Those not reusable should be donated to local community members for use as firewood.	PPE for workers, including leather gloves (potential for the sheets to injure the handler).	Claw hammer, Digging bar, Spraying equipment and Disinfectant
Sanitation facilities			
Squatting pan and trap or WC, PVC sewage piping	Care should be taken when handling these items as they have been in direct contact with human excreta. If planned for re-use, the pan, trap & PVC items will be removed and wash with disinfectant, to be dried and stored safely; Wastewater should be discharged into an approved disposal site at Tweapease.	Workers should be allowed to work only after wearing their PPE. Ensure that after cleaning the workers will take a bath and wash themselves with disinfectant and bathing soap.	Disinfectant, Chlorine solution, Brushes, Bathing Soap, PPE for workers (Gloves, reflective Overall, Safety boots, Head cover).
Masonry Foundations (cement/rings platform)	All above ground structure should be demolished (smashed)	Workers should be allowed to work only after wearing their PPE (and ensuring that the workers take a bath and wash with disinfectant and bathing soap.	Shovels, Pick axe, PPE for workers (Gloves, Overall, Safety boots, Head cover)
Mobile Toilets			
Mobile toilet/urinal units	Care should be taken when handling these items as they have been in direct contact with human wastes. Relocate all mobile toilet/units to new work sites or to contractor yard for future use at new sites.	Workers should be allowed to work only after wearing their PPE.	Disinfectant, Chlorine solution, Brushes, Bathing Soap, PPE for workers (Gloves, reflective Overall, Safety boots, Head cover).
Pit Latrine			

ITEM	DECOMMISSION ACTIVITY	SAFETY MEASURE	MATERIALS REQUIRED
Pit Latrine/urinal units	The pit should be covered with soil material and levelling it up and the area disinfected. Wooden slabs should be buried if applicable.	Workers should be allowed to work only after wearing their PPE.	Disinfectant, Chlorine solution, Pick axes, shovel, wheelbarrow Bathing Soap, PPE for workers (Gloves, reflective Overall, Safety boots, Head cover).
Bathroom			
Washroom and bathing place	The plastic sheet and wooden structures to be broken. Concrete platform to be smashed and the debris moved to a disposal site	Ensure that working crew move the debris to a disposal site	Shovels, Pick axe, wheelbarrow locally available

Project Equipment/Machinery and Materials

The project equipment such as excavators, generators, vehicles and other machinery will be relocated to new or other work sites in the country. Any leftover materials like sand, chippings will be removed from the site.

9.2 Post-Operational Phase – Project Facilities

The Contractor is expected to handover the Project facilities to the PIU after construction for operation of Tweapease CMDC. The PIU and other stakeholders will ensure that CMDC last for the period it has been designed for and even beyond. The CMDC will not be decommissioned entirely after the designed period but rehabilitation and expansion works will be carried out as appropriate for further improvement using modern and appropriate technologies.

Any such large-scale rehabilitation and improvement works to be carried out in the long term will be undertaken in line with the environmental assessment procedures of the country. The intended rehabilitation and improvement works will be registered with the EPA to enable the Agency advise on the level of environmental assessment and reporting to be carried out in accordance with the Environmental Assessment Regulations 1999, LI 1652.

Other stakeholders and relevant institutions will be informed prior to the commencement of any major rehabilitation work on the Tweapease CMDC, and these include:

- Birim North Municipal Assemblies – Local government authority in charge of developmental projects in the project area;
- Minerals Commission – Government Agency responsible for the mining sector; and
- PIU – responsible for implementation of the Project at Tweapease.

10.0 CONCLUSION

The intervention, a community-focused cleaner technology seeks to address current policy challenges as well as to strengthen regulatory frameworks and facilitate their implementation, to better address environmental health risks associated with mercury use in ASGM sector.

The proposed establishment of a CMDC at Tweapease is to assist in eliminating mercury exposure, use in ASGM, and improve the health risks and effects associated with mercury in the community and Ghana as a whole. Mercury is a known neurotoxin with high exposures linked to some health challenges including kidney and autoimmune dysfunction.

This ESMP therefore seeks to provide mitigation and management measures to realize the benefits from the intervention while eliminating any cumulative impacts.

The overall strategy for the intervention is designed to improve ASGM operations in mining communities such as Tweapease. While eliminating the health risks associated with mercury use in ASGM as the main benefit of the intervention other multiplier effects such as employment opportunities, poverty reduction and improved national reputation, some negative impacts during implementation have been identified during construction and operation of the ASGM sector. Such negative impacts include air quality deterioration, noise level elevation and landscape destruction during construction and wastewater generation during operation and maintenance which have been identified as minor.

The studies towards the preparation of this ESMP has revealed that the execution of the CMDC at Tweapease will not severely impact negatively on the existing environmental, social, safety and health of the community.

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www.ghanadistricts.com

12.0 LIST OF ANNEXES

Annex 3-1: Report of Ambient Air Quality Noise Assessment and Surface Water Quality Baseline Study
Annex 3-2: Report of Terrestrial Ecology Study
Annex 4-1: Stakeholder Engagement Results
Annex 7-1: Sample Code of Conduct Forms

Annex 3-1: Report of Ambient Air Quality Noise Assessment and Surface Water Quality Baseline Study

ENVIRONMENTAL PROTECTION AGENCY (EPA)

GHANA, AFRICA ENVIRONMENTAL HEALTH AND POLLUTION MANAGEMENT PROGRAMME (AEHPMP)

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AUGUST 2024

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❑ EXECUTIVE SUMMARY

The Environmental Protection Agency (EPA) has proposed to establish a Clean Mine Demonstration Centre (CMDC) at Tweapease near New Abirem in the Birim North Municipality of the Eastern Region of Ghana as part of the Africa Environment Health and Pollution Management Programme (AEHPMP) funded by the World Bank. The centre will be supplied with ore from a proposed Mine in Tweapease.

The establishment of the CMDC at Tweapease requires the preparation of an Environmental and Social Management Plan (ESMP). This report of the ambient air quality, noise levels, groundwater and surface water/ sediment quality baseline characteristics of the catchment area of the proposed establishment of a CMDC at Tweapease forms part of the baseline studies for the ESMP preparation. It describes the baseline ambient concentration of particulate matter, noxious gases and surface water/ sediment quality at specified locations in Tweapease. The monitoring was carried out by Messrs E**nvirorich Consult Limited** on 4th August, 2024. The samples were collected from the following locations described hereunder with their respective Global Positioning System (GPS).

For Ambient Air and Noise

ID	Sampling Site	Coordinates
AN1	Tweapease L/A Primary School	06°22'52.8"N, 000°54'41.5"W
AN2	Proposed Mining Site	06°21'54.7"N, 000°55'04.4"W
AN3	Demarcated Plant Site	06°22'38.4"N, 000°54'35.0"W

For Surface Water Quality

ID	Sampling Site	Coordinates
S1	Mamang Downstream	06°21'51.3"N, 000°55'04.7"W
S2	Mamang Upstream	06°22'45.3"N, 000°54'36.3"W
A Sediment Sample was taken from Mamang Down Stream (S1)		

For Groundwater Quality

ID	Sampling Point	Coordinates
BHW1	Borehole at Tweapease	06°22'58.1"N, 000°54'42.4"W

The purpose of the assignment was to monitor and confirm the baseline concentration of particulate matter, noxious gases, noise levels and surface water quality of the subproject area as part of the baseline study and depicting the baseline conditions.

The scope of work involved (1) fieldwork, (2) laboratory analysis, (3) data analysis and (4) report preparation.

for ambient air quality- (monitored 4th August, 2024)

ID	Sampling Site	TSP/ μgm^{-3}	PM_{10}/ μgm^{-3}	$PM_{2.5}$/ μgm^{-3}	NO_2/ μgm^{-3}	SO_2/ μgm^{-3}
AN1	Tweapease L/A Primary School	49.2	22.4	4.5	0.871	8.640
AN2	Proposed Mining Site	19.5	10.3	4.4	0.691	0.000
AN3	Demarcated Plant Site	16.3	7.9	2.8	0.943	7.949
GS 1236:2019- Ambient Air Pollutants		**150.0***	**70.0***	**35.0***	**150.0***	**50.0***
WHO Guideline Value		**na**	**50.0***	**25.0***	**200.0***	**50.0***
IFC Guideline Value		**na**	**50.0***	**25.0***	**200.0****	**20.0***

*…….24 hours averaging time **……..1 hour averaging time

GS 1236:2019 is "Environment and Health Protection- Requirements for Ambient Air Quality and Point Source/ Stack Emissions"

for noise levels- (monitored 4th August, 2024)- measurements done in line with GS 1253:2018

ID	Sampling Site	L_{eq}	L_{max}	L_{min}	L_{10}	L_{50}	L_{90}
AN1	Tweapease L/A Primary School	55.0	67.8	36.1	58.9	50.9	46.5
AN2	Proposed Mining Site	37.9	58.2	28.5	39.9	36.4	33.6
AN3	Demarcated Plant Site	39.3	49.1	28.2	41.2	38.1	36.6
GS 1222:2018 (Mixed Use)		**60.0**					
WHO Guideline Value (Industrial, Commercial Shopping and Traffic Areas, Indoors and Outdoors)		**70.0**					
IFC Guideline Value (Industrial, Commercial)		**70.0**					

Legend

L_{EQ} Equivalent Sound Level representing the average integrated sound level accumulated during the sampling period

L_{MAX} Maximum Sound Level obtained during the sampling period

L_{MIN} Minimum Sound Level obtained during the sampling period

L_{10} Nuisance noise level during the sampling period

L_{50} Average noise level recorded during the sampling period

L_{90} Background noise level recorded during the sampling period

GS 1222:2018 is "Health Protection- Requirements for Ambient Noise Control"

GS 1253:2018 is "Acoustic- Guide for Measurement of Outdoor A-Weighted Sound Levels"

For Borehole Water Quality- (sampled on 4th August, 2024)

Parameter	**Unit**	**BHW**	**GS 175-1**	**WHO Guideline**
Turbidity	NTU	<1.00	5	5
Colour (apparent)	Hz	<2.50	5	15
Odour	-	-	Inoffensive	Inoffensive
pH	pH Units	5.47	6.5-8.5	6.5-8.5
Conductivity	µS/cm	136.0	-	-
Total Suspended Solids (TSS)	mg/l	<1.00	0	-
Total Dissolved Solids (TDS)	mg/l	81.6	1,000	1,000
Sodium	mg/l	12.0	200	200
Potassium	mg/l	0.8	30	30
Calcium	mg/l	12.0	200	200
Magnesium	mg/l	3.78	150	150
Total Iron	Mg/l	0.131	0.3	0.3
Ammonium (NH_4-N)	mg/l	<0.001	0.00-1.5	0.00-1.5

Parameter	Unit	BHW	GS 175-1	WHO Guideline
Chloride	mg/l	29.8	250	250
Sulphate (SO_4)	mg/l	2.23	250	250
Phosphate (PO_4-P)	mg/l	0.088	-	-
Manganese	mg/l	0.093	0.4	0.4
Nitrite (NO_2-N)	mg/l	0.010	1.0	1.0
Nitrate (NO_3-N)	mg/l	1.360	10	10
Fluoride	mg/l	<0.010	1.5	1.5
Total Hardness (as $CaCO_3$)	mg/l	45.6	500	500
Total Alkalinity (as $CaCO_3$)	mg/l	21.8	-	-
Calcium Hardness (as $CaCO_3$)	mg/l	30.1	-	-
Mag. Hardness (as $CaCO_3$)	mg/l	15.6	-	-
Bicarbonate (as $CaCO_3$)	mg/l	26.6	-	-
Carbonate	mg/l	0.00	-	-

For Surface Water Quality- (sampled on 4th August, 2024)

Parameter	Unit	S1- Downstream	S2- Upstream	WRC Raw Water Quality Guidelines	GS 1212:2019
pH	-	7.62	6.98		6-9
Conductivity	µS/cm	107.0	110.0		1,500
Turbidity	NTU	22.0	38.0	0 - 1	75
Colour	Hz	45.0	50.0	-	150
Total Suspended Solids (TSS)	mg/l	15.0	40.0	-	50
Total Dissolved Solids (TDS)	mg/l	58.9	60.5		1,000
Ammonium (NH_4-N)	mg/l	0.792	0.448	-	1
Nitrate (NO_3-N)	mg/l	0.113	0.183	0 - 6	50
Total Phosphorus	mg/l	0.272	0.331	-	2
Sulphate	mg/l	28.25	19.60	-	300
Fluoride	mg/l	<0.005	<0.005	0 - 1	10
Chloride	mg/l	2.48	2.88		250
Sodium	mg/l	10.8	10.4	-	200
Potassium	mg/l	2.30	2.20	-	5
Calcium	mg/l	9.94	9.46	-	250
Magnesium	mg/l	5.92	5.63	-	2
BOD	mg/l	7.68	9.60	-	-
COD	mg/l	48.0	46.0	-	250
Oil/ Grease	mg/l	<1.00	<1.00	-	5
Total Iron	mg/l	1.90	2.59	0 – 0.1	10
Cadmium	mg/l	<0.002	<0.002	-	-
Chromium	mg/l	<0.010	<0.010	-	-
Zinc (Zn)	mg/l	0.011	0.009	0- 3	-
Copper	mg/l	0.070	0.049	-	5.0
Lead (Pb)	mg/l	<0.005	<0.005	0 – 10	0.1
Manganese	mg/l	0.013	0.047	-	-
Nickel	mg/l	<0.001	<0.001	-	-

