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REPUBLIC OF GHANA

MINISTRY OF ROADS & HIGHWAYS

Department of Feeder Roads (DFR)

TRANSPORT SECTOR PROJECT

Environmental and Social Management Plans [ESMPs] v. 3

11 Selected Feeder Roads

South Western Equatorial Zone

August 2011

List of Acronyms

CEHRT	Centre for Environment and Health Research and Training
DA	District Assembly
DE	District Engineer
DFR	Department of feeder Roads
IDA	International Development Association
EA	Environmental Assessment
EC	Energy Commission
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
FID	Factories Inspectorate Department
GAC	Ghana AIDS Commission
GHA	Ghana Highway Authority
GHGs	Green House Gases
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome
ILO	International Labour Organisation
LI	Legislative Instrument
MEST	Ministry of Environment, Science and Technology
MoE	Ministry of Energy
MRT	Ministry of Roads and Highways
MTTU	Motor Traffic and Transport Unit
NETF	National Employment Task force
NYEP	National Youth Employment Program
OP/BP	Operational Policy/Banks Policy
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment
SE	Site Engineer
SIM	Stakeholder Identification Matrix
SNEP	Strategic National Energy Plan
STIs	Sexually Transmitted Infections
ToR	Terms of Reference
TSP	Transport Sector Project
RoW	Right of Way
RPF	Resettlement Program Framework
URTIs	Upper Respiratory Tract Infections
VOC	Vehicle Operating Cost
WHO	World Health Organization

EXECUTIVE SUMMARY

Introduction

The Department of Feeder Roads of the Ministry of Roads and Highways (MRH) have selected eighty-four (84) feeder roads for minor rehabilitation/spot improvement and other maintenance works throughout the country. The maintenance works fall under the Transport Sector Project (TSP) to be financed by the International Development Association (IDA).

The implementation of projects under the TSP is guided by the Environmental and Social Management Framework (ESMF) and the Resettlement Policy Framework (RPF) of the MRH. This is to ensure compliance with the relevant environmental and social safeguard requirements for sound project execution. Therefore in line with the ESMF and the RPF, 84 ESMPs have been prepared for the maintenance works on the 84 selected feeder roads. The roads have been grouped under the four major eco-climatic zones of Ghana – the South-Western Equatorial; Dry Equatorial; Wet Semi Equatorial; and the Tropical Continental Zones. In order to facilitate administrative and implementation arrangement of the ESMPs, the eco-climatic zones have been aligned with the relevant regional boundaries. Thus, the ten administrative regions of Ghana have been grouped into four, based on their broad eco-climatic characteristics as follows:

- Western Region - - - South-Western Equatorial Zone
- Ashanti, Eastern and Volta (middle) Regions - Wet Semi Equatorial Zone
- Central, Greater Accra and Volta (southern) Regions - Dry Equatorial Zone
- Brong Ahafo, Northern, Upper East & West and Volta (northern) Regions - Tropical Continental Zone

This report focuses on the maintenance works in the South-Western Equatorial Zone, and presents the ESMPs for the eleven selected feeder roads in seven districts of the Western Region.

The scale of the maintenance/rehabilitation works is rather limited, with localised impacts within the existing right of way (RoW). No land outside the RoW or property, building or any structure will be affected by the road works, therefore no compensation or resettlement will be required. Also no sensitive sites or resources such as forest reserve, sacred grove, cemetery, shrine or other places of historical and cultural interests are within the RoW of any of the 11 roads earmarked for maintenance. Furthermore, the maintenance works will not affect any utility lines such as water, electricity or telecommunication lines. Thus, the World Bank Safeguard Policies such as the Involuntary Resettlement, Management of Cultural Property, Conservation of Natural Habitats and Forestry are not triggered.

Policy, Legislative and Administrative Frameworks

The relevant policy, legislative and administrative frameworks applicable to the sector and feeder road ESMP preparation which were considered included:

- Environmental and Social Management Framework of the Transport Sector Project (TSP);
- Ghana's Environmental Policy;
- Environmental Protection Agency Act, 1994;
- Environmental Assessment Regulations and Procedures;
- Environmental Assessment (Amendment) Regulations, 2002;
- Occupational Safety and Health Policy of Ghana (Draft);
- National Workplace HIV/AIDS Policy;
- The World Bank's Environmental Assessment Requirements.

General Project and Zonal Information

All the road alignments already exist, but in deplorable conditions. The average length of the project roads is about 7.68km, with the longest and shortest being 21.7km and 0.9km respectively. The total length of the roads for the maintenance works is approximately 84.50km, which represents 1.55% of feeder road network in the South-Western Equatorial Zone. The maintenance works to be carried out are mainly spot improvement and minor rehabilitation as provided in the Table 1 below.

Table 1 Selected Road for Maintenance in the South-Western Equatorial Zone

No	Road Name	District	Length (km)	Recommended Works
1	Pieso – Attakrom	Prestea Huni Valley	3.0	Spot Improvement
2	Sefwi Bekwai – Sukusuku	Bibiani Anhwiase Bekwai	0.9	Spot Improvement
3	Asawinso – Mmerewa	Bibiani-Anwiase Bekwai	12.0	Spot Improvement
4	Samanye – Etweakor	Jomoro	8.80	Spot Improvement
5	Boison – Appiakrom	Aowin Suaman	6.5	Minor Rehabilitation
6	Domama – Adukrom	Mpohor Wassa East	4.4	Spot Improvement
7	Gyampere – Kwesikrom Phase 1	Ellembelle	6.3	Spot Improvement
8	Gyampere – Kwesikrom Phase 2	Ellembelle	11.5	Spot Improvement
9	Dwinase – Kwamebour	Sefwi Wiawso	21.7	Spot Improvement
10	Penakrom – Futa	Sefwi Wiawso	3.10	Spot Improvement
11	Sefwi Wiawso – Mansie -Aboboyaa	Sefwi Wiawso	6.30	Spot Improvement
	Total		**84.50**	

The zone covers an area of 23,921km^2, which is about 10% of the total land surface of Ghana. About 75% of the vegetation cover is within the high forest zone. The zone is characterised by moderate temperatures, ranging from 22°C to 34°C. It is also the wettest part of Ghana, with double maxima rainfall pattern averaging 1,600 mm per annum; and high relative humidity, ranging from 70 to 90%.

The zone is aligned with the Western Region, which is the largest producer of cocoa and timber, the second highest producer of gold, as well as other minerals e.g. manganese. The region also has other tree crops and plantations such as rubber, coconut and oil palm.

Potential Impacts, Mitigation and Monitoring Measures

The main benefits of the projects will include enhanced mobility and access to market centres, efficient transportation, as well as reduced vehicle operating cost, reduced transportation cost and time and also CO_2 emissions. With the spot improvement works, farmers will be able to transport farm produce easily, reducing post harvest losses and discouraging smuggling of cocoa.

The potential adverse impacts for which relevant mitigation and monitoring measures have been provided include: water resource, drainage/flooding and erosion impacts, dust generation and air quality, temporary site office impacts, noise and vibration impacts, occupational health and safety, HIV/AIDS and STIs risks and waste generation as well as impacts of road diversion during construction of culverts.

Mitigation measures include: culverts and drains designed with adequate capacity to direct and contain flows and run-off, to prevent overflow and road embankment erosion; excavated and heaped materials retained in confinements and located 50 meters (minimum distance) away from water bodies and drainage channels; covering of all flyable materials; agreement between contractor and owner of land identified for erection of site office; use of noise protection devices and limiting time of exposure; water dousing, speed control limits and ramps; training and strict schedule of maintenance/servicing of machinery; use of personal protective equipment (PPE), provision of first aid kits as well as erection of warning signs; sensitization and awareness on transmission and prevention of HIV/AIDS and STIs; composting and

segregation of waste as well as maintaining high hygienic standards. In addition to mounting warning signs and directing traffic near culvert construction sites, barricades will also be mounted to protect workers.

Monitoring will check the effectiveness of mitigation and erosion prevention measures, material losses into and contamination of water bodies; records of machinery maintenance schedules; noise and vibration exposure levels and duration; water dousing and speed control; fulfilment of the terms of agreement on use of site for project office; records of injury and clinic attendance cases, use and state of PPEs; HIV/ AIDS awareness programs effectiveness; state of toilets and segregation of waste; and mounted road signs and directing of traffic.

Environmental and Social Management Plan Implementation

The general outline of the ESMP implementation by the various actors will involve the following stages:

- ESMP preparation and approval;
- Contract specifications on E&S safeguards obligations;
- Rehabilitation/project contract award;
- E&S safeguards implementation plan and schedule;
- Rehabilitation/project commencement;
- Capacity building on E&S safeguards (and other awareness programme);
- E&S safeguards and mitigation implementation;
- Monitoring of safeguard/mitigation measures;
- Reporting; and
- Compliance and other periodic verification monitoring.

The main environmental and social safeguard measures in the ESMPs are:

- Water resources, erosion control and flood prevention management;
- Noise and vibration exposure management;
- Dust control management;
- Public and occupational health and safety management;
- HIV/AIDS and health awareness management;
- Waste management;
- Road diversion and accident prevention; and
- Temporary site office reinstatement.

The key actors in the implementation of the ESMPs include:

- The contractor- to be awarded the rehabilitation contract and be required to implement the environmental and social safeguard measures;
- DFR - to ensure that E&S safeguards and other mitigation measures are duly implemented;
- EPA - to ensure compliance with the ESMP and other relevant approval conditions;
- MRH - to oversee the effective implementation of the road project and related E&S safeguards
- MEST - to address complaints of any aggrieved parties on E&S safeguards, especially with respect to ‘unfavourable’ decisions of the EPA.

The other components of the ESMP include capacity building, proposed implementation budget and E&S safeguards obligations of contractors. Capacity building mainly on E&S safeguards planning, implementation and supervision, monitoring and reporting, and also public and occupational E&S and health (including HIV/AIDS) awareness and waste management have been prepared to enhance the capacity of DFR District Engineers, Contractors and their Site Engineers/Foremen as well as selected members of nearby communities.

A proposed budget of three hundred and fifty one thousand, one hundred and ninety two dollars ($351,192) to facilitate implementation of the various measures, monitoring plan and capacity building of the ESMP has been made as an integral part of financing for the rehabilitation/maintenance projects. The specific E&S safeguards obligations for the contractor to be incorporated into the contract specifications are also provided, as well as other contractual provisions made in the General Items of the Bills of Quantities.

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- **Methodology for the ESMPs**
- **Organization of Report**

1.0 INTRODUCTION

1.1 Background

Under the Transport Sector Project (TSP) by the then Ministry of Transportation, an Environmental and Social Management Framework (ESMF) and a Resettlement Policy Framework (RPF) were prepared for the road transport sector in 2008. The ESMF and the RPF provided the means to addressing the safeguards requirements of projects to be financed under the TSP, when they were due for implementation.