Parameter	Unit	S1- Downstream	S2- Upstream	WRC Raw Water Quality Guidelines	GS 1212:2019
Mercury	mg/l	<0.001	<0.001	-	0.005
Total Arsenic	mg/l	<0.001	<0.001	-	1.0

For sediment Quality (sampled on 4th August, 2024)

Parameter	Unit	Sediment	CEQG Guidelines- TEL	CEQG Guidelines- PEL
pH	-	7.62		
Conductivity	µS/cm	68.0		
Oil/ Grease	mg/kg	<1.00		
Heavy Metals				
Iron	mg/kg	1,239.0	-	-
Cadmium	mg/kg	<0.200	0.6	3.5
Chromium	mg/kg	<0.500	37.3	90.0
Copper	mg/kg	2.64	35.7	197.0
Zinc (Zn)	mg/kg	9.8	123.0	315.0
Lead (Pb)	mg/kg	<0.500	35.0	91.0
Manganese	mg/kg	6.09	-	-
Nickel	mg/kg	0.760	-	-
Arsenic	mg/kg	<0.100	5.9	17
Mercury	mg/kg	<0.100	0.170	0.486

CEQG= Canadian Environmental Quality Guideline; PEL= Probable Effect Level; ISQG= Interim Sediment Quality Guidelines similar to those of USEPA; TEL= Threshold Effect Level; -= no data available for CEQG and USEPA

The results show that:

For Dust/ Noxious Gases

- Dust levels in the ambient air ranged from 16.3µgm^{-3} at the Demarcated Plant Site to 49.2µgm^{-3} at Tweapease L/A Primary School for TSP compared with the GS value of 150µgm^{-3} and from 7.9µgm^{-3} at the Demarcated Plant Site to 22.4µgm^{-3} at Tweapease L/A Primary School for PM_{10} compared with the GS value of 70µgm^{-3}. $PM_{2.5}$ values ranged from 2.78µgm^{-3} at the Demarcated Plant Site to 4.45µgm^{-3} at Tweapease L/A Primary School.
- Noxious gases emission was within the respective GS values. SO_2 was 0.000µgm^{-3} at the Proposed Mining Site to 8.640µgm^{-3} at Tweapease L/A Primary School, compared with the GS value of 50.0µgm^{-3}, while NO_2 ranged from 0.691µgm^{-3} at the Proposed Mining Site to 0.943µgm^{-3} at the Demarcated Plant Site, compared with the GS value of 150.0µgm^{-3}.
- All the parameters recorded values below the respective IFC and WHO guideline values.
- The prevailing wind direction was from South-West to North-East.

The following recommendations are therefore made:

- The ambient air quality should be sustained even during construction and/ or operation and maintenance phase of the proposed subproject.

For Noise

- Equivalent Noise Levels (Leq) ranged from 37.9dB(A) at the Proposed Mining Site to 55.0dB(A) at Tweapease L/A Primary School compared with the GS value of 60dB(A) for a mixed use Area and 70dB(A) for WHO Guideline Value (Industrial, Commercial Shopping and Traffic Areas, Indoors and Outdoors) and WBG Guideline Value (Industrial, Commercial).
- The Lmax values recorded ranged from 49.1dB(A) at the Demarcated Plant Site to 67.8dB(A) at Tweapease L/A Primary School.

The following recommendation is therefore made:

- The serene environment in Tweapease and surroundings should be maintained during construction and/ or operations and maintenance phase of the subproject.

For Borehole Water Quality

A borehole in the town was sampled to determine the quality of groundwater in the project area. The results have been compared with the available GS 175-1 and the WHO Guideline values for drinking water.

- Only the pH value fell outside the GS and WHO range of 6.5-8.5 with a value of 5.47.
- The groundwater is low in dissolved solids and can be said to be soft.

The following recommendations are therefore made:

- The groundwater resource in the project area should be protected to prevent any contamination during construction and/ or operation and maintenance of the Tweapease CMDC.

For Surface Water Quality

- The water quality results have been compared with the Water Resources Commission (WRC) administered Ghana Raw Water Quality Guidelines and also the Ghana Standard values (GS1212:2019)- Mining and Quarry Industry.
- For the physicochemical parameters, the water quality showed compliance with the GS 1212:2019 values except Magnesium, both upstream and downstream.

The following recommendation is therefore made:

- Ensure provision of silt and oil traps on drainage channels/ Mamang stream during construction and operation to avoid discharge of silt laden runoff and oil from the subproject site into the nearby Mamang stream.

For Sediment Quality

The results have been compared with the Canadian Environmental Quality Guideline (CEQG) values designated as Probable Effect Level (PEL) and Interim Sediment Quality Guidelines (ISQG). It is noted that the ISQG values are same as the USEPA values.

The results show that:

- The sediment sample obtained from the Mamang stream (downstream) showed compliance with the CEQG/ USEPA values in terms of the ISQG/TEL and the PEL.
- No sediment quality guidelines have been provided for Nickel, Iron and Manganese in the CEQG/ USEPA. The Nickel, Iron and Manganese concentrations obtained could be attributed to the

geological formation of the project area and other anthropogenic activities. Nickel, Iron and Manganese recorded values of 0.760mg/kg, 1,239.0mg/kg and 6.09mg/kg respectively.

The following recommendation is therefore made:

- A more elaborate sediment quality monitoring should be instituted during construction and operation of the CMDC at Tweapease.

1. INTRODUCTION

1.1 Background

As part of the Preparation of Environmental and Social Management Plan (ESMP) for the proposed Clean Mine Demonstration Centre (CMDC) at Tweapease, air quality and noise monitoring exercise as well as groundwater and surface water/ sediment sampling for laboratory analysis has been carried out by Messrs **Envirorich Consult Limited** for Tweapease to determine the baseline conditions of air, noise level, groundwater, surface water and sediment quality of the proposed project area. The report of the assignment is presented hereunder.

1.2 Environmental Quality Standard Values

The Ghana Standards Authority (GSA) has in collaboration with the Environmental Protection Agency (EPA) and through various National Technical Committees issued Ghana Standard (GS) requirements for Ambient Air Quality, Noise Control and Measurements and Effluent Quality, and the relevant standard values are as presented in **Table 1**, **Table 2** and **Table 3** respectively. Also included in Table 3 is the Water Resources Commission (WRC) administered Raw Water Quality Guideline values.

Table 2: Maximum Limits of Ambient Air Pollutants- GS1236:2019

NO.	SUBSTANCE	TIME WIGHTED AVERAGE, (TWA)	AVERAGING TIME
1.	Sulphur Dioxide (SO_2)	*520* μgm^{-3} 50 μgm^{-3}	*1hr* 24hrs
2.	Nitrogen Oxides (measured as NO_2)	*250* μgm^{-3} 150 μgm^{-3}	*1hr* 24hrs
3.	Total Suspended Particulate (TSP/SPM)	*150* μgm^{-3} 80 μgm^{-3}	*24hrs* 1yr
4.	PM_{10}	*70* μgm^{-3} 70 μgm^{-3}	*24hrs* 1yr
5.	$PM_{2.5}$	*35* μgm^{-3}	*24hrs*
6.	Carbon Monoxide (CO)*	*100 mg/m^3* 60 mg/m^3 30 mg/m^3 10 mg/m^3	*15mins* 30mins 1hr 8hrs

(Source: GSA, 2019) **……Fenceline Air Pollutant Standard*

Table 3: Requirements for Ambient Noise Control Level Based on Categorized Zones- GS 1222:2018

ZONE	DESCRIPTION OF AREA OF NOISE RECEPTION	PERMISSIBLE NOISE LEVEL IN dB(A)	
		DAY 0600 - 2200	NIGHT 2200 - 0600
A	Residential areas	55	48
B	Educational and health facilities, office and law courts	55	50
C	Mixed Use	60	55
D	Areas with some light industry	65	60
E	Commercial areas	75	65
F	Light industrial areas	70	60
G	Predominantly heavy industrial areas	70	70
Ensure that maximum noise level near the construction site does not exceed 66dB(A) in other areas and 75dB(A) in an industrial area			

(Source: GSA, 2018)

Table 4: Water Quality – Specification for Drinking Water -GS 175:2021

Parameter	Unit	GS 175-1	WHO Guideline
Turbidity	NTU	5	5
Colour	Hz	5	15
Odour	-	Inoffensive	Inoffensive
pH	pH Units	6.5-8.5	6.5-8.5
Conductivity	µS/cm	-	-
Total Suspended Solids (TSS)	mg/l	0	-
Total Dissolved Solids (TDS)	mg/l	1000	1000
Sodium	mg/l	200	200
Potassium	mg/l	30	30
Calcium	mg/l	200	200
Magnesium	mg/l	150	150
Ammonium (NH_4-N)	mg/l	0.00-1.5	0.00-1.5
Chloride	mg/l	250	250
Sulphate (SO_4)	mg/l	250	250
Phosphate (PO_4-P)	mg/l	-	-
Manganese	mg/l	0.4	0.4
Nitrite (NO_2-N)	mg/l	1.0	1.0
Nitrate (NO_3-N)	mg/l	10	10
Fluoride	mg/l	1.5	1.5
Total Hardness (as $CaCO_3$)	mg/l	500	500
Total Alkalinity (as $CaCO_3$)	mg/l	-	-
Calcium Hardness (as $CaCO_3$)	mg/l	-	-
Mag. Hardness (as $CaCO_3$)	mg/l	-	-
Bicarbonate (as $CaCO_3$)	mg/l	-	-
Carbonate	mg/l	-	-
Total Iron	mg/l	0.3	0.3
Total Coliform	CFU/100ml	0	0
Faecal Caliform	CFU/100ml	0	0
E Coli	CFU/100ml	0	0

(Source: DGS 175:2021)

Table 5: Environmental Protection – Requirements for Effluent Discharge for Mining and Quarry Industry (Gold Mining) and WRC Raw Water Quality Guidelines

Parameter	Unit	WRC Raw Water Quality Guidelines	GS 1212:2019
Turbidity	NTU	0-1	75
Temperature	°C	-	≤ 3° above ambient
Colour	Hz	-	150
pH	pH Units	6-9	6 - 9
Conductivity	µS/cm	0-700	1,500
Alkalinity	mg/l	-	
Total Suspended Solids (TSS)	mg/l	-	50
Total Dissolved Solids (TDS)	mg/l	0-450	1,000
Fluoride	mg/l	0-1	10
Sulphate	mg/l	-	-
Sulphide	mg/l	-	-
Ammonia-Nitrogen	mg/l	-	1
Total Phosphorus	mg/l	-	-
Chloride	mg/l	0-100	-
Nitrate (NO_3-N)	mg/l	0-6	50
Calcium	mg/l	-	-
Magnesium	mg/l	-	-
Sodium	mg/l	-	-
Silica	mg/l	-	20
Copper	mg/l	-	5
Lead	mg/l	0-10	0.1
Arsenic (Total)	mg/l	-	1
BOD	mg/l	-	
COD	mg/l	-	250
Oil/ Grease	mg/l	-	5
Total Iron	mg/l	0-0.1	-
Cadmium	mg/l	-	-
Chromium	mg/l	-	-

(Source: GSA, 2019)

Table 6: Sediment Quality- Guidelines for Heavy Metals

Parameter	Unit	CEQG Guidelines- TEL	CEQG Guidelines- PEL	CEQG Guidelines- ISQG
Total Iron	mg/kg	-	-	-
Cadmium	mg/kg	0.7	4.2	0.7
Chromium	mg/kg	52.3	160.0	52.3
Copper	mg/kg	18.7	108.0	18.7
Zinc (Zn)	mg/kg	124.0	271.0	124.0
Lead (Pb)	mg/kg	30.2	112.0	30.2
Manganese	mg/kg	-	-	-

1.3 Objective

The purpose of the assignment was to monitor the environmental media to confirm the baseline concentration of particulate matter, noxious gases, noise levels, groundwater quality, stream water quality and sediment quality of the project area as part of the ESMPs.

1.4 Scope of Work

The scope of work included the following among others:

- Groundwater/ Surface Water/ Sediment Quality sampling and laboratory analysis for physicochemical and other quality parameters;
- Monitoring of ambient air quality parameters involving the following at the selected points within the project area and environs viz: (i) Sulphur Dioxide (SO_2), (ii) Nitrogen Dioxide (NO_2), (iii) Total Suspended Particulate (TSP), and (iv) Respirable Dust ($PM_{2.5}$ & PM_{10}),
- Noise level assessment at the selected points within the concession;
- Laboratory analysis of samples;
- Climatic assessment;
- Analysis of data; and
- Report preparation.

2. WORK CARRIED OUT

The monitoring exercise was carried out by a three- man team during the period of 4th August 2024 at the specified locations in the proposed project area. The Community people provided support.

2.1 Monitoring Locations

The samples were collected from the sampling/ monitoring points as shown in **Tables 6, 7 and 8** for Ambient Air Quality and Noise, Ground Water Quality and Stream Water Quality/ Sediment respectively, and analysed for specified parameters. **Figure 1** is a map showing the air quality and noise monitoring locations and **Figure 2** is a map showing the stream water/ sediment sampling locations.