Currently, eighty-four (84) feeder roads have been selected for rehabilitation/maintenance works throughout the country under the TSP. The provisions of the ESMF require the preparation of an Environmental and Social Management Plan (ESMP) for each of the selected roads, given that the roads are in use and benefit from rehabilitation works from time to time. The country has been divided into four zones based on eco-climatic variations namely: the Tropical Continental, South-Western Equatorial, Wet-Semi Equatorial and the Dry Equatorial zones for purposes of grouping the planned rehabilitation / maintenance works. South-Western Equatorial Zone covers the whole of the Western Region of Ghana is expected to benefit from the maintenance works of 11 feeder roads. This report covers the ESMPs for the selected 11 feeder roads in the South-Western Equatorial Zone.

The total length of feeder roads in this eco-climatic zone is 5,468.7 km. Out of this 3,149.9km is engineered; 861.6 km is partially engineered; while 1,458.1km is unengineered. In terms of the surface type of these roads: 2,156.3km classified as good; 1214.59km classified as fair; while 2,099.48km is classified as poor. Feeder roads regularly undertake maintenance works given that they are often not tarred and susceptible to rapid deterioration. The main object of the proposed maintenance works is to improve the road condition to reduce travel time and enhance interconnection between the adjoining communities.

The nature and scale of the rehabilitation/maintenance works are rather limited and within the existing right of way (RoW). The likely environmental and social impacts will also be localised and mainly temporary, with known and easy to apply mitigation and management measures. No land outside the RoW or property, building or any structure will be affected by the road works, therefore no compensation or resettlement will be required. Also no sensitive sites or resources such as forest reserve, sacred grove, cemetery, shrine or other places of historical and cultural interests are within or near the RoW of any of the 11 roads earmarked for maintenance. Furthermore, the magnitude of maintenance works will not affect any utility lines such as water, electricity or telecommunication lines. Thus, the World Bank's Policy on Involuntary Resettlement, Management of Cultural Property, Conservation of Natural Habitats and Forestry are not triggered.

1.2 Objectives of the ESMPs

Environmental and Social Management Plans (ESMPs) are required for each road in line with the ESMF. ESMPs are usually prepared for existing undertakings/projects in accordance with Ghana's Environmental Assessment (EA) Regulations (LI 1652, Section 24).

The purpose of the ESMPs is to:

- Reduce the potential adverse environmental and social impacts of the required maintenance/civil works;
- Facilitate monitoring and enhancement measures as contribution to environmental and social performance during implementation;
- Provide institutional strengthening measures for effective oversight and supervision; as well as
- Ensure compliance with the safeguards requirements of the projects, in line with the ESMF.

1.3 Methodology for the ESMPs

The ESMPs preparation involved field visits to the project sites, document review and consultation with key representative stakeholders at the national, regional and district levels. The main national and the World Bank reference documents reviewed included:

- Environmental and Social Management Framework for TSP (2008);
- Resettlement Policy Framework for the TSP;
- Environmental Protection Agency Act, 1994 (Act 490);
- Environmental Assessment Regulations, 1999 (LI 1652);
- Environmental Assessment (Amendment) Regulations, 2002 (LI 1703)
- National Environmental Action Plan;
- Ghana EIA Procedures; and
- World Bank's Environmental and Social Safeguards Policies (OP/BP 4.01 and OP/BP 4.12).

The national and regional level institutions involved in the ESMPs processes were the EPA and the DFR. The district engineers of the relevant DAs were also consulted. Three sets of data capture forms were designed and used to conduct individual road project assessment. The forms captured data on the following:

- Project description (i.e. for the specific feeder roads);
- Project corridor and adjoining area (baseline) information; and
- Potential impacts (environmental and social) of the project (road works & borrow pits).

The scope/structure of the ESMPs for the zone covers the following:

- Policy, legislative/regulatory and administrative frameworks;
- Regional (baseline) information on the feeder roads;
- Beneficial and adverse impacts for specific project roads;
- Mitigation measures for the project roads;
- Monitoring plan; and
- Environmental and social management implementation plan and budget.

The methodology also took into account provisions made in the general items of the Bills of Quantities (BoQ), which are incorporated into contracts by the DFR.

1.4 Organization of Report

This report contains sixteen (16) main sections, preceded by a non-technical executive summary. The main sections are:

- Chapters 1, 2 and 3: General introduction to the ESMPs; overview of applicable legal, policy and administrative framework; and general project zonal information;
- Chapters 4 – 14: Assessment of each of the eleven (11) project roads in the Western Region;
- Chapter 15: Implementation of ESMPs, and associated budget; and
- Chapter 16: Consultation with stakeholders.

CHAPTER TWO

Policy, Legislative and Administrative Frameworks

- **National Environmental Requirements**
- **National Land, Labour, Safety and Health Requirements**
- **Environmental and Social Management Framework**
- **The World Bank Requirements**

2.0 POLICY, LEGISLATIVE AND ADMINISTRATIVE FRAMEWORKS

The principal policies, laws and procedures on ESMPs and related requirements which guided preparation of the ESMPs are presented below.

1) The national environmental requirements -
    a. Ghana's Environmental Policy;
    b. Environmental Protection Agency Act, 1994;
    c. Environmental Assessment Regulations and Procedures;
    d. Environmental Assessment (Amendment) Regulations, 2000.

2) The national land, labour, safety and health requirements -
    a. Lands Statutory Wayleaves Act, 1963;
    b. Factories, Offices and Shops Act, 1970;
    c. Occupational Safety and Health Policy of Ghana (Draft);
    d. National Workplace HIV/AIDS Policy;
    e. Labour Act, 2003; and
    f. Youth Employment Implementation Guidelines.

3) Environmental and Social Management Framework - Ghana Transport Sector Program (TSP).

4) The World Bank Requirements.
    a. Environmental Assessment (OP 4.01);
    b. Management of Cultural Property (OPN 11.03);
    c. Conservation of Natural Habitats (OP 4.04**)**; and
    d. Forestry (OP/BP 4.36).

2.1 National Environmental Requirements

2.1.1 Ghana's Environmental Policy

The environmental policy of Ghana formulated in the National Environmental Action Plan (NEAP) of 1993 hinges strongly on 'prevention' as the most effective tool for environmental protection. The policy aims at a sound management of resources and environment, and the reconciliation between economic planning and environmental resources utilization for sustainable national development. Within this context and in relation to the road transport sector, the policy also seeks among others, to institute an environmental quality control and sustainable development programs by requiring prior EA (including environmental and social management) of all developments, and to take appropriate measures to protect critical eco-systems, including the flora and fauna they contain against harmful effects, nuisance or destructive practices. The adoption of the NEAP led to the enactment of the EPA Act 1994 (Act 490); and subsequently the passing of the Ghana EIA Procedures into the EA Regulations, 1999 (LI 1652).

2.1.2 Environmental Protection Agency Act, 1994

The Environmental Protection Agency (EPA) Act, 1994 (Act 490) grants the Agency enforcement and standards setting powers, and the power to ensure compliance with the Ghana EA requirements/procedures. The Agency (including its Regional and District Offices) is also vested with the power to determine what constitutes an 'adverse effect on the environment' or an activity posing 'a serious threat to the environment or public health', to require EAs, ESMPs, AERs, etc of an 'undertaking', including road transport sector projects, to regulate and serve an enforcement notice for any offending or non-complying undertaking.

The Agency is required to conduct monitoring to verify compliance with permit conditions for project and mitigation commitments. Furthermore, a requirement by EPA for an EA precludes any authorising MDA from licensing, permitting, approving or consenting such undertaking, unless notified otherwise.

2.1.3 Environmental Assessment Regulations and Procedures

The Environmental Assessment (EA) Regulations combine both an environmental assessment and environmental management systems. The EA considers environmental and social aspects in an integrated way. The regulations prohibit commencing an "undertaking" (including road transport sector projects) without prior registration and environmental permit. Undertakings are grouped into schedules to enable registration and securing environmental permit from the EPA through the EA system. The Regulations also define the relevant stages and actions, including: certification, fee payment, ESMPs, AER, suspension/revocation of permit, complaints/appeals, etc.

2.1.4 Environmental Assessment (Amendment) Regulations, 2002

The Environmental Assessment (Amendment) Regulations, 2002 (LI 1703) were made to amend sections of the EA fees regime of LI 1652 (the 'principal enactment') on processing charges, payment for environmental permit and certificates (for ESMPs) issued by the Agency.

2.2 National Land, Labour, Safety and Health Requirements

2.2.1 Lands Statutory Wayleaves Act, 1963

The Lands Statutory Wayleaves Act 1963 (Act 186) was enacted to facilitate the entry on any land for the purposes of construction, installation and maintenance of public utility works and creation of right of ways and other similar right for such works. Works for which right of ways may be created are "feeder roads or works for purposes of, or in connection with any public utility works". The Act and its accompanying Regulations, the Lands Statutory Wayleaves Regulations 1964 (LI 334) provides the modalities and procedures for the acquisition of the Statutory right of ways. Thus, the mechanism for entry for survey works and construction has been spelt out in details. Provision has also been made for restoration of affected lands where that is possible.

2.2.2 Factories, Offices and Shops Act, 1970

The Factories, Offices and Shops Act of 1970 (Act 328) mandates the Factories Inspectorate Department to register factories and ensure that internationally accepted standards of providing safety, health and welfare of persons are adhered to. It defines a factory to include any premises (whether in or not in a building) in which one or more persons are employed in manual labour, among others. The Act spells out the responsibilities of the employer in ensuring a safe and healthy work environment so as to guarantee the health and safety of employees. In this respect, the Act makes provision for the protection of the workforce that will be involved in the road construction activities.

2.2.3 Occupational Safety and Health Policy of Ghana (Draft)

The policy statement of the OSH Policy (draft 2004) is: 'to prevent accidents and injuries arising out of or linked with or occurring in the course of work, by minimizing, as far as reasonably practicable, the cause of the hazards in the working environment and, therefore, the risk to which employees and the public may be exposed'. The policy is derived from provisions of the International Labour Organization (ILO) Conventions 155 and 161. The policy document has specific sections on objectives, scope, strategies, activities and promotion and awareness creation.

2.2.4 National Workplace HIV/AIDS Policy

The broad objectives of the policy among others, are to provide protection from discrimination in the workplace to people living with HIV and AIDS; prevent HIV and AIDS spread amongst workers; and provide care, support and counselling for those infected and affected.

2.2.5 Labour Act, 2003

The purpose of the Labour Act, 2003 (Act 651) is to amend and consolidate existing laws relating to labour, employers, trade unions and industrial relations. The Act provides for the rights and duties of

employers and workers; legal or illegal strike; guarantees trade unions and freedom of associations, and establishes the Labour Commission to mediate and act in respect of all labour issues. Under Part XV (Occupational Health, Safety and Environment), the Act explicitly indicates that it is the duty of an employer to ensure that every worker works under satisfactory, safe and healthy conditions.

2.2.6 Youth Employment Implementation Guidelines

The authority for decision-making on the implementation of the National Youth Employment Program (NYEP) resides in the Ministry of Employment and Social Welfare, through a National Employment Task Force (NETF) set up to implement the program. District Employment Task Forces set up are made accountable to the NETF in all their undertakings throughout the implementation of the program.

The overall objective of the program is to empower the youth to be able to contribute more productively towards the socio-economic and sustainable development of the nation. The specific objectives of the Program include checking the drift of the youth from the rural to urban communities in search of jobs by creating those opportunities in the rural areas, etc.

2.3 Environmental and Social Management Framework

The Environmental and Social Management Framework (ESMF), sponsored by the World Bank was prepared for the Ghana Transport Sector Program (TSP). The ESMF provides a corporate environmental and social safeguard policy framework, institutional arrangements, and capacity available to identify and mitigate potential safeguard issues and impacts of each sub-project. The ESMF was designed to address potential adverse environmental and social impacts at the planning stage of the feeder roads' maintenance works.

This ESMF defines the management procedures to avoid causing harm or exacerbating social tensions, and to ensure consistent management of environmental and social issues during feeder roads maintenance works.

2.4 The World Bank Requirements

2.4.1 The Bank's Safeguard Policies

The Bank's ten safeguard policies are designed to help ensure that programs proposed for financing are environmentally and socially sustainable, and thus improve decision-making. The Bank's Operational Policies (OP) are meant to ensure that operations of the Bank do not lead to adverse impacts or cause any harm.

The Safeguard Policies relevant to these projects include:

- Environmental Assessment (OP 4.01);
- Management of Cultural Property (OPN 11.03);
- Conservation of Natural Habitats (OP 4.04**)**; and
- Forestry (OP/BP 4.36).

2.4.2 Environmental Assessment (OP 4.01)

The OP 4.01 requires among others that screening for potential impacts is carried out early, in order to determine the level of EA to assess and mitigate potential adverse impacts. The Bank's project screening criteria group projects into three categories:

- Category A – Detailed Environmental Assessment;
- Category B - Initial Environmental Examination and
- Category C – Environmentally friendly.

The EA ensures that appropriate levels of environmental and social assessment are carried out as part of project design, including public consultation process, especially for Category A and B projects. The OP 4.01 is triggered if a program is likely to present some risks and potential adverse environmental impacts in its area of influence. The OP 4.01 is applicable to all components of the Bank's financed projects, even for co-financed components.

Considering the rather limited scale and nature of the proposed maintenance works on the feeder roads, the potentially low magnitude - due to already existing alignments and localized environmental and social impacts of the project, the proposed feeder roads maintenance works are classified category 'B'.

CHAPTER THREE

General Project and Zonal Information

- **Project Description**
- **Baseline Information**

3.0 GENERAL PROJECT AND ZONAL INFORMATION

3.1 Project Description

The proposed works form part of DFR's ongoing rehabilitation/maintenance activities which aims at improving access and mobility to and from the beneficiary communities and the districts. All the selected roads already exist, but are in deplorable conditions. Settlements, schools, farms and other rural infrastructure are located along some of the project routes. The maintenance works to be carried out are mainly spot improvement and minor rehabilitation as provided in table 3.1 below. These works will, however, not affect any structure or facility within the corridor, since the RoW already exists.

The average length of the project roads is about 7.68km, with the longest and shortest being 21.7km and 0.9km respectively. The total length of the roads for the maintenance works is approximately 84.50km, which represents 1.55% of feeder road network in the South-Western Equatorial Zone. Out of the 84.50km, 6.5km will undergo minor rehabilitation while the remaining 78km will be spot improved. The template that aided in gathering information on the project and the zone is provided as Appendix 1 in the appendices section of this report.

Table 3.1 Proposed Roads for Maintenance in South-Western Equatorial Zone

No.	Road Name	District	Length (km)	Recommended Works
1	Pieso – Attakrom	Prestea Huni Valley	3.0	Spot Improvement
2	Sefwi Bekwai – Sukusuku	Bibiani Anhwiase Bekwai	0.9	Spot Improvement
3	Asawinso – Mmerewa	Bibiani-Anwiase Bekwai	12.0	Spot Improvement
4	Samanye – Etweakor	Jomoro	8.80	Spot Improvement
5	Boison – Appiahkrom	Aowin Suaman	6.5	Minor Rehabilitation
6	Domama – Adukrom	Mpohor Wassa East	4.4	Spot Improvement
7	Gyampere – Kwesikrom Ph 1	Ellembelle	6.3	Spot Improvement
8	Gyampere – Kwesikrom Ph 2	Ellembelle	11.5	Spot Improvement
9	Dwinase – Kwamebour	Sefwi Wiawso	21.7	Spot Improvement
10	Penakrom – Futa	Sefwi Wiawso	3.10	Spot Improvement
11	Sefwi Wiawso – Mansie – Aboboyaa	Sefwi Wiawso	6.30	Spot Improvement
	Total		**84.50**	

Spot Improvement

Spot improvement works basically involves maintenance of specific spots of the road that are in bad shape and thus impedes easy transportation. This may include construction of culverts, sectional gravelling, sectional levelling, etc.

Minor Rehabilitation

This usually involves rehabilitation of the entire stretch of the road. The activities undertaken are similar to that of spot improvement works but the extent of works differs. The extent of works in minor rehabilitation activities are more involving than in spot improvement. Such works includes clearing, formation activities, blading, gravelling, culvert construction and drain cleaning.

3.2 Baseline Information

The zone covers an area of 23,921 square kilometres, which is about 10 per cent of Ghana's total land surface. It has about 75 per cent of its vegetation within the high forest zone of Ghana. The South-Western areas of the zone are noted for their rain forest, interspersed with patches of mangrove forest along the

coast and coastal wetlands, while a large expanse of high tropical forest and semi-deciduous forest is also found in the northern part of the region. The zone also has 24 forest reserves, which account for about 40 per cent of the forest reserves in the country. Prominent among them are the Bia Reserve, Cape Three Points National Park, and the Ankasa/Nini Suhyien Forest and Game Reserve.

In terms of climatic conditions, the zone is characterised by moderate temperatures, ranging from 22°C at nightfall to 34°C during the day. It is also the wettest part of Ghana, with a double maxima rainfall pattern averaging 1,600 mm per annum. The two rainfall peaks fall between May-July and September/October. In addition to the two major rainy seasons, the zone also experiences intermittent minor rains all year round. This high rainfall regime creates much moisture culminating in high relative humidity, ranging from 70 to 90 per cent in most parts of the region.

The zone is the largest cocoa and timber producing area of Ghana, the second highest producer of gold, with the potential to become the highest producer of this commodity. It has the largest and only economically viable rubber plantation in the country, stretching from Agona Junction to Bonsa on the Tarkwa road, from Agona Junction to Dadwen on the Axim road, and Baamiangor in the Dwira traditional area on the Esaaman to Dominase/Enibil road. The only commercially viable manganese mine in the country, located at Nsuta, which has been exploited for over seventy years, is still operating here as well. The template that aided in gathering information on the baseline for the zone is provided as Appendix 1 in the appendices section of this report.

Commercial productions of vegetable oil palms such as coconut and palm oil, both of which have the potential of rivalling cocoa, are most actively pursued in this region. The Benso Oil Palm Plantation, owned by Unilever Ghana Limited, is one of the largest in the country. The country's only bauxite mine currently in production is at Awaso in the Sefwi District.

The total length of feeder roads in the region is 5,468.7km. Out of this 2,156.3 km (39.4%) is classified as good, 1,214.59km (22.21%) is classified as fair and 2,099.48 (38.39%) is classified as poor. 3,149.9km is engineered; 861.6km is partially engineered; while 1,458.1km is unengineered. In terms of the surface type of these roads:

a) 162.1 km is Bitumen surface;
b) 3586.5 km is Gravel surface; and
c) 1,720.3 km is Earth surface.

CHAPTER FOUR

Asawinso-Mmrewa Road Spot Improvement Project

- **Project Environment Information**
- **Project Description**
- **Potential Impacts, Mitigation and Monitoring Measures**

4.0 ASAWINSO-MMREWA ROAD SPOT IMPROVEMENT PROJECT

4.1 Project Environment Information

The project road is located in the Bibiani-Anwiase Bekwai District, about 29km from the district capital-Bibiani. The road is 12km long with the following communities along the stretch: Asawinso, Manse and Mmrewa.

The following are located close to the road corridor:

- Kasapa cell site (km 1+100; 10m from road corridor) (450m from Asawinso town),
- Anhwiaso East Forest Reserve (km 4+600-10+700),
- Three Schools (0+100, 2+300 & 12+100; 15m, 20m & 10m respectively from road corridor),
- Two Clinics (0+550, 11+800; 30m & 15m from road corridor) (Asawinso and Mmrewa towns),
- Cemetery (km 2+700; 15m from road corridor) (Mansie town),
- Two Churches (2+400 & 11+800; 20m & 15m respectively) (Mansie and Mmrewa towns), and
- Football field (km 11+500; 10m) from road corridor (Mmrewa town).

The vegetation type of the area is generally forest. The area is noted for agriculture, both cash and food crops cultivation. The road passes through the Anhwiaso Forest Reserve and stretches for about 6km through the reserve. The road crosses 5 streams and creeks (Abomasu, Bru, Amu, Srekuma and Sre rivers). The topography is generally hilly.

4.2 Project Description

The road currently has poor surface and structure conditions (depressions, soft spots, ruts, etc), despite being reshaped in 2008. It has poor drainage structure and several river crossing points. Sections are rendered almost unmotorable in the rainy season. The width of the road is reduced to 4.0m on the average (instead of 6.0m).

The objective of the proposed spot improvement works includes facilitating easy transportation of agricultural produce and people living near the road corridor to the market centre and to provide the least cost intervention for ensuring reliable, all-season passability for the means of transport.

The specific works intended to be carried out are mainly clearing, formation, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table below.