Table 7: Ambient Air and Noise Monitoring Location

AN1	Tweapease L/A Primary School	06°22'52.8"N, 000°54'41.5"W
AN2	Proposed Mining Site	06°21'54.7"N, 000°55'04.4"W
AN3	Demarcated Plant Site	06°22'38.4"N, 000°54'35.0"W

Table 8: Groundwater Sampling Point

ID	Sampling Point	Coordinates
BHW1	Borehole at Tweapease	06°22'58.1"N, 000°54'42.4"W

Table 9: Stream Water Quality Sampling Location

ID	Sampling Site	Coordinates
S1	Mamang Downstream	06°21'51.3"N, 000°55'04.7"W
S2	Mamang Upstream	06°22'45.3"N, 000°54'36.3"W
A Sediment Sample was taken from the Mamang Down Stream (S1)		

The sampling points were so chosen to ensure coverage of the baseline conditions in the concession.

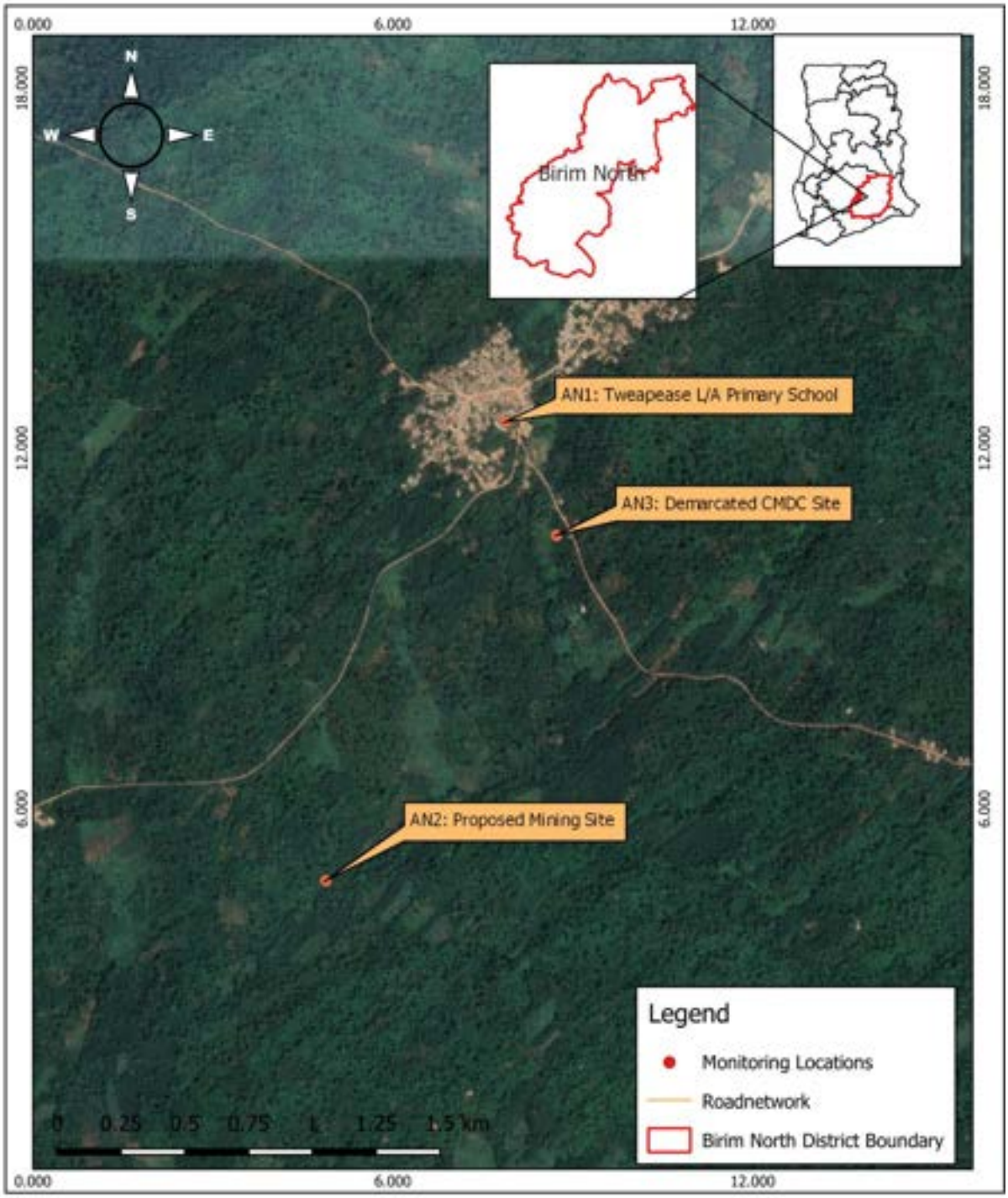

Figure 2: Ambient Air, and Noise Monitoring Locations in the Project Area and Environ

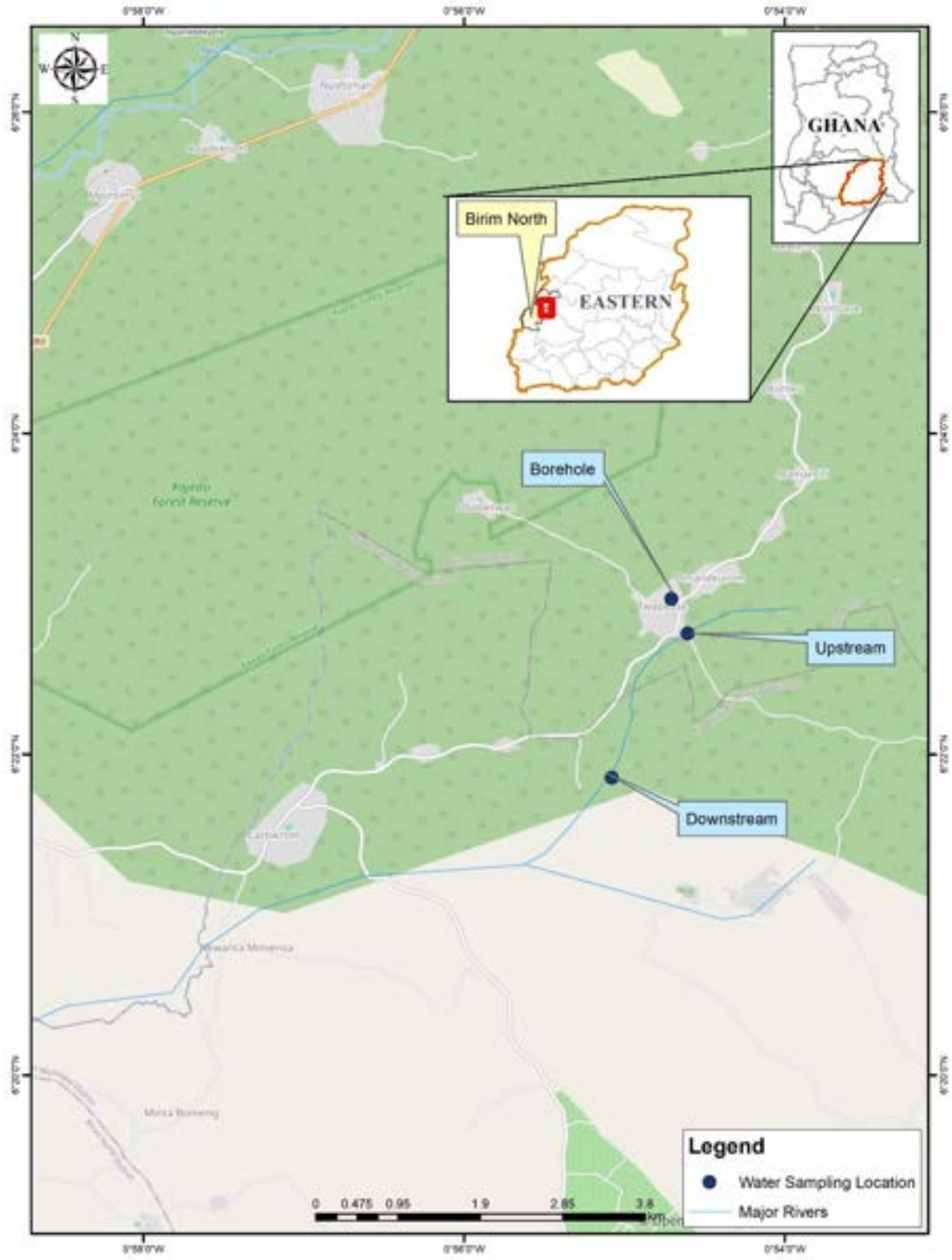

Figure 3: Surface Water Basins and Sampling Locations in the Project Area and Environs

- ***2.2 Methodology***
-
- **2.2.1 Particulate Matter and Noxious Gases Measurement**

The ambient air quality was monitored for concentrations of Total Suspended Particulates (TSP), Respirable Dust ($PM_{2.5}$ PM_{10}), Sulphur Dioxide (SO_2), and Nitrogen Dioxides (NO_2), at the designated sampling locations as well as the noise level.

Particulate Matter

The Osiris, a Turnkey Instrument's direct reading airborne particulates monitor was used to measure the concentrations of the TSP, PM_{10} and $PM_{2.5}$ in the ambient air. The Osiris particulates monitor is time-integrated and configured to measure the particulates mentioned above in real time, and provides the time-weighted average values over the monitoring period- 24- hour averaging time. It works by using Turnkey's specially-developed nephelometer i.e., air samples are continuously drawn through the nephelometer, which analyses individual particles as they pass through a laser beam. The particles are then collected on the reference filter.

The Osiris has achieved the Environment Agency's MCERTS certification, ensuring its accuracy in recording data. **Plate 1** shows the Osiris mounted at the site of the points monitored.

Plate 2: The Osiris Particulates Monitor at Location AN1 (Tweapease L/A Primary School)

Noxious Gases

Levels of sulphur dioxide, nitrogen dioxide and carbon monoxide in the ambient air at different sampling locations in the site was determined using the Aeroqual Series 500 gas monitor with sensor heads of the required noxious gas as shown in **Plate 2.** It enables real time monitoring of the particular gas and provides the time-weighted average values over the monitoring period- 24- hour averaging time at the points monitored.

Plate 3: The Aeroqual Series 500 Gas Monitoring Deployed at AN 3 (Demarcated Plant Site)

2.2.2 Noise Assessment

Noise Levels were captured in-situ in decibels on the A scale, i.e. dB(A) using a portable Pulsar Integrated Sound Level Meter with data logging system. Measurement of noise is often 'A-weighted' to take into account the fact that some sound wavelengths are perceived as being particularly loud and not sensitive to the human ear. Thus the A scale gives greater weight to the frequencies of sound to which the human ear is most sensitive.

Noise levels were measured for a period of time and the data logged into the equipment memory. The statistical summaries were later retrieved for analysis (**See Plate 3**).

Plate 4: The Noise Monitor Positioned at AN1

- **2.2.3 Groundwater and Surface Water Quality**

Specified methods as laid in "Standard Methods for the Examination of Water and Wastewater" published jointly by the American Water Works Association (AWWA), American Public Health Association (APHA) and the Water Environment Federation (WEF) 24thEdition, 2017 were followed. The methods are as shown in **Table 15. Plate 4** shows the Borehole sampled.

Plate 5: Borehole Water Sampled at Tweapease (S1)

- ***2.3 Analysis of Data***

Direct comparison with the GS values for the various emissions was employed.

Particulate Matter/ Noxious Gases

Air quality and meteorological data were analysed and compared with the GS values and the possible areas of impact respectively.

Noise

The following statistical summaries were automatically retrieved from the sound level meter and are as explained below and compared with the GS value for Predominantly Commercial Areas:

- L_{EQ} Equivalent Sound Level representing the average integrated sound level accumulated during the sampling period;
- L_{MAX} Maximum Sound Level obtained during the sampling period;
- L_{MIN} Minimum Sound Level obtained during the sampling period;
- L_{10} Nuisance noise level obtained during the sampling period;
- L_{50} Average noise level recorded during the sampling period; and
- L_{90} Background noise level recorded during the sampling period.

Table 10: Analytical Methods Employed for Stream Water Analysis

Parameter	Method of Analysis
pH	pH Electrode Probe
Conductivity	Cond/ TDS Electrode Probe
Total Dissolved Solids (TDS)	Cond/ TDS Electrode Probe
Alkalinity	Titrimetric
Colour (TCU)	Nessleriser
Turbidity (NTU)	Nephelometric
Biochemical Oxygen Demand (BOD)	Winkler Azide Modification
Chemical Oxygen Demand (COD)	Winkler Azide Modification
Total Suspended Solids (TSS)	Gravimetric
Oil/Grease	Gravimetric Through Extraction
Ammonia-N	Direct Nesslerisation
Nitrate-N	Spectrophotometry (Hydrazine Reduction)
Chloride	Titrimetric (Argentometric)
Fluoride	Spaans
Total Phosphorous	Spectrophotometry (Stannous Chloride)
Iron	Atomic Absorption Spectrophotometry (AAS)
Lead	Atomic Absorption Spectrophotometry (AAS)
Zinc	Atomic Absorption Spectrophotometry (AAS)
Total Coliform, counts/100ml	Membrane Filtration
E coli, counts/100ml	Membrane Filtration

- ***2.4 Calibration of Equipment***

All equipment used for the exercise were calibrated at the laboratory prior to carrying out the assignment using Standard Operating Procedures (SOPs).