Table 4.1 Locations / Distances of Specific Works along the Asawinso-Mmrewa Road

	Specific Works	**Location or Distance**
1	Clearing	Km 0.000 – 12.000
2	Formation	Km 0.000-0.450, 0.550-1.000, 1.100-1.600, 1.700-1.850, 1.950-2.200, 2.450-3.950, 4.050-4.350, 4.450-5.050, 5.150-5.950, 6.050-7.450, 7.750-8.350, 8.550-8.800, 8.900-10.350 and 10.450-12.000.
3	Construction of culverts	14 No. 700 x 900 u-culverts at km 0.500, 1.050, 1.650, 1.900, 2.400, 4.000, 4.400, 5.100, 7.700, 8.400, 8.500, 8.85, 10.000 & 10.400 and 2No. 900 x 1200 u-culverts at km 2.250 & 7.500.
4	Laying of sub-base	Km 0.000-1.200, 1.500-3.500, 3.900-5.300, 5.900-6.20, 6.700-6.900, 7.200-7.900, 8.000-9.200 and 10.000-12.000.

Clearing involves weeding along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works include blading and drains. Two types of new culverts will be constructed, seventeen in number along the road. The sizes and numbers are as follows:

a) 14 No. 700 x 900 u-culverts; and

b) 2 No. 900x1200 u-culverts.

Filling will be done mainly in the approaches of culverts and also Gravelling of the entire stretch of the road. The list of types and numbers of equipment/machinery to be used include:

a)	2No	Dozer	b)	1No	Pay loader
c)	2No	Motor Grader	d)	1No	Excavator
e)	3No	Tipper Truck	f)	1No	Water tanker
g)	1No	Vibratory Roller	h)	1No	Concrete Mixture
i)	1No	Low Loader	j)	1No	Concrete Vibrator

The type of raw materials and the estimated quantities will include:

a) Aggregates - 130,551 m^3
b) Gravel (sub-base) - 43,200 m^3
c) Portland cement - 993 bags
d) Filling Material - 3,638m^3

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. A workforce of about thirty (30) people is estimated to be employed for the project. The project implementation will take about eight (8) months.

4.3 Potential Impacts, Mitigation and Monitoring Measures

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 4.0m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing bush within the RoW, construction of culverts and Laying of sub-base.

The main beneficial and adverse environmental and social impacts likely to arise from the project road, as well as the relevant mitigation measures are presented in this section.
The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. It will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade. Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members.
The construction of a culvert on the Abomasu, Bru, Amu, Srekuma and Sre rivers will avert the difficulty of crossing in the rainy season. The spot improvement works will thus improve interconnection between communities.

The potential adverse impacts due to the rather limited and small-scale nature of the project activities include:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air Quality;

4. Occupational health and safety;
5. Potential spread of HIV/ AIDS and STIs;
6. Waste generation;
7. Road diversion impacts; and
8. Temporary site office impacts.

4.3.1 Water Resources Impacts, Mitigation and Monitoring

The road crosses five seasonal streams and creeks: Abomasu, Bru, Amu, Srekuma and Sre streams. Impact on these streams during the minor rehabilitation works will largely be siltation during clearing and erosion of top soil into stream during the rainy season. This impact will be compounded by the hilly topography. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the Abomasu, Bru, Amu, Srekuma and Sre streams, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing along the corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.

Excavated materials will be retained away from the water bodies and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the Abomasu, Bru, Amu, Srekuma and Sre streams:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

4.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of:

- Bulldozers and grader in clearing the 12.0km road;
- Concrete mixers to mix concrete for culvert construction; and
- Vibratory roller for sectional filling and gravelling.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise

and vibration on humans include stress, hearing impairment, communication problems, etc. Workers, especially those working with or close to these equipments will be badly exposed. In addition three schools (0+100, 2+300 & 12+100; 15m, 20m & 10m respectively from road corridor) and the two clinics (0+550, 11+800; 30m & 15m from road corridor) will also be receptors of noise due to their relative distances from the road.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

4.3.3 Dust Generation and Air Quality Impacts, Mitigation and Monitoring

Land clearing for the entire 12.0km stretch, haulage of material by trucks and laying of sub-base are all dust generating activities. Excavations for the construction of culverts can also lead to dust during windy hours. Generation of dust will occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. The three Schools (0+100, 2+300 & 12+100; 15m, 20m & 10m respectively from road corridor) and the two Clinics (0+550, 11+800; 30m & 15m from road corridor) will also be receptors of dust.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control ramps will be erected along the road to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;

- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

4.3.4 Public/Occupational Health and Safety Impacts, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, excessive vibration from rollers, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

To reduce the incidence of occupational accidents, training will be organised for all workers on health and safety precautions associated with feeder road works, equipment and machinery handling, etc. Personal Protective Equipment (PPE) like helmets, earmuffs, gloves, boots, etc. will be made available to employees. The use of PPE will be mandatory. The contractor or the assigned supervisor will be responsible and answerable for any instance of non-compliance. Non-compliant staff will be reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The First Aid Team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets and wash rooms will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercise regularly.

4.3.5 Potential HIV/AIDS and STIs Spread, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the conditions to engage multiple sexual partners and hence increase the risk of HIV/ AIDS infection..

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 4 from the workforce while the nearby communities nominate 4 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

4.3.6 Waste Generation Impacts, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;

- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

4.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 16 culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers will be operating close to moving vehicles, at the risk of falling vehicles or objects on them or even knockdowns.

The current road width has reduced to between 3 and 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

4.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration (of 8months) for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;

- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

CHAPTER FIVE

Boinso-Appiakrom Road Minor Rehabilitation Project

- **Project Environmental Information**
- **Project Description**
- **Potential Impacts, Mitigation and Monitoring Measures**

5.0 BOINSO-APPIAKROM ROAD MINOR REHABILITATION PROJECT

5.1 Project Environment Information

The project road is located in the Aowin Suaman District of the Western Region, about 42km from Enchi - the district capital. The road is 6.5km long with the following communities along the stretch: Boison, Appiahkrom and Boison boundary.

The vegetation type is forest. The area is generally noted for agriculture, both cash and food crops cultivation. The topography is generally hilly.

5.2 Project Description

The road has poor surface and structure conditions (depressions, soft spots, ruts, etc). It has a poor drainage structure and several river crossing points. Though it was spot improved in 2007, because of the many stream crossings, sections are rendered almost unmotorable in the rainy season. The width of the road is reduced to 2.5m on the average (instead of 6.0m).

The objectives of the proposed spot improvement works are to:

- Facilitate easy transportation of agricultural produce to the nearest market centre;
- Provide the least cost intervention for reliable, all-season passable means of transport ; and
- Expand the width of the road to 6.0m all-through.

The specific works intended to be carried out are mainly clearing, formation of road, blading and compaction of road surface, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in the Table below.

Table 5.1 Locations / Distances of Specific Works along the Boison Appiakrom Road

	Specific Works	**Location or Distance**
1	Clearing	Km 0+000-6+500
2	Formation	Km (0+000 – 0+850, 0+950-1+150, 1+250-1+350, 1+450-2+200, 2+350-2+450, 2+550-2+700, 2+750-3+600, 3+700-5+200 and 5+300-6+500)
3	Construction of culverts(mm)	1/900x700 at ch. 0+900, 1/900x700 at ch. 1+200, 1/900x700 at ch. 1+400,1/900x700 at ch. 2+300, 1/900x700 at ch. 2+500, 1/900x700 at ch. 2+700, 1/1200x900 at ch. 3+650,1/900x700 at ch. 4+300, 1/1200x900 at 4+750, 1/900x700 at ch. 5+800 and 1/900x700 at ch. 6+100
4	Laying of sub-base	Km 0+000-6+500

Clearing involves removal of savannah/light bush with a dozer along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works includes blading and compaction of road surface and drains. Two types of new culverts will be constructed, eleven in number along the road. The sizes and numbers are as follows:

a) 9 No. 700 x 900 u-culverts; and
b) 2 No. 900x1200 u-culverts.

Filling will be done mainly in the approaches of culverts and also gravelling of the entire stretch of the road. The list of types and numbers of equipment/machinery to be used include:

a)	1No	Dozer	b)	1No	Pay loader
c)	2No	Motor Grader	d)	1No	Excavator
e)	1No	Tipper Truck	f)	1No	Water tanker
g)	1No	Vibratory Roller	h)	1No	Concrete Mixture
i)	1No	Low Loader	j)	1No	Concrete Vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 3,36 m^3
b) Aggregates - 76m^3
e) Portland cement -798 bags
f) Filling Material - 10,598m^3

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. A workforce of about 30 people is estimated to be employed for the project. The project implementation will take about twelve (12) months.

5.3 Potential Impacts and Mitigation Measures

The Boison-Appiakrom road was spot improved in 2007. The current proposed Spot Improvement Project is part of regular on-going road works to improve and maintain access in Boison, Appiahkrom and Boison boundary communities in particular, and the Aowin Suaman District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 2.5m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing bush within the RoW, construction of culverts and Laying of sub-base.

The main beneficial and adverse environmental and social impacts likely to arise from the project road, as well as the relevant mitigation measures are presented in this section.
The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. It will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade. Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members.

There will be a few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. These include:

1. Noise and vibration impacts;
2. Dust generation and impact on air quality;
3. Occupational health and safety;
4. Potential spread of HIV/ AIDS and STIs;
5. Waste generation;
6. Road diversion impacts; and
7. Temporary site office impacts.

5.3.1 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of:

- Bulldozers and grader in clearing the 6.5km road;
- Concrete mixers to mix concrete for culvert construction; and
- Vibratory roller for sectional filling and gravelling.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. Workers, especially those working with or close to these equipments will be badly exposed.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

5.3.2 Dust Generation and Air Quality Impacts, Mitigation and Monitoring

Land clearing for the entire 6.5km stretch, haulage of material by trucks and laying of sub-base are all dust generating activities. Excavations for the construction of culverts can also lead to dust during windy hours. Excavations for the construction of culverts can also lead to dust during windy hours. Generation of dust will occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control ramps will be erected along the road to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;

- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

5.3.3 Public/ Occupational Health and Safety Impacts, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, excessive vibration from rollers, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

Training will be organised for all workers on health and safety precautions associated with feeder road works, equipment and machinery handling, etc. Personal Protective Equipment (PPE) like helmets, earmuffs, gloves, boots, etc. will be made available to employees. The use of PPE will be mandatory. The contractor or the assigned supervisor will be responsible and answerable for any instance of non-compliance. Non-compliant staff will be reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The first aid team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets and wash rooms will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercise regularly.

5.3.4 Potential HIV/AIDS and STIs Spread, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the conditions to engage multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 4 from the workforce while the nearby communities nominate 4 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

5.3.5 Waste Generation Impacts, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

5. 3.6 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 11 culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers will be operating close to moving vehicles, at the risk of falling vehicles or objects on them or even knockdowns.

The current road width has reduced to between 2.5m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

5.3.7 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration (of 12months) for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

CHAPTER SIX

Domama-Adukrom Road Spot Improvement Project

- **Project Environment Information**
- **Project Description**
- **Potential Impacts, Mitigation and Monitoring Measures**

6.0 DOMAMA-ADUKROM ROAD SPOT IMPROVEMENT PROJECT

6.1 Project Environment Information

The project road is located in the Mpohor Wassa East District of the Western Region, about 68.0km from Daboase - the district capital. The road is 4.4 km long with Domama and Adukrom communities along the stretch.

There is a school at Domama town 20m from the road corridor and a clinic at Domama clinic 150m from the road corridor. There are a number of farmlands along the road corridor. The vegetation type is forest. The area is generally noted for farming activities. The road crosses the Subri River and three other streams. The topography is generally undulating.

6.2 Project Description

The road has poor surface and structure conditions (depressions, soft spots, ruts, etc). It has poor drainage structure and several river crossing points. It was reshaped about a year ago (2008). The width of the road is reduced to 3.0m on the average (instead of 6.0m).

The objectives of the proposed spot improvement works are to:

- Expand the width of the road to 6.0m all-through;
- Facilitate easy transportation of agricultural produce to the nearest market centre; and
- Provide the least cost intervention for reliable, all-season passable means of transport.

The specific works intended to be carried out are mainly clearing, formation of road, blading and compaction of road surface, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table below.

Table 6.1 Locations / Distances of Specific Works along the Domama-Adukrom Road

	Specific Works	**Location or Distance**
1	Clearing	Km 0.000 – 4.400
2	Formation	Km 0.150-0.250, 0.450-0.650, 0.750-0.950, 1.050-1.150, 1.250-1.550, 1.650-2.050, 2.150-2.550, 2.650-2.850, 2.950-3.050, 3.150-3.350, 3.450-3.950 and 4.150-4.400.
3	Construction of culverts	11No. 700 x 900 u-culverts at km 0.000, 0.100, 0.300, 0.400,0.700, 1.000, 1.200, 2.100, 2.900, 3.100 and 4.100; 1No. 900 x 1200 u-culvert at km 3.400; 2No. 1250 x 1800 u-culvert at km 1.600 & 2.600 and 1No.2/1250 x 1800 u-culvert at km 4.000.
4	Laying of sub-base	Km 0.000 – 4.400

Clearing involves removal of bush with a dozer along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works includes blading and compaction of road surface and drains. Four types of new culverts will be constructed, fifteen in number along the road. The sizes and numbers are as follows:

a) 11No. 700 x 900 u-culverts;
b) 1 No. 900x1200 u-culvert;
c) 2No. 1250x1800 u-culverts; and
d) 1No. 2/1250x1800 u-culvert.

Filling will be done mainly in the approaches of culverts and also gravelling of the entire stretch of the road. The list of types and numbers of equipment/machinery to be used include:

a) 1No Dozer ; b) 1No Pay loader;
c) 2No Motor Grader ; d) 1No Excavator;
e) 2No Tipper Truck; f) 1No Water tanker;

g) 1No Vibratory Roller; h) 1No Concrete Mixture;
i) 1No Low Loader; and j) 1No Concrete Vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 13,200 m^3
b) Aggregates - Aggregates - 23,093 m^3
c) Portland cement - 1,383 bags
d) Filling material - 4,786m^3.

Figure 6.1 Some sections of the Domama-Adukrom Road

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase. A workforce of about twenty eight (28) people is estimated to be employed for the project. The project implementation will take about eight (8) months.

6.3 Potential Impacts and Mitigation Measures

The Domama-Adukrom road was reshaped in 2008. The proposed Spot Improvement Project is part of regular on-going road works to improve and maintain access in Domama and Adukrom communities in particular, and the Mpohor Wassa East District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 3.0m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing bush within the RoW, construction of culverts and Laying of sub-base.

The main beneficial and adverse environmental and social impacts likely to arise from the project road, as well as the relevant mitigation measures are presented in this section.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. It will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade.

Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members.

There will be a few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. These include:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality ;
4. Occupational health and safety;
5. Potential spread of HIV/ AIDS and STIs;
6. Waste generation;
7. Road diversion impacts; and
8. Temporary site office impacts.

6.3.1 Water Resources Impacts, Mitigation and Monitoring

The road crosses the Subri River and three other streams. These are important source of water for the communities. Impact on these streams during the minor rehabilitation works will largely be siltation during clearing and erosion of top soil into stream during the rainy season. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the Subri River, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing along the corridor will be restricted to the right of way (RoW), and road works will progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.

Excavated materials will be retained away from the water bodies and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the River Subri and 3 other streams:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

6.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of:

- Bulldozers and grader in clearing the 4.4km road;

- Concrete mixers to mix concrete for culvert construction; and
- Vibratory roller for sectional filling and gravelling.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. Workers, especially those working with or close to these equipments will be badly exposed. In addition, the school at Domama town, which is 20m from the road corridor, will be a receptor of noise.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

6.3.3 Dust Generation and Air Quality Impacts, Mitigation and Monitoring

Clearing of the 4.4km stretch, haulage of material by trucks to the site and laying of sub-base will all generate dust. Excavations for the construction of culverts using the excavator can also lead to dust during windy hours. Generation of dust will occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Apart from respiratory effects, dust may result in eye and skin irritation and affect plant growth.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control ramps will be erected along the road in communities to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;

- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

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Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, excessive vibration from rollers, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

Training will be organised for all workers on health and safety precautions associated with feeder road works, equipment and machinery handling, etc. so as to reduce the incidence of occupational accidents. Personal Protective Equipment (PPE) like helmets, earmuffs, gloves, boots, etc. will be made available to employees. The use of PPE will be mandatory. The contractor or the assigned supervisor will be responsible and answerable for any instance of non-compliance. Non-compliant staff will be reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The first aid team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits.

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- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
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- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
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- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and

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- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers will be operating close to moving vehicles, at the risk of falling vehicles or objects on them or even knockdowns.

The current road width has reduced to 3m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

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6.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration (of 8months) for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

CHAPTER SEVEN

Dwinase-Kwamebour Road Spot Improvement Project

- **Project Environment Information**
- **Project Description**
- **Potential Impacts, Mitigation and Monitoring Measures**

7.0 DWINASE-KWAMEBOUR ROAD - SPOT IMPROVEMENT PROJECT

7.1 Project Environment Information

The project road is located in the Sefwi Wiawso District of the Western Region, about 0.3km from Sefwi Wiawso - the district capital. The road is 21.7km long with the following communities along the stretch: Ayirekrom, Abopre, Nzuazua, Nso Nyame Ye, Anglo, Kwamebour, Kwamebour Shed Krnd Obonu.

The following are located close to the corridor:

- Prayer centre (ch. 0+800; 20m from roadside),
- Two schools (ch. 10+900 & 14+500; 30m and 20m from roadside respectively.), and
- Three churches (11+100, 16+300 & 16+500; 25m, 25m and 30m respectively) from the roadside.
- Farms, especially cocoa and plantain farms along the road corridor

The vegetation type is forest. The area is generally noted for cash crops and food crop farming. The road crosses 20 water bodies (Kunzin, Betekye, Ayire, Amokyie, Bropa, Anglo, Damme, Nkoasuo, and Nyamanyama Rivers). The topography is generally hilly.

7.2 Project Description

The road currently has poor surface and structure conditions (depressions, soft spots, ruts, etc). It has poor drainage structure and several river crossing points. It was reshaped in 2008. The width of the road is reduced to 4.0m on the average (instead of 6.0m).

The objectives of the proposed spot improvement works are to:

- Expand the width of the road to 6.0m all-through;
- Facilitate easy transportation of agricultural produce to the nearest market centre; and
- Provide the least cost intervention for reliable, all-season passable means of transport.

The specific works intended to be carried out are mainly clearing, formation of road, blading and compaction of road surface, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in the Table below.

Table 7.1 Locations / Distances of Specific Works along the Dwinase-Kwamebour Road

	Specific Works	**Location or Distance**
1	Clearing	Km 0.000 – 21.700
2	Formation	Km 0.000-0.350, 0.450-3.450, 3.550-6.050, 6.150-7.450, 7.550-10.250, 10.350-11.450, 11.550-11.950, 12.050-13.300, 13.400-15.300, 15.400-16.00, 16.100-18.650, 18.750-20.750 and 20.850-21.400; 0.000-0.300 on Baakanko branch road.
3	Construction of culverts	4 No. 700 x 900 u-culverts at km. 0.400, 7.500, 18.700 & 20.800; 2 No. 900x1200 u-culverts at km 10.300 & 11.500; 2 No. 2/1250x1800 u-culverts at km 6.100 & 12.00; 2No. 1800x1800 at km 13.350 & 15.350 and 2No. 2/3mx3m B.Culverts at km 3.500 & 16.000. 1No. 700x900 u-culvert on Baakanko branch road.
4	Laying of sub-base	Km 3.100-3.900, 4.480-4.600, 7.100-7.700, 9.900-10.500 and 14.000-14.550

Clearing involves removal of bush with a dozer along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works includes blading and compaction of road surface and drains. Two types of new culverts will be constructed, twelve in number along the road. The sizes and numbers are as follows:

a) 4 No 700 x 900 u-culverts;

b) 2 No 900x1200 u-culverts;
c) 2 No 2/1250x1800 u-c;
d) 2 No 1800x1800; and
e) 2 No 2/3mx3m B.Culverts

Filling will be done mainly in the approaches of culverts and also gravelling of the entire stretch of the road. The list of types and numbers of equipment/machinery to be used include:

a)	2 No	Dozer	b)	1 No	Low Loader
c)	4 No	Motor Grader	d)	2 No	Vibratory Roller
e)	3 No	Tipper Truck	f)	1 No	Water tanker
g)	1 No	Pay Loader	h)	1 No	Concrete Mixture
i)	1 No	Excavator	j)	1 No	Concrete Vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 12,810 m^3
b) Aggregates - 36,907 m^3
c) Portland cement - 2,716 bags
d) Filling material - 8,942m^3

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase.
A workforce of about forty two (42) people is estimated to be employed for the project. The project implementation will take about eighteen (18) months.

7.3 Potential Impacts and Mitigation Measures

The road was reshaped in 2008. The proposed Spot Improvement Project is part of regular on-going road works to improve and maintain access in Ayirekrom, Abopre, Nzuazua, Nso Myame Ye, Anglo, Kwamebour, Kwamebour Shed Krnd Obonu communities in particular, and the Sefwi Wiawso District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 4.0m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing bush within the RoW, construction of culverts and laying of sub-base.

The main beneficial and adverse environmental and social impacts likely to arise from the project road, as well as the relevant mitigation measures are presented in this section.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. It will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade. Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members.

The construction of a culvert on the Kunzin, Betekye, Ayire, Amokyie, Bropa, Anglo, Damme, Nkoasuo, and Nyamanyama Rivers and other drainage channels will avert the difficulty of crossing in the rainy season. The spot improvement works will thus improve interconnection between communities.