3. RESULTS AND DISCUSSIONS

3.1 Results

3.1.1 Ambient Air Quality Results

The results of the air quality monitoring exercise are as shown in **Table 10.**

Table 11: Ambient Air Quality Results - (monitored 4th August, 2024)

ID	Sampling Site	TSP/ μgm^{-3}	PM_{10}/ μgm^{-3}	$PM_{2.5}$/ μgm^{-3}	NO_2/ μgm^{-3}	SO_2/ μgm^{-3}
AN1	Tweapease L/A Primary School	49.2	22.4	4.5	0.871	8.640
AN2	Proposed Mining Site	19.5	10.3	4.4	0.691	0.000
AN3	Demarcated Plant Site	16.3	7.9	2.8	0.943	7.949
GS 1236:2019- Ambient Air Pollutants		150.0*	70.0*	35.0*	150.0*	50.0*
WHO Guideline Value		na	50.0*	25.0*	200.0*	50.0*
WBG Guideline Value		na	50.0*	25.0*	200.0**	20.0*

*…….24 hours averaging time **……..1 hour averaging time

GS 1236:2019 is "Environment and Health Protection- Requirements for Ambient Air Quality and Point Source/ Stack Emissions"

3.1.2 Noise Level Results

The results of the noise monitoring exercise are as shown in **Tables 11.**

Table 12: Noise - (Monitored 4th August, 2024) – measurements done in line with GS 1253:2018

	Sampling Site						
	Tweapease L/A Primary School						
	Proposed Mining Site						
	Demarcated Plant Site						
GS 1222:2018 (Mixed Use)							
WHO Guideline Value (Industrial, Commercial Shopping and Traffic Areas, Indoors and Outdoors)							

WBG Guideline Value (Industrial, Commercial)		

Legend

L_{EQ} Equivalent Sound Level representing the average integrated sound level accumulated during the sampling period

L_{MAX} Maximum Sound Level obtained during the sampling period

L_{MIN} Minimum Sound Level obtained during the sampling period

L_{10} Nuisance noise level during the sampling period

L_{50} Average noise level recorded during the sampling period

L_{90} Background noise level recorded during the sampling period

GS 1222:2018 is "Health Protection- Requirements for Ambient Noise Control"

GS 1253:2018 is "Acoustic- Guide for Measurement of Outdoor A-Weighted Sound Levels"

❑ 3.1.3 Groundwater and Stream Water/ Sediment Quality Results

The results of the groundwater, surface water and sediment quality analysis are as shown in **Tables 12, 13** and **14** respectively.

Table 13: Borehole Water Quality Results – (Sampled on 4th August, 2024)

Parameter	Unit	BHW	GS 175-1	WHO Guideline
Turbidity	NTU	<1.00	5	5
Colour (apparent)	Hz	<2.50	5	15
Odour	-	-	Inoffensive	Inoffensive
pH	pH Units	5.47	6.5-8.5	6.5-8.5
Conductivity	µS/cm	136.0	-	-
Total Suspended Solids (TSS)	mg/l	<1.00	0	-
Total Dissolved Solids (TDS)	mg/l	81.6	1,000	1,000
Sodium	mg/l	12.0	200	200
Potassium	mg/l	0.8	30	30
Calcium	mg/l	12.0	200	200
Magnesium	mg/l	3.78	150	150
Total Iron	Mg/l	0.131	0.3	0.3
Ammonium (NH_4-N)	mg/l	<0.001	0.00-1.5	0.00-1.5
Chloride	mg/l	29.8	250	250
Sulphate (SO_4)	mg/l	2.23	250	250
Phosphate (PO_4-P)	mg/l	0.088	-	-
Manganese	mg/l	0.093	0.4	0.4
Nitrite (NO_2-N)	mg/l	0.010	1.0	1.0
Nitrate (NO_3-N)	mg/l	1.360	10	10
Fluoride	mg/l	<0.010	1.5	1.5
Total Hardness (as $CaCO_3$)	mg/l	45.6	500	500
Total Alkalinity (as $CaCO_3$)	mg/l	21.8	-	-
Calcium Hardness (as $CaCO_3$)	mg/l	30.1	-	-
Mag. Hardness (as $CaCO_3$)	mg/l	15.6	-	-
Bicarbonate (as $CaCO_3$)	mg/l	26.6	-	-
Carbonate	mg/l	0.00	-	-

Table 14: Surfacce Water Quality Results – (Sampled on 4th August, 2024)

Parameter	Unit	S1- Downstream	S2- Upstream	WRC Raw Water Quality Guidelines	GS 1212:2019
pH	-	7.62	6.98		6-9
Conductivity	µS/cm	107.0	110.0		1,500
Turbidity	NTU	22.0	38.0	0 - 1	75
Colour	Hz	45.0	50.0	-	150
Total Suspended Solids (TSS)	mg/l	15.0	40.0	-	50
Total Dissolved Solids (TDS)	mg/l	58.9	60.5		1,000
Ammonium (NH_4-N)	mg/l	0.792	0.448	-	1

Parameter	Unit	S1- Downstream	S2- Upstream	WRC Raw Water Quality Guidelines	GS 1212:2019
Nitrate (NO_3-N)	mg/l	0.113	0.183	0 - 6	50
Total Phosphorus	mg/l	0.272	0.331	-	2
Sulphate	mg/l	28.25	19.60	-	300
Fluoride	mg/l	<0.005	<0.005	0 - 1	10
Chloride	mg/l	2.48	2.88		250
Sodium	mg/l	10.8	10.4	-	200
Potassium	mg/l	2.30	2.20	-	5
Calcium	mg/l	9.94	9.46	-	250
Magnesium	mg/l	5.92	5.63	-	2
BOD	mg/l	7.68	9.60	-	-
COD	mg/l	48.0	46.0	-	250
Oil/ Grease	mg/l	<1.00	<1.00	-	5
Total Iron	mg/l	1.90	2.59	0 – 0.1	10
Cadmium	mg/l	<0.002	<0.002	-	-
Chromium	mg/l	<0.010	<0.010	-	-
Zinc (Zn)	mg/l	0.011	0.009	0- 3	-
Copper	mg/l	0.070	0.049	-	5.0
Lead (Pb)	mg/l	<0.005	<0.005	0 – 10	0.1
Manganese	mg/l	0.013	0.047	-	-
Nickel	mg/l	<0.001	<0.001	-	-
Mercury	mg/l	<0.001	<0.001	-	0.005
Total Arsenic	mg/l	<0.001	<0.001	-	1.0

Table 15: Sediment Quality Results – for Heavy Metals (Sampled on 4th August, 2024)

Parameter	Unit	Sediment	CEQG Guidelines- TEL	CEQG Guidelines- PEL
pH	-	7.62		
Conductivity	µS/cm	68.0		
Oil/ Grease	mg/kg	<1.00		
Heavy Metals				
Iron	mg/kg	1,239.0	-	-
Cadmium	mg/kg	<0.200	0.6	3.5
Chromium	mg/kg	<0.500	37.3	90.0
Copper	mg/kg	2.64	35.7	197.0
Zinc (Zn)	mg/kg	9.8	123.0	315.0
Lead (Pb)	mg/kg	<0.500	35.0	91.0
Manganese	mg/kg	6.09	-	-
Nickel	mg/kg	0.760	-	-
Arsenic	mg/kg	<0.100	5.9	17
Mercury	mg/kg	<0.100	0.170	0.486

-

3.1.4 Ambient Weather Conditions

The prevailing wind direction during the air quality monitoring periods was from South-West to North-East.

3.2 Discussions

The results show that:

For Dust/ Noxious Gases

- Dust levels in the ambient air ranged from 16.3µgm^{-3} at the Demarcated Plant Site to 49.2µgm^{-3} at Tweapease L/A Primary School for TSP compared with the GS value of 150µgm^{-3} and from 7.9µgm^{-3} at the Demarcated Plant Site to 22.4µgm^{-3} at Tweapease L/A Primary School for PM_{10} compared with the GS value of 70µgm^{-3}. $PM_{2.5}$ values ranged from 2.8µgm^{-3} at the Demarcated Plant Site to 4.5µgm^{-3} at Tweapease L/A Primary School.
- Noxious gases emission was within the respective GS values. SO_2 was 0.000µgm^{-3} at the Proposed Mining Site to 8.640µgm^{-3} at Tweapease L/A Primary School, compared with the GS value of 50.0µgm^{-3}, while NO_2 ranged from 0.691µgm^{-3} at the Proposed Mining Site to 0.943µgm^{-3} at the Demarcated Plant Site, compared with the GS value of 150.0µgm^{-3}.
- All the parameters recorded values below the respective WBG and WHO guideline values.
- The prevailing wind direction was from South-West to North-East.

For Noise

- Equivalent Noise Levels (Leq) ranged from 37.9dB(A) at the Proposed Mining Site to 55.0dB(A) at Tweapease L/A Primary School compared with the GS value of 60dB(A) for a mixed use Area and 70dB(A) for WHO Guideline Value (Industrial, Commercial Shopping and Traffic Areas, Indoors and Outdoors) and WBG Guideline Value (Industrial, Commercial).
- The Lmax values recorded ranged from 49.1dB(A) at the Demarcated Plant Site to 67.8dB(A) at Tweapease L/A Primary School.

For Borehole Water Quality

A borehole in the town was sampled to determine the quality of groundwater in the project area. The results have been compared with the available GS 175-1 and the WHO Guideline values for drinking water.

- Only the pH value fell outside the GS and WHO range of 6.5-8.5 with a value of 5.47.
- The groundwater is low in dissolved solids and can be said to be soft.

For Surface Water Quality

- The water quality results have been compared with the Water Resources Commission (WRC) administered Ghana Raw Water Quality Guidelines and also the Ghana Standard values (GS1212:2019)- Mining and Quarry Industry.
- For the physicochemical parameters, the water quality showed compliance with the GS 1212:2019 values except Magnesium, both upstream and downstream.

For Sediment Quality

The results have been compared with the Canadian Environmental Quality Guideline (CEQG) values designated as Probable Effect Level (PEL) and Interim Sediment Quality Guidelines (ISQG). It is noted that the ISQG values are same as the USEPA values.

The results show that:

- The sediment sample obtained from the Mamang stream (downstream) showed compliance with the CEQG/ USEPA values in terms of the ISQG/TEL and the PEL.
- No sediment quality guidelines have been provided for Nickel, Iron and Manganese in the CEQG/ USEPA. The Nickel, Iron and Manganese concentrations obtained could be attributed to the geological formation of the project area and other anthropogenic activities. Nickel, Iron and Manganese recorded values of 0.760mg/kg, 1,239.0mg/kg and 6.09mg/kg respectively.

4. CONCLUSION AND RECOMMENDATIONS

4.1 Conclusion

for ambient air quality

- TSP $PM_{2.5}$, PM_{10}, SO_2, and NO_2 were all compliant with the respective GS values, WHO Guideline Value and WBG Guideline Value at all the monitoring locations.

for noise levels

- The equivalent noise levels (Leq) of all the monitoring locations of the project area were below the GS value of 60dB(A) for the monitoring period.

for groundwater quality

- Only the pH value fell outside the GS and WHO range of 6.5-8.5 with a value of 5.47 and it is low in dissolved solids and can be said to be soft.

for surface water quality

- For the physicochemical parameters, the stream water quality showed compliance with the GS 1212:2019 values except Magnesium, both upstream and downstream.

For sediment quality

- The sediment quality compared with the Canadian Environmental Quality Guidelines (CEQG)/ USEPA values showed minimal values in terms of heavy metal concentration (excluding Nickel, Iron and Manganese).

4.2 Recommendations

The following recommendations are therefore made:

For Dust/ Noxious Gases

- The ambient air quality should be sustained even during construction and/ or operation and maintenance phase of the proposed subproject.

For Noise

- The serene environment in Tweapease and surroundings should be maintained during construction and/ or operations and maintenance phase of the subproject.

For Borehole Water Quality

- The groundwater resource in the project area should be protected to prevent any contamination during construction and/ or operation and maintenance of the Tweapease CMDC.

For Surface Water Quality

- Ensure provision of silt and oil traps on drainage channels/ Mamang stream during construction and operation to avoid discharge of silt laden runoff and oil from the subproject site into the nearby Mamang stream.

For Sediment Quality

- A more elaborate sediment quality monitoring should be instituted during construction and operation of the CMDC at Tweapease.

Annex 3-2: Report of Terrestrial Ecology Study

ECOLOGICAL STUDY REPORT FOR TWEAPEASE SITE, NEAR NEW ABIREM

CONSULTANCY SERVICE FOR THE PREPARATION OF ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR SELECTED CLEAN MINE DEMONSTRATION CENTRE-TWEAPEASE

OCTOBER 2024

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• 1.0 INTRODUCTION

As part of the ESMP preparation, an ecological study was undertaken to establish the baseline composition of flora and fauna of the subproject area at Tweapease, near New Abirem. It is a proposed community mining scheme.

The ecological survey for Tweapease Clean Mine Demonstration Centre (CMDC) site was conducted on 04 August 2024.