There will be a few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. These include:

1. Impacts on Water Resources;
2. Noise and Vibration Impacts;
3. Dust Generation and Impact on Air Quality;
4. Occupational Health and Safety;
5. Potential Spread of HIV/ AIDS and STIs
6. Waste generation;
7. Road diversion impacts; and
8. Temporary site office impacts.

7.3.1 Water Resources Impacts, Mitigation and Monitoring

The road crosses 20 water bodies (Kunzin, Betekye, Ayire, Amokyie, Bropa, Anglo, Damme, Nkoasuo, and Nyamanyama Rivers). These are important sources of water for the communities as some of these are depended on by people for various uses. Impact on these streams during the minor rehabilitation works will largely be siltation during clearing and erosion of top soil into stream during the rainy season. Blocking of water course may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the Kunzin, Betekye, Ayire, Amokyie, Bropa, Anglo, Damme, Nkoasuo, and Nyamanyama Rivers, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing along the corridor will be restricted to the right of way (RoW), and road works will progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.

Excavated materials will be retained away from the water bodies and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

7.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of:

- Bulldozers and grader in clearing the 21.7km road;
- Concrete mixers to mix concrete for culvert construction; and
- Vibratory roller for sectional filling and gravelling.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. Workers, especially those working with or close to these equipments will be badly exposed. In addition two schools (ch. 10+900 & 14+500; 30m and 20m from roadside respectively) will also be receptors of noise due to their relative distances from the road.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Works Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

7.3.3 Dust Generation and Air Quality Impacts, Mitigation and Monitoring

Land clearing for the entire 21.7km stretch, haulage of material by trucks and laying of sub-base are all dust generating activities. Excavations for the construction of culverts can also lead to dust during windy hours. Generation of dust will occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. Facilities likely to suffer from dust includes Prayer centre (ch. 0+800; 20m), the schools (10+900 & 14+500; 30m & 20m from roadside respectively) and the churches (11+100, 16+300 & 16+500; 25m, 25m & 30m respectively).

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along the road to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the

flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

7.3.4 Public/ Occupational Health and Safety Impacts, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, excessive vibration from rollers, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

To reduce the incidence of occupational accidents, training will be organised for all workers on health and safety precautions associated with feeder road works, equipment and machinery handling, etc. Personal Protective Equipment (PPE) like helmets, earmuffs, gloves, boots, etc. will be made available to employees. The use of PPE will be mandatory. The contractor or the assigned supervisor will be responsible and answerable for any instance of non-compliance. Non-compliant staff will be reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The first aid team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets and wash rooms will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;

- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercise regularly.

7.3.5 Potential HIV/AIDS and STIs Spread, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the conditions to engage multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 5 from the workforce while the nearby communities nominate 5 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

7.3.6 Waste Generation Impacts, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary

facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

7.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 12 culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers will be operating close to moving vehicles, at the risk of falling vehicles or objects on them or even knockdowns.

The current road width has reduced to 4m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

7.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration (of 18months) for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the

land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

CHAPTER EIGHT

Gyampere-Kwasikrom Road Phase I Spot Improvement Project

- **Project Environmenta Information**
- **Project Description**
- **Potential Impacts, Mitigation and Monitoring Measures**

8.0 GYAMPERE-KWASIKROM PHASE I SPOT IMPROVEMENT PROJECT

8.1 Project Environment Information

The project road is located in the Ellembelle District of the Western Region, about 50km from Nkroful - the district capital. The road is 10.0 km long serving the Gyampere community.

The vegetation type is forest. The area is generally noted for agricultural activities. The road crosses 32 water bodies and drainage channels including River Ayawura and River Ewroku. The topography is generally undulating.

8.2 Project Description

The road has poor drainage structures and several river crossing points which are not bridged. The width of the road is reduced to 1.5m on the average (instead of 6.0m).

The objectives of the proposed spot improvement works are to:

- Expand the width of the road to 6.0m all-through;
- Facilitate easy transportation of agricultural produce to the nearest market centre; and
- Provide the least cost intervention for reliable, all-season passable means of transport.

The specific works intended to be carried out are mainly clearing, formation of road, blading and compaction of road surface, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in the Table below.

Table 8.1 Locations / Distances of Specific Works along the Gyampere-Kwasikrom Road

	Specific Works	**Location or Distance**
1	Clearing	Km 0+000-10+000
2	Formation	Km (0+000-0+250, 0+500-0+600, 0+700-0+850, 0+900-0+950, 1+050-1+100, 1+200-1+550, 1+750-1+800, 1+900-1+200, 2+200-2+250, 2+350-2+550, 2+850-3+200, 33+300-3+450, 3+650-3+700, 3+800-3+950, 4+050-4+150, 4+300-4+500, 4+600-4+850, 5+100-5+450, 5+550-5+800, 5+900-6+150, 6+250-6+350, 6+550-6+850, 6+950-7+950, 8+050-8+450, 8+700-9+200, 9+300-9+400, 9+500-9+650, 9+750-9+850, 9+950-10+000)
3	Construction of culverts(mm)	1/900x700 at ch. 0+300, 1/900x700 at ch. 0+450, 1/900x700 at ch. 0+650, 1/900x700 at ch. 0+900, 1/900x700 at ch. 1+000, 1/900x700 at ch. 1+150, 2/3000x300 box at ch. 1+600, 1/900x700 at ch. 1+700, 1/1200x900 at ch. 1+850, 1/900x700 at ch. 2+050, 1/1200x900 at ch. 2+150, 1/900x700 at ch. 2+300, 1/900x700 at ch. 2+600, 1/900x700 at ch. 2+750, 1/3000x3000box at ch.2+800, 1/900x700 at ch. 3+250, 1/900x700 at ch. 3+500, 1/900x700 at ch. 3+600, 1/900x700 at ch. 3+750, 1/900x700 at ch. 4+000, 1/900x700 at ch. 4+200, 1/900x700 at ch. 4+250, 1/900x700 at ch.4+550, 1/1200x900 at ch. 4+900, 1/900x700 at ch. 5+000, 1/900x700 at ch. 5+050, 1/900x700 at ch. 5+500, 1/900x700 at ch. 5+850, 1/900x700 at ch. 6+200, 1/900x700 at ch. 6+400, 1/900x700 at ch. 6+500, 1/900x700 at ch. 6+900, 2/1800x1800 at ch. 8+000, 1/1200x900 at ch. 8+500, 1/900x700 at ch. 8+650, 1/900x700 at ch. 9+250, 1/900x700 at ch. 9+450, 1/1200x900 at ch.9+700, 1/900x700 at ch. 9+900.
4	Laying of sub-base	No sub-base

Clearing involves removal of bush with a dozer along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works includes

blading and compaction of road surface. Two types of new culverts will be constructed, thirty nine in number along the road. The sizes and numbers are as follows:

a) 31 No. 700 x 900 u-culverts;
b) 5No. 900x1200 u-culverts;
c) 1 No. 2/3x3 box-culvert;
d) 1No. 1/3x3 box-culvert; and
e) 1No. 2/1800x1800

Filling will be done mainly in the approaches of culverts and also gravelling of the entire stretch of the road. The list of types and numbers of equipment/machinery to be used include:

a)	2 No	Dozer	b)	1 No	Low Loader
c)	3 No	Motor Grader	d)	2 No	Vibratory Roller
e)	2 No	Tipper Truck	f)	1 No	Water tanker
g)	1 No	Pay Loader	h)	1 No	Concrete Mixture
i)	1 No	Excavator	j)	1 No	Concrete Vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 19720 m^3
b) Aggregates - 24536 m^3
c) Portland cement - 1645 bags
d) Filling material - 36,622 m^3

Figure 8.1 A car stuck on a section of the Gyampere-Kwasikrom Road

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase.
A workforce of about thirty six (36) people is estimated to be employed for the project. The project implementation will take about (18) months.

8.3 Potential Impacts and Mitigation Measures

The proposed Spot Improvement Project of the Gyampere-Kwasikrom road is part of regular on-going road works to improve and maintain access in the Gyampere community in particular, and the Ellembelle District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 1.5m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing bush within the RoW, construction of culverts and Laying of sub-base.

The main beneficial and adverse environmental and social impacts likely to arise from the project road, as well as the relevant mitigation measures are presented in this section.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. It will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade. Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members.

The construction of a culvert on the thirty two (32) water bodies including River Ayawura and River Ewroku will avert the difficulty of crossing in the rainy season. The spot improvement works will thus improve interconnection between communities.

There will be a few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. These include:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety;
5. Potential spread of HIV/ AIDS and STIs;
6. Waste generation;
7. Road diversion impacts; and
8. Temporary site office impacts.

8.3.1 Water Resources Impacts, Mitigation and Monitoring

The road crosses thirty two (32) water bodies including River Ayawura and River Ewroku. Impact on these streams during the spot improvement works will largely be siltation during clearing and erosion of top soil into stream during the rainy season. This impact will be compounded by the hilly topography. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials

such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the thirty two (32) water bodies, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing along the corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.

Excavated materials will be retained away from the water bodies and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the Rivers Ayawura and Ewrku:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

8.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of:

- Bulldozers and grader in clearing the 10.0km road;
- Concrete mixers to mix concrete for culvert construction; and
- Vibratory roller for sectional filling and gravelling.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. Workers, especially those working with or close to these equipments will be badly exposed.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

8.3.3 Dust Generation and Air Quality Impacts, Mitigation and Monitoring

Land clearing for the entire 10.0km stretch, haulage of material by trucks and laying of sub-base are all dust generating activities. Excavations for the construction of culverts can also lead to dust during windy hours. Generation of dust will occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along the road to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

8.3.4 Public/ Occupational Health and Safety Impacts, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, excessive vibration from rollers, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

To reduce the incidence of occupational accidents, training will be organised for all workers on health and safety precautions associated with feeder road works, equipment and machinery handling, etc. Personal Protective Equipment (PPE) like helmets, earmuffs, gloves, boots, etc. will be made available to employees. The use of PPE will be mandatory. The contractor or the assigned supervisor will be responsible and answerable for any instance of non-compliance. Non-compliant staff will be reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The first aid team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets and wash rooms will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercise regularly.

8.3.5 Potential HIV/AIDS and STIs Spread, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the conditions to engage multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 5 from the workforce while the nearby communities nominate 5 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at

each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;

- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

8.3.6 Waste Generation Impacts, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

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8.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 39 culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers will be operating close to moving vehicles, at the risk of falling vehicles or objects on them or even knockdowns.

The current road width has reduced to between 1.5m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

8.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration (of 18months) for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

CHAPTER NINE

Gyampere-Kwasikrom Road Phase II Spot Improvement Project

- **Project Environment Information**
- **Project Description**
- **Potential Impacts, Mitigation and Monitoring Measures**

9.0 GYAMPERE-KWASIKROM PHASE II SPOT IMPROVEMENT PROJECT

9.1 Project Environment Information

The project road is located in the Ellembelle District, about 60km from Nkroful - the district capital. The road is 11.5km long serving the Kwasikrom community.

The vegetation type is forest. The area is generally noted for agricultural activities. The road crosses 37 water bodies Ayawura River and Ewroku River. The topography is generally undulating.

9.2 Project Description

The road has poor drainage structures and several river crossing points which are not bridged. The width of the road is reduced to 1.5m on the average (instead of 6.0m).

The objectives of the proposed spot improvement works are to:

- Expand the width of the road to 6.0m all-through;
- Facilitate easy transportation of agricultural produce to the nearest market centre; and
- Provide the least cost intervention for reliable, all-season passable means of transport.

The specific works intended to be carried out are mainly clearing, formation of road, blading and compaction of road surface, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in the Table below.

Table 9.1 Locations / Distances of Specific Works along the Gyampere-Kwasikrom Road

	Specific Works	**Location or Distance**
1	Clearing	Km 10+000-21+500
2	Formation	Km , 10+000-10+650, 10+750-10+950, 11+075-11+450-11+, 11+600-11+800, 11+900-12+350, 12+450-12+750, 12+850-13+050, 13+150-13+200,13+300-13+400, 13+500-13+550, 13+650-13+750,13+850-13+950, 14+050-14+250, 14+350-14+600, 14+700-14+850, 14+950-15+350, 15+450-15+550, 15+650-15+800, 15+900-16+350, 16+450-16+650, 16+750-18+050, 18+150-18+275, 18+375-19+200,19+300-19+400, 19+500-19+800, 19+900-20+050, 20+150-20+200,20+300-20+600, 20+700- 20+750, 20+850-20+050, 20+150-21+300 and 21+400-21+500
3	Construction of culverts	26No. 900x700 at km 10+700,11+025,11+550,11+850,12+400,12+800,13+100,13+450,13+600,14+000,14+300,14+650,14+900,15+400, 15+600, 15+850, 16+400, 16+700, 18+100, 19+250, 19+450, 19+850, 20+250, 20+650, 20+800 and 21+000. 5No. 1200x900 at km 11+000, 13+250, 13+800, 18+325 and 20+100 1No. 2/1800x1800 at km 17+300 1No. 1800x1250 at km 21+350 1No. 2/1200x900 at km 18+325
4	Laying of sub-base	Km(12+400-14+700, 17+000-19+200)

Clearing involves removal of bush with a dozer along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works includes blading and compaction of road surface and drains. Two types of new culverts will be constructed, thirty four in number along the road. The sizes and numbers are as follows:

a) 26 No. 700 x 900 u-culverts;
b) 5 No. 900x1200 u-culverts;
c) 1 No. 2/1800x1800;

d) 1 No. 1250x1800; and
e) 1 No. 2/900x1200

Filling will be done mainly in the approaches of culverts and also gravelling of the entire stretch of the road. The list of types and numbers of equipment/machinery to be used include:

a)	2 No	Dozer	b)	1 No	Low Loader
c)	4 No	Motor Grader	d)	1 No	Vibratory Roller
e)	3 No	Tipper Truck	f)	1 No	Water tanker
g)	1 No	Pay Loader	h)	1 No	Concrete Mixture
i)	1 No	Excavator	j)	1 No	Concrete Vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 20250 m^3
b) Aggregates - 28923 m^3
c) Portland cement - 2643 bags
d) Filling material - 28,915 m^3

Figure 9.1 Community members improvising a culvert

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase.
A workforce of about thirty seven (37) people is estimated to be employed for the project. The project implementation will take about eighteen (18) months.

9.3 Potential Impacts and Mitigation Measures

The proposed Spot Improvement Project of the Gyampere-Kwasikrom PH. II Road is part of regular on-going road works to improve and maintain access in the Kwasikrom community in particular, and the Ellembelle District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 1.5m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing bush within the RoW, construction of culverts and Laying of sub-base.

The main beneficial and adverse environmental and social impacts likely to arise from the project road, as well as the relevant mitigation measures are presented in this section.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. It will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade. Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members.

The construction of a culvert on the thirty seven (37) water bodies including River Ayawura and River Ewroku will avert the difficulty of crossing in the rainy season. The spot improvement works will thus improve interconnection between communities.

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1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
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5. Potential spread of HIV/ AIDS and STIs;
6. Waste generation;
7. Road diversion impacts; and
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The road crosses thirty seven (37) water bodies including River Ayawura and River Ewroku. Impact on these rivers during the spot improvement works will largely be siltation during clearing and erosion of top soil into stream during the rainy season. This impact will be compounded by the hilly topography. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

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Monitoring will cover the following parameters and their frequency of monitoring:

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- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

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Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, excessive vibration from rollers, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

To reduce the incidence of occupational accidents, training will be organised for all workers on health and safety precautions associated with feeder road works, equipment and machinery handling, etc. Personal Protective Equipment (PPE) like helmets, earmuffs, gloves, boots, etc. will be made available to employees. The use of PPE will be mandatory. The contractor or the assigned supervisor will be responsible and answerable for any instance of non-compliance. Non-compliant staff will be reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a safety first rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The first aid team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets and wash rooms will be checked whether they have been provided before the start of the project;

- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercise regularly.

9.3.5 Potential HIV/AIDS and STIs Spread, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the conditions to engage multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 5 from the workforce while the nearby communities nominate 5 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

9.3.6 Waste Generation Impacts, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

9.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 34 culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers will be operating close to moving vehicles, at the risk of falling vehicles or objects on them or even knockdowns.

The current road width has reduced to between 1.5m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and

- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

9.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration (of 18months) for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

CHAPTER TEN

Penakrom-Futa Road Spot Improvement Project

- **Project Environmental Information**
- **Project Description**
- **Potential Impacts, Mitigation and Monitoring Measures**

10.0 PENAKROM-FUTA ROAD SPOT IMPROVEMENT PROJECT

10.1 Project Environment Information

The project road is located in the Sefwi-Wiawso District, about 4.9km from Sefwi-Wiawso - the district capital. The road is 3.10km long serving Futa and Adukura communities.

There is a school (ch. 2+700) - 20m from the road corridor and a number of farmlands along the road corridor. The vegetation type is forest. The area is generally noted for agricultural activities. The road crosses the Adukuram River (ch. 2+800; existing 2mx2m box culvert). The topography is generally rolling.

10.2 Project Description

The road has poor surface and structure conditions (depressions, soft spots, ruts, etc). The width of the road is reduced to 3.0m on the average (instead of 6.0m) despite being reshaped about a year ago (2008).

The objectives of the proposed spot improvement works are to:

- Expand the width of the road to 6.0m all-through;
- Facilitate easy transportation of agricultural produce to the nearest market centre; and
- Provide the least cost intervention for reliable, all-season passable means of transport.

The specific works intended to be carried out are mainly clearing, formation of road, blading and compaction of road surface, construction of culverts and filling and gravelling. The specific works according to mileage (location) and/or distance are provided the Table below.

Table 10.1 Locations / Distances of Specific Works along the Penakrom-Futa Road

	Specific Works	**Location or Distance**
1	Clearing	Km 0.000 – 3.100
2	Formation	Km 0.000-0.750, 0.850-1.950, 2.050-2.950 and 3.050-3.100
3	Construction of culverts	3No. 700 x 900 u-culverts at km 0.800, 2.000 and 3.000.
4	Laying of sub-base	Km 2.500 – 3.000

Clearing involves removal of bush with a dozer along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works includes blading and compaction of road surface and drains. Only one type of new culvert will be constructed, three in number along the road. The sizes and numbers are as follows:

- 3 No. 700 x 900 u-culverts

Filling will be done mainly in the approaches of culverts and also gravelling of the entire stretch of the road. The list of types and numbers of equipment/machinery to be used include:

a) 1 No Dozer
b) 1 No Low Loader
c) 1 No Motor Grader
d) 1 No Vibratory Roller
e) 1 No Tipper Truck
f) 1 No Water tanker
g) 1 No Pay Loader
h) 1 No Concrete Mixture
i) 1 No Excavator
j) 1 No Concrete Vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 2250m^3
b) Aggregates - 3360 m^3
c) Portland cement - 190 bags
d) Filling material - 790m^3

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase.

It is estimated to employ a workforce of about 23 people for the project. The project implementation will take about six (6) months.

10.3 Potential Impacts and Mitigation Measures

The Penakrom-Futa road was reshaped in 2008. The proposed Spot Improvement Project is part of regular on-going road works to improve and maintain access in Futa and Adukura communities in particular, and the Sefwi-Wiawso District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 3.0m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing bush within the RoW, construction of culverts and Laying of sub-base.

The main beneficial and adverse environmental and social impacts likely to arise from the project road, as well as the relevant mitigation measures are presented in this section.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. It will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade. Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members.

There will be a few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. These include:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety;
5. Potential spread of HIV/ AIDS and STIs;
6. Waste generation;
7. Road diversion impacts; and
8. Temporary site office impacts.

10.3.1 Water Resources Impacts, Mitigation and Monitoring

The road crosses Adukuram. Impact on this stream during the spot improvement works will largely be siltation during clearing and erosion of top soil into stream during the rainy season. This impact will be compounded by the hilly topography. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in

sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the Adukuram River, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing along the corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.

Excavated materials will be retained away from the water bodies and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the Adukuram:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

10.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of:

- Bulldozers and grader in clearing the 3.1km road;
- Concrete mixers to mix concrete for culvert construction; and
- Vibratory roller for sectional filling and gravelling.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. Workers, especially those working with or close to these equipments will be badly exposed. In addition, a school (ch. 2+700) - 20m from the road corridor, will also be a receptor of noise.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quite periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

10.3.3 Dust Generation and Air Quality Impacts, Mitigation and Monitoring

Land clearing for the entire 3.10km stretch, haulage of material by trucks and laying of sub-base are all dust generating activities. Excavations for the construction of culverts can also lead to dust during windy hours. Generation of dust will occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust pollution can adversely affect health of workers engaged directly or indirectly in the road works. The school (ch. 2+700), 20m from the road corridor may also suffer from dust impacts. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along the road to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

10.3.4 Public/ Occupational Health and Safety Impacts, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, excessive vibration from rollers, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

To reduce the incidence of occupational accidents, training will be organised for all workers on health and safety precautions associated with feeder road works, equipment and machinery handling, etc. Personal Protective Equipment (PPE) like helmets, earmuffs, gloves, boots, etc. will be made available to employees. The use of PPE will be mandatory. The contractor or the assigned supervisor will be

responsible and answerable for any instance of non-compliance. Non-compliant staff will be reprimanded and subsequently a fine of GH¢5 and then outright dismissal.
First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. The contractor shall select 4 of his workers to be trained (by officers from the health directorates of the road districts) in first aid procedures. The first aid team will be in charge of educating their fellow workers on first aid procedures. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets and wash rooms will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercise regularly.