• 1.1 Objective of Assignment

The objective is to conduct terrestrial ecology study within the proposed subproject site of about 1 ha to monitor the changes in flora and fauna of the subproject area. The study will address structure and composition, focal habitats (i.e. sites important for biodiversity), and focal species, with particular attention paid to the status (abundance and distribution of identified species of conservation concern).

• 1.2 Scope of the Study

Specifically, the study covered:

- terrestrial flora studies, including comparison of structural characteristics of current and baseline vegetation conditions such as occurrence of large trees and trees known to be important for biodiversity and presence of regeneration, coarse woody debris or deadwood, and other elements specific to the agroecological zone, such as anthills, etc.
- focal habitat sites especially those important for biodiversity e.g. for shelter, feeding or reproduction and monitoring and management recommendations for their maintenance and enhancement. Examples of such sites include wetlands, streams, marshes, etc.
- focal species – status of species of national and regional conservation concern and the level of awareness about occurrence, status, condition, and abundance.
- terrestrial fauna studies to monitor changes in terrestrial fauna of conservation importance in the project area.
- impacts and threats – among others, this should assess presence of trees of commercial or local value, presence of invasive species, evidence of fires, illegal hunting, poisoning, capturing or collecting, vegetation clearance for charcoal production, etc.

- **2.0 METHODOLOGY FOR TERRESTRIAL ECOLOGICAL SURVEY**

- **2.1 Flora Survey**

The flora survey was in two parts:

1. Literature Review – relevant literature on the vegetation and ecological characteristics of the subproject affected area was carried out. The literature consulted included Hawthorne and Musah (1995), Hawthorne and Jongkind (2006), Hall and Swaine (1981), Hutchinson and Dalziel (1954-1972), Rose Innes (1977), and Taylor (1960), with the objective of obtaining a general overview of the vegetation and environment of the subproject area.
2. Field survey – A rapid survey was conducted within the subproject site and its external boundaries to obtain an overview of the extent, topography and complexity of the vegetation. A quadrat sample plot (20 m x 20 m) was studied in the proposed subproject site. The subproject area studied is a valley within the Mamang River basin. Species lists were compiled for the Tweapease site, and the habitat type determined. The location of the samples was recorded with a Garmin 64s GPS. Table 1 shows the sample location coordinates and their associated vegetation types.

Table 16: Coordinates of Sampling Locations and Associated Vegetation Types

Sample No.	Latitude (N)	Longitude (W)	Description
1	06.36428	000.91794	Riverine forest/cocoa farm/wetland and secondary thicket
2	06.36846	000.91780	Farmland /secondary thicket/wetland
3	06.371133	000.91845	Roadside/oil palm/freshwater Swamp
4	06.37766(5)	00.90944(4)	Farmlands (plantain & cassava)/riverine forest

Table 2 provides a description of the Star Rating System while Table 3 provides a description of the IUCN Red List Categories.

Table 17: Star Rating System

Rating	Description
Black Star species	Species rare internationally and at least uncommon in Ghana; urgent attention to conservation of populations needed
Gold Star species	Fairly rare internationally and/or locally
Blue star species	Widespread internationally but rare in Ghana or vice-versa
Scarlet star species	Common, but under serious pressure from heavy exploitation
Red Star species	Common, but under pressure from exploitation
Pink Star species	Common and moderately exploited. Also, non-abundant species of high potential value
Green Star species	No particular conservation concern, common in Ghana

Table 18: IUCN Red List Categories

Category	Description
Extinct (EX)	A taxon is Extinct when there is no reasonable doubt that the last individual has died. A taxon is presumed Extinct when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Extinct in the Wild (EW)	A taxon is Extinct in the Wild when it is known only to survive in cultivation, in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed Extinct in the Wild when exhaustive surveys in known and/or expected habitat, at appropriate times (diurnal, seasonal, annual), throughout its historic range have failed to record an individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.
Critically Endangered (CR)	A taxon is Critically Endangered when the best available evidence indicates that it meets any of the criteria A to E for Critically Endangered, and it is therefore considered to be facing an extremely high risk of extinction in the wild.
Endangered (EN)	A taxon is endangered when the best available evidence indicates that it meets any of the criteria for Endangered, and it is therefore considered to be facing a very high risk of extinction in the wild.
Vulnerable (VU)	A taxon is Vulnerable when the best available evidence indicates that it meets any of the criteria for Vulnerable, and it is therefore considered to be facing a high risk of extinction in the wild.
Near Threatened (NT)	A taxon is Near Threatened when it has been evaluated against the criteria but does not qualify for Critically Endangered, Endangered or Vulnerable now, but is close to qualifying for or is likely to qualify for a threatened category in the near future.
Least Concern (LC)	A taxon is Least Concern when it has been evaluated against the criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened. Widespread and abundant taxa are included in this category
Data Deficient (DD)	A taxon is Data Deficient when there is inadequate information to make a direct, or indirect, assessment of its risk of extinction based on its distribution and/or population status. A taxon in this category may be well studied, and its biology well known, but appropriate data on abundance and/or distribution are lacking.
Not Assessed (NA)	A taxon is Not yet Assessed when it is has not yet been evaluated against the criteria

- ### 2.2 Fauna Survey

The main methods used in the faunal survey were:

- Desk Survey: As part of the desk survey, references were made to available literature including those of Cansdale (1948; 1951), Booth (1958), Schiotz (1969), Hughes and Barry (1969), Decher (1997a), Decher et al. (1997), Kingdon (1997).

- Direct/opportunistic observation and identification of animal spoors: Direct/opportunistic observation involved recording any animal sightings while driving or walking along the main road or animal trails to the areas bordering the proposed subproject site. General walks through the subproject sites to spot animal *spoors* (any sign left by a living animal, such as feeding sites, regular pathways, tracks, footprints, faecal pellets, nests, etc.) were also undertaken. The animals identified were classified as either S.1 or S.2 depending on the degree of protection they enjoy under the national wildlife conservation regulation (Schedules, 1995) as follows:

S.1. (Schedule 1) - The hunting, capturing or destroying of these species is prohibited at all times.
S.2. (Schedule 2) **-** The hunting capturing or destroying of these species is absolutely prohibited between 1st August and 1st December of any season. The hunting, capturing or destroying of any young animal, or adult accompanied by its young, of these species is absolutely prohibited at all times.

- **2.3 Data Analyses**

A total of 4 vegetation samples were taken during the survey. The total number of species encountered in the survey was determined and used in determining the floristic composition of the subproject site. Floristic analysis (Appendix 2) was carried out to determine the dominant families, species frequency distributions life form composition and the ecological guilds of the species. The analysis also included the composition of species in terms of their Star Rating and IUCN threat status. The species list was inspected for alien invasive species.

- **2.4 Survey Limitations**

Complete flora and fauna surveys require multiple surveys at different times of the year and over a number of years to enable observations of all species present. Some flora, such as annuals, are available for collection at certain times of the year (e.g., when they are flowering). Climatic and other events (human disturbances like clearing, fires) may affect the presence of species.

- **3.0 RESULTS OF THE TERRESTRIAL ECOLOGICAL SURVEY**

- **3.1 Flora Survey**

- 3.1.1 Regional Context

The project area lies in the South-East (MSSE) subtype of the Moist Semi-deciduous forest type of Hall and Swaine, 1981, and Taylor's Celtis-Triplochiton Association (Taylor, 1960). The Moist Semi-deciduous forest type is generally characterised by species such as *Leptaspis cochleata* (a forest grass), *Celtis mildbraedii, Nesogordonia papaverifolia*, *Culcasia angolensis, Griffonia simplicifolia, Calycobolus africanus, Microdesmis puberula* and *Baphia nitida*. Some of the trees in this forest type reach between 50 to 60 m in height and it is the most productive forest type in Ghana, with soils ideal for cultivation of cocoa and other food crops. Characteristic species of the South-East subtype are *Turraeanthus africanus, Daniellia ogea, Khaya ivorensis, Illigera pentaphylla, Pteris togoensis, Chytranthus macrobotrys* and *Cola nitida* (edible cola). All the tree species listed above are of economic importance.

The characteristic species of the Moist Semi-Deciduous Forest type and their conservation statuses are presented in Table 4.

Table 19: Characteristic species of the Moist Semi-Deciduos Forest and their conservation statuses (after Hall and Swaine, 1981)

Characteristic Species	IUCN Threat Status	Star Rating
Turraeanthus africanus	VU	Pink
Daniellia ogea	NT	Pink
Khaya ivorensis	VU	Scarlet
Illigera pentaphylla	NE	Green
Pteris togoensis	NE	Green
Chytranthus macrobotrys	LC	Green
Cola nitida	LC	Pink

…..Vulnerable (VU), Least Concern (LC), Not Evaluated (NE)

- 3.1.2 Habitat Types in the Project Site

The vegetation of the project site is a mosaic of farms, fallows/secondary thickets, secondary forests and riverine and freshwater swamp forests. The vegetation shows various successional stages due to human induced disturbances. Farms and fallows dominate the landscape (Plates 1 and 2. Crops such as Plantain (*Musa paradisiaca*), Cassava (*Manihot esculenta*), and vegetables are usually planted in admixture with the Cocoa. Oil palm (*Elaeis guineensis*) is also cultivated in plantations of varying sizes (Plate 3). Cola (*Cola nitida*) and Avocado pear (*Persea americana*) are also common in the Cocoa farms. The riverine forest is dominated by Raphia hookeri (Plate 3).

The Cocoa farms are interspersed with several large trees (most of which are merchantable timbers) making important repositories of flora diversity. Notable among the trees are *Pycnanthus angolensis* (Otie), *Terminalia superba* (Ofram), *Milicia excelsa* (Odum) and *Triplochiton scleroxylon* (Wawa). The fallows and secondary thickets develop on abandoned cocoa farms whereas secondary forest occurs on the slopes of the hills that border the concession. Depressions in the concession have poorly developed freshwater swamp vegetation with species such as *Raphia hookeri*. Appendix 1 shows the sample locations and descriptions of the local vegetation types encountered in the survey.

Plate 6: Food Crop Farm (Cassava and Plantain) in the Foreground

Plate 7: Fallow Land/Secondary Thicket (Foreground) and Cocoa Farm with Isolated Trees (Background-Right)

Plate 8: Oil Palm plantation on the mine site

Plate 9: Riverine Forest Along the Bank of the Mamang River Dominated by Raphia hookeri

- 3.1.3 Floristic Analysis

The flora survey recorded a total of 68 species in 64 genera belonging to 32 families (Appendix 2). The family Fabaceae dominated the flora with 11 species followed by Poaceae with 7 families,

Moraceae with 5 species and Asteraceae and Euphorbiaceae with 4 species each. All other families were represented by less than 4 species each. These families together accounted for 45.6% of the species recorded.

Tables 5, 6 and 7, respectively, show the life form composition, the species composition by Star Rating and IUCN threat categories. Table 5 shows the tree life form dominated the flora of the project site (47%) followed by the Herb with 32.4% while the Climber and Shrub life forms were about equally represented with 8% and 6% respectively. The paucity of Climber and Shrub life forms is expected since the project sites are under cultivation.

Table 20: Life Form Composition of Project Site

Life forms	**no**	%
Climber	8	11.8
Herb	22	32.4
Shrub	6	8.8
Tree	32	47.1
Total	68	100.1

Table 6 indicates that majority of the species (about 91%) are of no conservation concern, being either Green Star or Not Evaluated. Six species of national conservation concern, (5 Pink and 1 Scarlet) were recorded during the survey (Table 7). Except for *Elaies guineensis* (Oil Plam, exploited for food) all the species of conservation concern are exploited for timber, with *Milicia excelsa* being heavily exploited.

Table 21. Species Composition by Star Rating

Star rating	**No**	%
Green	38	55.9
Pink	5	7.4
NE	24	35.3
Scarlet	1	1.5
Total	68	100.1

Key: NE - Not Evaluated

Table 22: Species of National Conservation Concern Recorded During Survey

Species	**Family**	**Life Form**	**Star Rating**
Antiaris toxicaria	Moraceae	Tree	Pink
Elaeis guineensis	Arecaceae	Tree	Pink
Piptadeniastrum africanum	Fabaceae	Tree	Pink
Pycnanthus angolensis	Myristicaceae	Tree	Pink
Terminalia superba	Combretaceae	Tree	Pink
Milicia excelsa	Moraceae	Tree	Scarlet

Table 8 summarizes the IUCN Threatened species assessment of project site. Most the species recorded in the project site were of no global or international conservation concern, being either Least Concern (LC) or Not Evaluated (NE). *Milicia excelsa*, Near Threatened (NT), was the only species of some global conservation concern.

Table 23: Summary of IUCN Threatened species Categories

IUCN	No	%
LC	31	45.6
NT	1	1.5
NE	36	52.9
Total	68	100.0

- 3.1.4: Alien Invasive Species

The species list compiled shows that one (1) alien invasive species commonly occurs in the project site viz., *Chromolaena odorata* (Shrub). This species should be managed (controlled or eliminated) during the construction phase to prevent their spread to other areas.

- **3.2 Fauna Survey**

The interviews with some locals (Plate 5) and literature available indicate that some of the common fauna existing in the project area are of national and global conservation concern. Appendix 4 is a list of some of the animals compiled from literature and interviews with farmers and hunters. Common birds encountered in the area include the Common Bulbul, Red-eyed Dove, African Green Pigeon, African Pied Hornbill, Red-bishop Village Weaver, Bronze Mannikin and Ahanta Francolin.

Plate 10: Interactions with a Hunter/ Farmer at Tweapease

- **4.0 CONCLUSIONS AND RECOMMENDATIONS**

The subproject site is a human modified habitat, having been cultivated and impacted by mining activities. It is anticipated that there would not be significant impacts on the flora and fauna of the area since the area to be developed is rather small. Animals are mobile and are likely to move or may have moved to safer Forest reserves nearby.

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APPENDICES

Appendix 1: Samples profiles and species list

1. Mamang stream

Riverine forest/cocoa farm/swamp/forbes and thickets

N 06.36428

W000.91794

Elevation 177m

Photo: 3632- 3634

Raphia hookeri

Elaeis guineensis

Paullinia pinnata

Nephrolepis biserrata

Ceiba pentandra

Albizia zygia

Trichilia prieureana

Costus afer

Macaranga barteri

Palisota hirsuta

Bridelia micrantha

Cissus petiolata

Ludwigia decurrens

Acroceras zizanioides

Pueraria phaseoloides

Sarcophrynium brachystachyum

Dioscorea smilacifolia

Chromolaena odorata

Myrianthus arboreus

Synedrella nodiflora

Terminalia superba

Pycnanthus angolensis

Anthocleista djalonensis

Platostoma africanum

Artocarpus heterophyllus

Alchornea cordifolia

Ficus sur

Sterculia tragacantha

Baphia pubescens

Baphia nitida

Justicia flava

Spathodea campanulata

Mariscus longibracteatus

Ageratum conyzoides

2. Oil palm plantation /cocoa /forbes/regrowth thickets/swamp

N 06.36846

W 000.91780

Photo: 3638-3641

Piper umbellatum

Macaranga barteri

Rhaphidophora africana

Microsorum scolopendria

Nephrolepis biserrata

Cyathula prostrata

Synedrella nodiflora

Millettia zechiana

Baphia nitida

Saccharum officinale

Ageratum conyzoides

Anthocleista djalonensis

Asystasia gangetica

Solanum torvum

Elaeis guineensis

Musa sp

Anthocleista djalonensis

Ficus sur

Mimosa pudica

Rottboellia cochinchinensis

Solanum torvum

Terminalia superba

Ceiba pentandra

Raphia hookeri

Sterculia tragacantha

Piptadeniastrum africanum

Palisota hirsuta

Paullinia pinnata

Hoslundia opposita

Cyperus haspan

Chromolaena odorata

3. Roadside/oil palm/swamp

N06.371133

W000.91845

Pueraria phaseoloides

Panicum maximum

Centrosema pubescens

Eleusine indica

Acroceras zizanioides

Schrankia leptocarpa

Ceiba pentandra

Newbouldia laevis

Sorghum arundinaceum

Colocasia esculenta

4. CMDC Site

Farmlands/riverine forest(plantain & cassava)

N06.37766(5)

W00.90944(4)

Photo: 3644-3647

Sterculia tragacantha

Terminalia superba

Alchornea cordifolia

Elaeis guineensis

Centrosema pubescens

Pueraria phaseoloides

Panicum maximum

Mimosa pudica

Asystasia gangetica

Chromolaena odorata

Erigeron floribundus

Griffonia simplicifolia

Musanga cecropioides

Ficus exasperata

Mallotus oppositifolius

Trichilia prieureana

Baphia nitida

Antiaris toxicaria

Pycnanthus angolensis

Morinda lucida

Anthocleista nobilis

Alchornea cordifolia

Anthocleista djalonensis

Milicia excelsa

Cissus petiolata

Albizia zygia

Musanga cecropioides

Elaeis guineensis

Albizia adianthifolia

Dioscorea smilacifolia

Ceiba pentandra

Millettia zechiana

Funtumia africana

Paullinia pinnata

Hoslundia opposita

Ficus sur

Bambusa vulgaris

Anchomanes difformis

Appendix 2: Floristic Composition of the Subproject Sites Surveyed

Species	Family	Life Form	Guild	Star rating	IUCN
Acroceras zizanioides	Poaceae	Herb	Pioneer	Green	LC
Ageratum conyzoides	Asteraceae	Herb	Non forest/weed Pioneer	NE	LC
Albizia adianthifolia	Fabaceae	Tree	NPLD	Green	LC
Albizia zygia	Fabaceae	Tree	NPLD	Green	LC
Alchornea cordifolia	Euphorbiaceae	Tree	Pioneer	Green	LC
Anchomanes difformis	Araceae	Herb	NE	Green	NE
Anthocleista djalonensis	Gentianaceae	Tree	Pioneer	Green	LC
Anthocleista nobilis	Gentianaceae	Tree	Pioneer	Green	LC
Antiaris toxicaria	Moraceae	Tree	NPLD	Pink	LC
Artocarpus heterophyllus	Moraceae	Tree	NE	NE	NE
Asystasia gangetica	Acanthaceae	Herb	Pioneer	Green	NE
Bambusa vulgaris	Poaceae	Tree	Swamp	Green	NE
Baphia nitida	Fabaceae	Tree	Shade-Bearing	Green	LC
Baphia pubescens	Fabaceae	Tree	Pioneer	Green	LC
Bridelia micrantha	Euphorbiaceae	Tree	Pioneer	Green	LC
Ceiba pentandra	Malvaceae	Tree	Pioneer	Green	LC
Centrosema pubescens	Fabaceae	Climber	Pioneer	NE	NE
Chromolaena odorata	Asteraceae	Shrub	Pioneer	Green	NE
Cissus petiolata	Vitaceae	Climber	NE	Green	NE
Colocasia esculenta	Araceae	Herb	Non forest Savana/planted	NE	LC
Costus afer	Costaceae	Herb	Pioneer	Green	NE
Cyathula prostrata	Amaranthaceae	Herb	Non forest/weed Pioneer	NE	NE
Cyperus haspan	Cyperaceae	Herb	NE	NE	NE
Dioscorea smilacifolia	Dioscoreaceae	Climber	NE	Green	LC
Elaeis guineensis	Arecaceae	Tree	Pioneer	Pink	LC
Eleusine indica	Poaceae	Herb	Pioneer	NE	LC
Erigeron floribundus	Asteraceae	Herb	Non forest/weed Pioneer	NE	NE
Ficus exasperata	Moraceae	Tree	Pioneer	Green	LC
Ficus sur	Moraceae	Tree	Pioneer	Green	LC
Funtumia africana	Apocynaceae	Tree	NPLD	Green	LC
Griffonia simplicifolia	Fabaceae	Climber	NPLD	Green	NE
Hoslundia opposita	Lamiaceae	Shrub	Non forest/weed Pioneer	NE	NE

Justicia flava	Acanthaceae	Herb	Non forest/weed Pioneer	NE	NE
Ludwigia decurrens	Onagraceae	Shrub	NE	NE	NE
Macaranga barteri	Euphorbiaceae	Tree	Pioneer	Green	LC
Mallotus oppositifolius	Euphorbiaceae	Tree	Shade-Bearing	Green	LC
Mariscus longibracteatus	Cyperaceae	Herb	Non forest/weed Pioneer	NE	NE
Microsorum scolopendria	Polypodiaceae	Climber	NE	NE	NE
Milicia excelsa	Moraceae	Tree	Pioneer	Scarlet	NT
Millettia zechiana	Fabaceae	Tree	Pioneer	Green	LC
Mimosa pudica	Fabaceae	Shrub	Non forest/weed Pioneer	NE	LC
Morinda lucida	Rubiaceae	Tree	Pioneer	Green	LC
Musa sp	Musaceae	Tree	NE	NE	NE
Musanga cecropioides	Cecropiaceae	Tree	Pioneer	Green	LC
Myrianthus arboreus	Cecropiaceae	Tree	Shade-Bearing	Green	LC
Nephrolepis biserrata	Nephrolepidaceae	Herb	NE	Green	NE
Newbouldia laevis	Bignoniaceae	Tree	Pioneer	Green	NE
Palisota hirsuta	Commelinaceae	Herb	Pioneer	Green	NE
Panicum maximum	Poaceae	Herb	Non forest/weed Pioneer	NE	NE
Paullinia pinnata	Sapindaceae	Climber	Pioneer	Green	NE
Piper umbellatum	Piperaceae	Herb	Pioneer	Green	NE
Piptadeniastrum africanum	Fabaceae	Tree	NPLD	Pink	LC
Platostoma africanum	Lamiaceae	Herb	Non forest/weed Pioneer	NE	NE
Pueraria phaseoloides	Fabaceae	Climber	Non forest/weed Pioneer	NE	NE
Pycnanthus angolensis	Myristicaceae	Tree	NPLD	Pink	NE
Raphia hookeri	Arecaceae	Tree	Swamp	Green	LC
Rhaphidophora africana	Araceae	Climber	Shade-bearing	Green	NE
Rottboellia cochinchinensis	Poaceae	Herb	Non forest/weed Pioneer	NE	NE
Saccharum officinale	Poaceae	Herb	NE	NE	NE
Sarcophrynium brachystachyum	Marantaceae	Herb	Shade-bearing	Green	NE
Schrankia leptocarpa	Fabaceae	Shrub	Non forest/weed Pioneer	NE	NE
Solanum torvum	Solanaceae	Shrub	Non forest/weed Pioneer	NE	NE
Sorghum arundinaceum	Poaceae	Herb	Pioneer	NE	LC
Spathodea campanulata	Bignoniaceae	Tree	Pioneer	Green	LC
Sterculia tragacantha	Malvaceae	Tree	Pioneer	Green	LC
Synedrella nodiflora	Asteraceae	Herb	Pioneer	NE	NE
Terminalia superba	Combretaceae	Tree	Pioneer	Pink	NE
Trichilia prieureana	Meliaceae	Tree	NPLD	Green	NE

Appendix 3: Frequency distribution of the species in the project site

Species/Sites	S1	S2	S3	S4	Totals
Acroceras zizanioides	1	0	1	0	2
Ageratum conyzoides	1	1	0	0	2
Albizia adianthifolia	0	0	0	1	1
Albizia zygia	1	0	0	1	2
Alchornea cordifolia	1	0	0	1	2
Anchomanes difformis	0	0	0	1	1
Anthocleista djalonensis	1	1	0	1	3
Anthocleista nobilis	0	0	0	1	1
Antiaris toxicaria	0	0	0	1	1
Artocarpus heterophyllus	1	0	0	0	1
Asystasia gangetica	0	1	0	1	2
Bambusa vulgaris	0	0	0	1	1
Baphia nitida	1	1	0	1	3
Baphia pubescens	1	0	0	0	1
Bridelia micrantha	1	0	0	0	1
Ceiba pentandra	1	1	1	1	4
Centrosema pubescens	0	0	1	1	2
Chromolaena odorata	1	1	0	1	3
Cissus petiolata	1	0	0	1	2
Colocasia esculenta	0	0	1	0	1
Costus afer	1	0	0	0	1
Cyathula prostrata	0	1	0	0	1
Cyperus haspan	0	1	0	0	1
Dioscorea smilacifolia	1	0	0	1	2
Elaeis guineensis	1	1	0	1	3
Eleusine indica	0	0	1	0	1
Erigeron floribundus	0	0	0	1	1
Ficus exasperata	0	0	0	1	1
Ficus sur	1	1	0	1	3
Funtumia africana	0	0	0	1	1
Griffonia simplicifolia	0	0	0	1	1
Hoslundia opposita	0	1	0	1	2
Justicia flava	1	0	0	0	1
Ludwigia decurrens	1	0	0	0	1
Macaranga barteri	1	1	0	0	2
Mallotus oppositifolius	0	0	0	1	1
Mariscus longibracteatus	1	0	0	0	1
Microsorum scolopendria	0	1	0	0	1

Milicia excelsa	0	0	0	1	1
Millettia zechiana	0	1	0	1	2
Mimosa pudica	0	1	0	1	2
Morinda lucida	0	0	0	1	1
Musa sp	0	1	0	0	1
Musanga cecropioides	0	0	0	1	1
Myrianthus arboreus	1	0	0	0	1
Nephrolepis biserrata	1	1	0	0	2
Newbouldia laevis	0	0	1	0	1
Palisota hirsuta	1	1	0	0	2
Panicum maximum	0	0	1	1	2
Paullinia pinnata	1	1	0	1	3
Piper umbellatum	0	1	0	0	1
Piptadeniastrum africanum	0	1	0	0	1
Platostoma africanum	1	0	0	0	1
Pueraria phaseoloides	1	0	1	1	3
Pycnanthus angolensis	1	0	0	1	2
Raphia hookeri	1	1	0	0	2
Rhaphidophora africana	0	1	0	0	1
Rottboellia cochinchinensis	0	1	0	0	1
Saccharum officinale	0	1	0	0	1
Sarcophrynium brachystachyum	1	0	0	0	1
Schrankia leptocarpa	0	0	1	0	1
Solanum torvum	0	1	0	0	1
Sorghum arundinaceum	0	0	1	0	1
Spathodea campanulata	1	0	0	0	1
Sterculia tragacantha	1	1	0	1	3
Synedrella nodiflora	1	1	0	0	2
Terminalia superba	1	1	0	1	3
Trichilia prieureana	1	0	0	1	2

Appendix 4: Fauna of the study area

Scientific Name	Common Name	IUCN Red List Status	CITES Status	Ghana Status
Artiodactyla				
Tragelaphus euryceros	Bongo	Near threatened		
Cephalophus dorsalis	Bay duiker	Near threatened	III	II
Cephalophus maxwelli	Maxwell's duiker	Near threatened	---	II
Cephalophus niger	Black duiker	Near threatened	---	II
Neotragus pygmaeus	Royal antelope	Near threatened		
Tragelaphus scriptus	Bush buck	---	---	II

Primates				
Cercopithecus Diana	Diana monkey	Endangered	II	I
Cercopithecus mona	Mona monkey	---	II	I
Cercopithicus nictitans	Putty-nosed monkey	---	---	II
Cercopithecus petaurista	Spot-nosed monkey	--	II	II
Colobus polykomos	Black and white colobus	Near threatened	---	I
Galago senegalensis	Bosman's potto	--	II	I
Galagoides demidovi	Bush baby	--	II	I
Hyrocoidea				
Dendrohyrax arboreus	Tree hyrax	--	---	I
Carnivora				
Genetta maculata	Forest genet	--	---	I
Herpestes sanguinus	Dwarf mongoose	--	---	II
Mungos gambianus	Gambian mongoose	Data Deficient		
Mungos obscurus	Cusimanse	--	---	II
Nandinia binotata	Palm civet	--	---	I
Vivera civetta	African civet	--	---	I
Pholidota				
Manis tetradactyla	Black-bellied pangolin	--	--	I
Phataginus tricuspis	White-bellied pangolin	--	--	I
Rodentia				
Anomalurus beecrofti	Beecroft's flying squirrel	--	--	I
Anomalurus derbianus	Derby flying squirrel	--	--	I
Anomalurus peli	Pel's flying squirrel	Near threatened	III	I
Athururus africanus	Brush-tailed porcupine	--	---	II
Funiscurius substriatus	Red side-striped squirrel	Data Deficient	---	---
Hystrix cristata	Crested porcupine	---	II	II
Protoxerus stangeri	Giant forest squirrel	--	---	II
Chiroptera				
Epomophorus gambianus	Gambian epaulet bat	---	---	II
Epomops franquetti	Singing fruit bat	---	---	II
Hippodiderus abae	Round-leaf bat	Near threatened	---	---
Hipposiderus jonesii	Horseshoe bat	Near threatened	---	---
Hypsignathus montstrosus	Hammer bat	---	---	II
Lissonycteris angolensis angolensis	Angola fruit bat	---	---	II
Megalosgolossus woermanni	Nectar bat	---	---	II
Micropteris pusillus	Lesser epaulet bat	---	---	II
Myoncycteris leptodon	Sierra Leone collared fruit bat	---	---	II
Nannocyctris veldkampii	Little flying cow	---	---	II
Nycteris microtis	Slit-faced bat	---	---	II
Rousettus aegyptiacus	Egyptian fruit bat	---	---	II
Scotonycteris ophiodon	Pohle's fruit bat	Endangered	--	II
Scotonycteris zenkeri	Zenker's fruit bat	Near threatened	--	II
Reptilia				
Chameleo gracilis	Chameleon	--	II	--
Kinixys belliana	Hinged tortoise	Vulnerable	II	II
Python regius	Royal python	---	II	--
Python sebae	African python	---	II	---

Varanus exanthematicus	Bosc's monitor	---	II	---
Varanus niloticus	Nile monitor	---	II	II
Birds				
Bleda eximius	Green-tailed bristlebill	Vulnerable	---	---
Bubo poensis	Frazer's eagle owl	---	---	I
Ceratogymna atrata	Black-casqued hornbill	---	---	II
Corythaeola cristata	Great blue turaco	---	---	II
Crinifer piscatorax	Grey plantain eater	---	II	II
Elanus caeruleus	Black-shouldered kite	--	---	II
Euplectus orix	Red bishop	---	---	II
Francolinus bicalcaratus	Double-spurred francolin	---	---	II
Glaucidium tephrontum	Pearl-spotted owlet	---	---	I
Illidopsis rufescens	Rufous-winged illadopsis	Threatened	---	---
Kaupifalco monnogrammicus	Lizard buzzard	---	---	I
Lonchura cucullata	Bronze manakin	---	III	II
Lonchura fringilloides	Magpie mannikan	---	---	II
Milvus migrans	Black kite	---	II	I
Neophron manachus	Hooded vulture	---	II	I
Ploceus cuculatus	Village weaver	---	III	II
Ploceus niggerimus	Veillot's black weaver	---	III	II
Ploceus nigricollis brachypterus	Spectacled weaver	---	III	II
Psittachus erathicus	Grey parrot	---	---	II
Serinus leucopygius	Grey canary	---	---	II
Tauraco macrorhyncus	Verreaux's turoco	---	---	II
Tauraco persa	Guinea turoco	---	---	II
Treron calvus	African green pigeon	---	---	II
Tockus camurus	Red-billed dwarf hornbill	---	---	II
Tockus faciatus semifasciatus	Black-and-white-tailed hornbill	---	---	II
Tropicanus albocristatus	White-crested hornbill	---	---	II
Tutur afer	Red-billed wood dove	---	III	II

Annex 4-1: Stakeholder Engagement Results

List of Persons Contacted and Key Issues Raised

No.	Location/ Venue	Person Contacted	Date Engaged	Issues/Concerns Raised	Responses Provided
1	New Abirem	• Audrey Arkoh, District Planning Officer (0247502271) • Anas Boadiwaa, Department of Social Welafre and Communuty Development (0246170728) • Emmanuel Fiebor, Health Directorate (0203747456) • Alberta Essiful, GSS, (0549867279)	12/08/ 2024	• They have been briefed about the Project and interested in providing the necessary support; • Would like to know how soon the Project will start • Concerned about the loss of agricultural lands to small-scale mining activities. • Noted that the remaining farmlands are too far and are disincentive to potential farmers especially, the youth • Raised concern about the high cost of living (food, rent and other services like farm labourers) • Noted that the loss of cash crops (cocoa, cola nut, teak, oil palm plantation) has changed the local economy from agricultural based to mining / cash based economy.	There is need to ensure that mining does not thrive to the detriment of farming which may result in famine in the subproject area
2	Tweapease	• Eunice Asante, The Hunger Project (0242533787)	12/08/ 2024	• The Project is a loudable one; it will help addresse some of the health risks associated with small-scale mining • Would like to know the role health professionals can play on the Project • The top ten diseases that are reported to the center are malaria, anemia, upper respiratory tract disease, intestinal worm, dysentery, rheumatism and hypertension which are often referred to the district hospital. • Medication for treatment of ailments is always in stock. • Transporting referred patients remains the biggest challenge of the center.	Hopefully, more of such workshops will be organized to educate miners on environmental, safety and health issues
3	Tweapease	• Okley Teye, Unit Committee (0541921803) • Kweku Sipi, Unit Committee (0593058667) • Emmanuel Anyetei, Unit committee, Chairman (0242909809)	12/08/ 2024	• Would like to know if the Project will create employment for residents, or the employees will rather brought in from elsewhere • Would like to know if the Chief and the community be compensated for the use of land • Suggest that in order to guarantee the sustainability of the Project, the deplorable road network to the community must be fixed. • Advised that the operations of the processing plant should not affect nearby residents • Would like to know what will happen to the waste generated from processing the gold ore.	The EPA will organize for more stakeholder inputs into the subproject and the overall project

No.	Location/ Venue	Person Contacted	Date Engaged	Issues/Concerns Raised	Responses Provided
				• Curious to understand how the community is going to benefit from the project • The Minerals Commission and the Environmental Protection Agency have been to the community for sensitization.	
4	Tweapease	Youth Group • Ebenezer Nartey (0247122112) • Kenny joseph (0246366696) • Stephen Ametor (0595246946) • Eric Sarkodie (0533488200) • Lami Ayi (0247274041) • Solomon Djamgbah (0244179790)	12/08/2024	• Most of the youth involved in galamsey do so outside the community e.g. Ntronang • Happy about the prospect of a project of such magnitude coming to their community, considering the community development that the project is likely to bring. • Expressed the hope of getting employment. • Concerned about the fact that currently crime levels are very low in the community; the fear is how this rate of crime will be improved upon after the project takes off.	The assembly has a major role to play in the subproject and will be consulted regularly to ensure success of the subproject

Annex 7-1: Sample Code of Conduct Forms

A). Company Code of Conduct Preventing Sexual Exploitation and Abuse and Violence Against Children

The company is committed to creating and maintaining an environment in which gender-based violence (SEA/SH) and violence against children (VAC) have no place, and will not be tolerated by any employee, associate, or representative of the company. Therefore, in order to ensure that all those engaged in the project are aware of this commitment, and in order to prevent, be aware of, and respond to any allegations of SEA/SH and VAC, the company commits to the following core principles and minimum standards of behaviour that will apply to all company employees, associates, and representatives including sub-contractors, without exception:

1. The company — and therefore all employees, associates, and representatives — commit to treating women, children (persons under the age of 18), and men with respect regardless of race, colour, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status. Acts of SEA/SH and VAC are in violation of this commitment.
2. Demeaning, threatening, harassing, abusive, culturally inappropriate, or sexually provocative language and behaviour are prohibited among all company employees, associates, and its representatives.
3. Acts of SEA/SH or VAC constitute gross misconduct and are therefore grounds for sanctions, which may include penalties and/or termination of employment. All forms of SEA/SH and VAC, including grooming are unacceptable, regardless of whether they take place on the work site, the work site surroundings, at worker's camps or at worker's homes.
4. In addition to company sanctions, legal prosecution of those who commit acts of SEA/SH or VAC will be pursued if appropriate.
5. Sexual contact or activity with children under 18—including through digital media and use of children as construction labour —is prohibited. Mistaken belief regarding the age of a child is not a defines. Consent from the child is also not a defines or excuse.
6. Sexual favours—for instance, making promises or favourable treatment dependent on sexual acts—or other forms of humiliating, degrading or exploitative behaviour are prohibited.
7. Unless there is full consent[2] by all parties involved in the sexual act, sexual interactions between the company's employees (at any level) and members of the communities surrounding the work place are prohibited. This includes relationships involving the withholding/promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex—such sexual activity is considered "non-consensual" within the scope of this Code.
8. All employees, including volunteers and sub-contractors are highly encouraged to report suspected or actual acts of SEA/SH and/or VAC by a fellow worker, whether in the same company or not. Reports must be made in accordance with SEA/SH and VAC Allegation Procedures.
9. Managers are required to report suspected or actual acts of SEA/SH and/or VAC as they have a responsibility to uphold company commitments and hold their direct reports responsible.

Consent is defined as the informed choice underlying an individual's free and voluntary intention, acceptance or agreement to do something. No consent can be found when such acceptance or agreement is obtained through the use of threats, force or other forms of coercion, abduction, fraud, deception, or misrepresentation. In accordance with the United Nations Convention on the Rights of the Child, the World Bank considers that consent cannot be given by children under the age of 18, even in the event that national legislation of the country into which the Code of Conduct is introduced has a lower age. Mistaken belief regarding the age of the child and consent from the child is not a defense.

To ensure that the above principles are implemented effectively the company commits to ensuring that:

10. All managers sign the 'Manager's Code of Conduct' detailing their responsibilities for implementing the company's commitments and enforcing the responsibilities in the 'Individual Code of Conduct'.
11. All employees sign the project's 'Individual Code of Conduct' confirming their agreement not to engage in activities resulting in SEA/SH or VAC.
12. Displaying the Company and Individual Codes of Conduct prominently and in clear view at workers' camps, offices, and in in public areas of the work space. Examples of areas include waiting, rest and lobby areas of sites, canteen areas, health clinics.
13. Ensure that posted and distributed copies of the Company and Individual Codes of Conduct are translated into the appropriate language of use in the work site areas as well as for any international staff in their native language.
14. An appropriate person is nominated as the company's 'Focal Point' for addressing SEA/SH and VAC issues, including representing the company on the SEA/SH and VAC Compliance Team which is comprised of representatives from the client, contractor(s), the supervision consultant, and local service provider(s).
15. Ensuring that an effective Action Plan is developed in consultation with the Compliance Team which includes as a minimum:
    a. **SEA/SH and VAC Allegation Procedure** to report SEA/SH and VAC issues through the project Grievance Redress Mechanism (GRM);
    b. **Accountability Measures** to protect confidentiality of all involved; and,
    c. **Response Protocol** applicable to SEA/SH and VAC survivors and perpetrators.
16. That the company effectively implements the Action Plan, providing feedback to the SEA/SH and VAC Compliance Team for improvements and updates as appropriate.
17. All employees attend an induction training course prior to commencing work on site to ensure they are familiar with the company's commitments and the project's SEA/SH and VAC Codes of Conduct.
18. All employees attend a mandatory training course once a month for the duration of the contract starting from the first induction training prior to commencement of work to reinforce the understanding of the project's SEA/SH and VAC Code of Conduct.

I do hereby acknowledge that I have read the foregoing Company Code of Conduct, and on behalf of the company agree to comply with the standards contained therein. I understand my role and responsibilities to prevent and respond to SEA/SH and VAC. I understand that any action inconsistent with this Company Code of Conduct or failure to take action mandated by this Company Code of Conduct may result in disciplinary action.

Company name: _____
Signature: _____
Printed Name: _____
Title: _____
Date: _____

B). Manager's Code of Conduct Preventing Sexual Exploitation and Abuse, Sexual Harassment

Managers at all levels have particular responsibilities to uphold the company's commitment to preventing and addressing SEA/SH and Violence Against Children (VAC). This means that managers have an acute responsibility to create and maintain an environment that prevents SEA/SH and VAC. Managers need to support and promote the implementation of the Company Code of Conduct. To that end, managers must adhere to this Manager's Code of Conduct and also sign the Individual Code of Conduct. This commits them to supporting and developing systems that facilitate the implementation of the Action Plan and maintain a SEA/SH-free and VAC-free environment at the workplace and in the local community. These responsibilities include but are not limited to:

Implementation

1. To ensure maximum effectiveness of the Company and Individual Codes of Conduct:
    a. Prominently displaying the Company and Individual Codes of Conduct in clear view at workers' camps, offices, and in in public areas of the work space. Examples of areas include waiting, rest and lobby areas of sites, canteen areas, health clinics.
    b. Ensuring all posted and distributed copies of the Company and Individual Codes of Conduct are translated into the appropriate language of use in the work site areas as well as for any international staff in their native language.
2. Verbally and in writing explain the Company and Individual Codes of Conduct to all staff.
3. Ensure that:
    a. All direct reports sign the 'Individual Code of Conduct', including acknowledgment that they have read and agree with the Code of Conduct.
    b. Staff lists and signed copies of the Individual Code of Conduct are provided to the client.
    c. Participate in training and ensure that staff also participate as outlined below.
    d. Staff are familiar with the Grievance Redress Mechanism (GRM) and that they can use it to anonymously report concerns of SEA/SH or VAC incidents.
    e. Staff are encouraged to report suspected or actual SEA/SH or VAC through the GRM by raising awareness about SEA/SH and VAC issues, emphasizing the staff's responsibility to the Company and the country hosting their employment, and emphasizing the respect for confidentiality.
4. In compliance with applicable laws and to the best of your abilities, prevent perpetrators of sexual exploitation and abuse from being hired, re-hired or deployed. Use background and criminal reference checks for all employees.
5. Ensure that when engaging in partnership, sub-contractor or similar agreements, these agreements:
    a. Incorporate the SEA/SH and VAC Codes of Conduct as an attachment.
    b. Include the appropriate language requiring such contracting entities and individuals, and their employees and volunteers, to comply with the Individual Codes of Conduct.
    c. expressly state that the failure of those entities or individuals, as appropriate, to take preventive measures against SEA/SH and VAC, to investigate allegations thereof, or to take corrective actions when SEA/SH or VAC has occurred, shall constitute grounds for sanctions and penalties in accordance with the Individual Codes of Conduct.
6. Provide support and resources to the SEA/SH and VAC Team to create and disseminate internal sensitization initiatives through the awareness-raising strategy under the Action Plan.
7. Ensure that any SEA/SH or VAC issue warranting police action is reported to the client and the World Bank immediately.

Training

8. All managers are required to attend an induction manager training course prior to commencing work on site to ensure that they are familiar with their roles and responsibilities in upholding the SEA/SH and VAC Codes of Conduct. This training will be separate from the induction training course required of all employees and will provide managers with the necessary understanding and technical support needed to begin to develop the Action Plan for addressing SEA/SH and VAC issues.
9. Ensure that time is provided during work hours and that staff attend the mandatory project facilitated induction training on SEA/SH and VAC required of all employees prior to commencing work on site.
10. Ensure that staff attend the monthly mandatory refresher training course required of all employees to combat increased risk of SEA/SH and VAC during civil works.
11. Managers are required to attend and assist with the project facilitated monthly training courses for all employees. Managers will be required to introduce the trainings and announce the self-evaluations.
12. Collect satisfaction surveys to evaluate training experiences and provide advice on improving the effectiveness of training.

Response

13. Managers will be required to provide input to the SEA/SH and VAC Allegation Procedures and Response Protocol developed by the SEA/SH and VAC Team as part of the final cleared Action Plan.
14. Once adopted by the Company, managers will uphold the Accountability Measures set forth in the Action Plan to maintain the confidentiality of all employees who report or (allegedly) perpetrate incidences of SEA/SH and VAC (unless a breach of confidentiality is required to protect persons or property from serious harm or where required by law).
15. If a manager develops concerns or suspicions regarding any form of SEA/SH or VAC by one of his/her direct reports, or by an employee working for another contractor on the same work site, s/he is required to report the case using the GRM.
16. Once a sanction has been determined, the relevant manager(s) is/are expected to be personally responsible for ensuring that the measure is effectively enforced, within a maximum timeframe of 14 days from the date on which the decision to sanction was made.
17. Managers failing to report or comply with such provision can in turn be subject to disciplinary measures, to be determined and enacted by the company's Chief Executive Officer, Managing Director or equivalent highest-ranking manager. Those measures may include:
    a. Informal warning.
    b. Formal warning.
    c. Additional Training.
    d. Loss of up to one week's salary.
    e. Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
    f. Termination of employment.
18. Ultimately, failure to effectively respond to SEA/SH and VAC cases on the work site by the company's managers or Chief Executive Officer may provide grounds for legal actions by authorities.

I do hereby acknowledge that I have read the foregoing Manager's Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to SEA/SH and VAC. I understand that any action inconsistent with this Manager's Code of Conduct or failure to take action mandated by this Manager's Code of Conduct may result in disciplinary action.

Signature: _____
Printed Name: _____
Title: _____
Date: _____

C). Individual Code of Conduct Preventing Sexual Exploitation and Abuse and Sexual Harassment and Violence Against Children

I, _____, acknowledge that preventing gender-based violence (SEA/SH) and violence against children (VAC) is important. The company considers that SEA/SH or VAC activities constitute acts of gross misconduct and are therefore grounds for sanctions, penalties or potential termination of employment. All forms of SEA/SH or VAC are unacceptable be it on the work site, the work site surroundings, or at worker's camps. Prosecution of those who commit SEA/SH or VAC may be pursued if appropriate.

I agree that while working on the project I will:

- Consent to police background check.
- Treat women, children (persons under the age of 18), and men with respect regardless of race, colour, language, religion, political or other opinion, national, ethnic or social origin, property, disability, birth or other status.
- Not use language or behaviour towards women, children or men that is inappropriate, harassing, abusive, sexually provocative, demeaning or culturally inappropriate.
- Not participate in sexual contact or activity with children—including grooming, or contact through digital media. Mistaken belief regarding the age of a child is not a defence. Consent from the child is also not a defence or excuse.
- Not engage in sexual favours—for instance, making promises or favourable treatment dependent on sexual acts—or other forms of humiliating, degrading or exploitative behaviour.
- Unless there is the full consent[3] by all parties involved, I will not have sexual interactions with members of the surrounding communities. This includes relationships involving the withholding or promise of actual provision of benefit (monetary or non-monetary) to community members in exchange for sex—such sexual activity is considered "non-consensual" within the scope of this Code.
- Attend and actively partake in training courses related to HIV/AIDS, SEA/SH and VAC as requested by my employer.
- Consider reporting through the GRM or to my manager any suspected or actual SEA/SH or VAC by a fellow worker, whether employed by my company or not, or any breaches of this Code of Conduct.

With regard to children under the age of 18:

- Wherever possible, ensure that another adult is present when working in the proximity of children.
- Not invite unaccompanied children unrelated to my family into my home, unless they are at immediate risk of injury or in physical danger.
- Not sleep close to unsupervised children unless absolutely necessary, in which case I must obtain my supervisor's permission, and ensure that another adult is present if possible.
- Use any computers, mobile phones, or video and digital cameras appropriately, and never to exploit or harass children or to access child pornography through any medium (see also "Use of children's images for work related purposes" below).
- Refrain from physical punishment or discipline of children.

[3] **Consent** is defined as the informed choice underlying an individual's free and voluntary intention, acceptance or agreement to do something. No consent can be found when such acceptance or agreement is obtained through the use of threats, force or other forms of coercion, abduction, fraud, deception, or misrepresentation. In accordance with the United Nations Convention on the Rights of the Child, the World Bank considers that consent cannot be given by children under the age of 18, even in the event that national legislation of the country into which the Code of Conduct is introduced has a lower age. Mistaken belief regarding the age of the child and consent from the child is not a defense.

- Refrain from hiring children for domestic or other labour which is inappropriate given their age or developmental stage, which interferes with their time available for education and recreational activities, or which places them at significant risk of injury.
- Comply with all relevant local legislation, including labour laws in relation to child labour.

Use of children's images for work related purposes

When photographing or filming a child for work related purposes, I must:

- Before photographing or filming a child, assess and endeavour to comply with local traditions or restrictions for reproducing personal images.
- Before photographing or filming a child, obtain informed consent from the child and a parent or guardian of the child. As part of this I must explain how the photograph or film will be used.
- Ensure photographs, films, videos and DVDs present children in a dignified and respectful manner and not in a vulnerable or submissive manner. Children should be adequately clothed and not in poses that could be seen as sexually suggestive.
- Ensure images are honest representations of the context and the facts.
- Ensure file labels do not reveal identifying information about a child when sending images electronically.

Sanctions

I understand that if I breach this Individual Code of Conduct, my employer will take disciplinary action which could include:

- Informal warning.
- Formal warning.
- Additional Training.
- Loss of up to one week's salary.
- Suspension of employment (without payment of salary), for a minimum period of 1 month up to a maximum of 6 months.
- Termination of employment.
- Report to the police if warranted.

I understand that it is my responsibility to avoid actions or behaviours that could be construed as SEA/SH or VAC or breach this Individual Code of Conduct. I do hereby acknowledge that I have read the foregoing Individual Code of Conduct, do agree to comply with the standards contained therein and understand my roles and responsibilities to prevent and respond to SEA/SH and VAC. I understand that any action inconsistent with this Individual Code of Conduct or failure to take action mandated by this Individual Code of Conduct may result in disciplinary action and may affect my ongoing employment.

Signature: _____

Printed Name: _____

Title: _____

Date: _____

RAISING CONCERNS

If any person observes behaviours that he/she believes may represent a violation of this Code of Conduct, or that otherwise concerns him/her, he/she should raise the issue promptly. This can be done in either of the following ways:

1. Contact [*enter name of the Contractor's Social Expert with relevant experience in handling gender-based violence, or if such person is not required under the Contract, another individual designated by the Contractor to handle these matters*] in writing at this address [ ] or by telephone at [ ] or in person at [ ]; or
2. Call [ ] to reach the Contractor's hotline *(if any)* and leave a message.

The person's identity will be kept confidential, unless reporting of allegations is mandated by the country law. Anonymous complaints or allegations may also be submitted and will be given all due and appropriate consideration. We take seriously all reports of possible misconduct and will investigate and take appropriate action. We will provide warm referrals to service providers that may help support the person who experienced the alleged incident, as appropriate.

There will be no retaliation against any person who raises a concern in good faith about any behaviour prohibited by this Code of Conduct. Such retaliation would be a violation of this Code of Conduct.

CONSEQUENCES OF VIOLATING THE CODE OF CONDUCT

Any violation of this Code of Conduct by Contractor's Personnel may result in serious consequences, up to and including termination and possible referral to legal authorities.

FOR CONTRACTOR'S PERSONNEL:

I have received a copy of this Code of Conduct written in a language that I comprehend. I understand that if I have any questions about this Code of Conduct, I can contact [*enter name of Contractor's contact person(s) with relevant experience]* requesting an explanation.

Name of Contractor's Personnel: [insert name]
Signature: _____
Date: (day month year): _____

Countersignature of authorized representative of the Contractor:
Signature: _____
Date: (day month year): _____

Behaviours constituting Sexual Exploitation and Abuse (SEA) and behaviours constituting Sexual Harassment (SH).

The following non-exhaustive list is intended to illustrate types of prohibited behaviours.

(1) **Examples of sexual exploitation and abuse** include, but are not limited to:

- A Contractor's Personnel tells a member of the community that he/she can get them jobs related to the work site (e.g. cooking and cleaning) in exchange for sex.
- A Contractor's Personnel that is connecting electricity input to households says that he can connect women headed households to the grid in exchange for sex.
- A Contractor's Personnel rapes, or otherwise sexually assaults a member of the community.
- A Contractor's Personnel denies a person access to the Site unless he/she performs a sexual favour.
- A Contractor's Personnel tells a person applying for employment under the Contract that he/she will only hire him/her if he/she has sex with him/her.

(2) **Examples of sexual harassment in a work context**

- Contractor's Personnel comment on the appearance of another Contractor's Personnel (either positive or negative) and sexual desirability.

- When a Contractor's Personnel complains about comments made by another Contractor's Personnel on his/her appearance, the other Contractor's Personnel comment that he/she is "asking for it" because of how he/she dresses.
- Unwelcome touching of a Contractor's or Employer's Personnel by another Contractor's Personnel.

A Contractor's Personnel tells another Contractor's Personnel that he/she will get him/her a salary raise, or promotion if he/she sends him/her naked photographs of himself/her