10.3.5 Potential HIV/AIDS and STIs Spread, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the conditions to engage multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at

each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

10.3.6 Waste Generation Impacts, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:
- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

10.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 3 culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:
- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers will be operating close to moving vehicles, at the risk of falling vehicles or objects on them or even knockdowns.

The current road width has reduced to 3m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

10.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration (of 6months) for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

CHAPTER ELEVEN

Pieso-Attakrom Road Spot Improvement Project

- **Project Environment Information**
- **Project Description**
- **Potential Impacts, Mitigation and Monitoring Measures**

11.0 PIESO-ATTAKROM ROAD SPOT IMPROVEMENT PROJECT

11.1 Project Environment Information

The road project is located in the Prestea Huni Valley District, about 43km from Bogoso - the district capital. The road is 3.0 km long serving Pieso and Attakrom communities.

The vegetation type is forest. The area is generally noted for agricultural activities. The road crosses River Bonsa and River Anikoko. The topography is generally undulating.

11.2 Project Description

This partially engineered road has poor surface and structure conditions (depressions, soft spots, ruts, etc). The width of the road is reduced to 3.0m on the average (instead of 6.0m). It was reshaped in 2009 by a Timber Firm.

The objective of the proposed spot improvement works includes to:

- Expand the width of the road to 6.0m all-through;
- Facilitate easy transportation of agricultural produce to the nearest market centre; and
- Provide the least cost intervention for reliable, all-season passable means of transport.

The specific works intended to be carried out are mainly clearing, formation of road, blading and compaction of road surface, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 1.

Table 11.1 Locations / Distances of Specific Works along the Pieso-Attakrom Road

	Specific Works	**Location or Distance**
1	Clearing	0+000-3+000
2	Formation	0+000-0+950, 1+300-1+900, 2+000-2+350, 2+550-2+650 and 2+800-3+000
3	Construction of culverts(mm)	1/900x700 at ch. 1+000, 1/3000x3000 box at ch. 1+200, 1/1800x1250 at ch. 1+900, 1/900x700 at ch. 2+400, 1/900x700 at ch. 2+500, 1/900x700 at ch. 2+700 and 1/900x700 at ch. 2+750.
4	Laying of sub-base	0+000-1+450, 2+350-2+550 and 2+650-2+800

Clearing involves removal of bush with a dozer along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works includes blading and compaction of road surface and drains. Three types of new culverts will be constructed, seven in number along the road. The sizes and numbers are as follows:

- 5 No. 700 x 900 u-culverts;
- 1 No. 1250x1800 u-culvert; and
- 1 No. 3mx3m B.C.

Filling will be done mainly in the approaches of culverts and also gravelling of the entire stretch of the road. The list of types and numbers of equipment/machinery to be used include:

a) 1 No Dozer
b) 1 No Low Loader
c) 2 No Motor Grader
d) 1 No Vibratory Roller
e) 1 No Tipper Truck
f) 1 No Water tanker
g) 1 No Pay Loader
h) 1 No Concrete Mixture
i) 1 No Excavator
j) 1 No Concrete Vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 5818 m^3
b) Aggregates - 28923 m^3
c) Portland cement - 1041 bags
d) Filling material - 5,051 m^3

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase.
A workforce of about twenty-five (25) people is estimated to be employed for the. The project implementation will take about six (6) months.

11.3 Potential Impacts and Mitigation Measures

The Pieso-Attahkrom road was reshaped in 2009 by a Timber Firm. The proposed Spot Improvement Project is part of regular on-going road works to improve and maintain access in Pieso and Attakrom communities in particular, and the Prestea Huni Valley District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 3.0m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing bush within the RoW, construction of culverts and Laying of sub-base.

The main beneficial and adverse environmental and social impacts likely to arise from the project road, as well as the relevant mitigation measures are presented in this section.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. It will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade. Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members.

The construction of a culvert on the River Bonsa and River Anikoko will avert the difficulty of crossing in the rainy season. The spot improvement works will thus improve interconnection between communities.

There will be a few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. These include:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety;
5. Potential HIV/AIDS and STIs Spread;
6. Waste generation;
7. Road diversion impacts; and

8. Temporary site office impacts.

11.3.1 Water Resources Impacts, Mitigation and Monitoring

The road crosses River Bonsa and River Anikoko. Impact on these streams during the minor rehabilitation works will largely be siltation during clearing and erosion of top soil into stream during the rainy season. This impact will be compounded by the hilly topography. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the River Bonsa and River Anikoko, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing along the corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.

Excavated materials will be retained away from the water bodies and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the Rivers Bonsa and Anikoko:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

11.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of:

- Bulldozers and grader in clearing the 3.0km road;
- Concrete mixers to mix concrete for culvert construction; and
- Vibratory roller for sectional filling and gravelling.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. Workers, especially those working with or close to these equipments will be badly exposed.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3

hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

11.3.3 Dust Generation and Air Quality Impacts, Mitigation and Monitoring

Land clearing for the entire 3.0km stretch, haulage of material by trucks and laying of sub-base are all dust generating activities. Excavations for the construction of culverts can also lead to dust during windy hours. Generation of dust will occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along the road to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

11.3.4 Public/ Occupational Health and Safety Impacts, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, excessive vibration from rollers, vehicular knock downs,

etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

To reduce the incidence of occupational accidents, training will be organised for all workers on health and safety precautions associated with feeder road works, equipment and machinery handling, etc. Personal Protective Equipment (PPE) like helmets, earmuffs, gloves, boots, etc. will be made available to employees. The use of PPE will be mandatory. The contractor or the assigned supervisor will be responsible and answerable for any instance of non-compliance. Non-compliant staff will be reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets and wash rooms will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercise regularly.

11.3.5 Potential HIV/AIDS and STIs Spread, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the conditions to engage multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the

workers will emphasize the deadly effects of the disease. The contractor will select 3 from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

11.3.6 Waste Generation Impacts, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

11.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 7 culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers will be operating close to moving vehicles, at the risk of falling vehicles or objects on them or even knockdowns.

The current road width has reduced to 3m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

11.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration (of 6months) for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement

terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

CHAPTER TWELVE

Samenye-Etweakor Road Spot Improvement Project

- **Project Environment Information**
- **Project Description**
- **Potential Impacts, Mitigation and Monitoring Measures**

12.0 SAMENYE-ETWEAKOR ROAD SPOT IMPROVEMENT PROJECT

12.1 Project Environment Information

The project road is located in Jomoro District, about 53km from Half Assini - the district capital. The road is 8.8km long serving Samenye and Etweakor communities.

There are houses 2m from the edge of the road, farms 1m from the edge of the road and a cemetery at ch 0+800 1m from the edge of the road.

The vegetation type is forest. The area is generally noted for agricultural activities. The topography is generally undulating.

12.2 Project Description

The road is engineered, but has poor surface and structure conditions (depressions, soft spots, ruts, etc) as shown in Figure 12.1. The width of the road is reduced to 2.5m on the average (instead of 6.0m) despite being improved in 2009. The objective of the proposed spot improvement works includes:

- Facilitate easy transportation of agricultural produce and people living within the road corridor to the nearest commercial centre.
- Provide uninterrupted all-year high quality road.

Figure 12.1 Sections of the Samenye-Etweakor Road in its current state

The specific works intended to be carried out are mainly clearing, formation of road, blading and compaction of road surface, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in the table below.

Table 12.1 Locations / Distances of Specific Works along the Samenye-Etweakor Road

	Specific Works	**Location or Distance**
1	Clearing	ch. 0+000-8+800
2	Formation	ch. 0+150-0+250, 0+350-0+850, 0+950-1+050, 1+150-1+450, 1+550-1+850, 2+000-2+050, 2+150-2+550, 2+650-3+350, 3+450-3+950, 4+000-4+150, 4+400-5+050, 5+150-5+750, 5+850-5+950, 6+000-6+500, 6+600-6+750, 6+850-6+950, 7+050-7+550, 7+650-7+800 and 8+000-8+800
3	Construction of culverts(mm)	1/900x700 at ch. 0+100, 1/900x700 at ch. 0+300, 1/1200x900 at ch. 0+900, 1/900x700 at ch. 1+100, 1/900x700 at ch. 1+500, 1/1200x900 at ch. 1+900, 1/900x700 at ch. 2+100, 1/900x700 at ch. 2+600, 1/900x700 at ch. 3+400, 1/900x700 at ch. 4+000, 1/900x700 at ch. 4+200, 1/900x700 at

		ch.4+350, 1/900x700 at ch. 5+100, 1/900x700 at ch. 5+800, 1/900x700 at ch.6+000, 1/900x700 at ch. 6+150, 1/900x700 at ch. 6+550, 1/900x700 at ch.6+800, 1/900x700 at ch. 7+000, 1/900x700 at ch. 7+600, 1/900x 700 at ch.7+850 and 1/900x700 at ch. 8+000.
4	Laying of sub-base	ch. 0+000-8+800

Clearing involves removal of bush with a dozer along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works includes blading and compaction of road surface and drains. Two types of new culverts will be constructed, twenty one in number along the road. The sizes and numbers are as follows:

a) 19 No. 700 x 900 u-culverts; and
b) 2 No. 900x1200 u-culverts.

Filling will be done mainly in the approaches of culverts and also gravelling of the entire stretch of the road. The list of types and numbers of equipment/machinery to be used include:

a) 1 No Dozer
b) 1 No Low Loader
c) 2 No Motor Grader
d) 1 No Vibratory Roller
e) 2 No Tipper Truck
f) 1 No Water tanker
g) 1 No Pay Loader
h) 1 No Concrete Mixture
i) 1 No Excavator
j) 1 No Concrete Vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 13,200 m^3
b) Aggregates - 46,713 m^3
c) Portland cement - 1369 bags
d) Filling material - 6,041m^3

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase.
It is estimated to employ a workforce of about thirty-two (32) for the project. The project implementation will take about twelve (12) months.

12.3 Potential Impacts and Mitigation Measures

The Samenye-Etweakor road was improved in 2009. The proposed Spot Improvement Project is part of regular on-going road works to improve and maintain access in Samenye and Etweakor communities in particular, and the Jomoro District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 2.5m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing bush within the RoW, construction of culverts and Laying of sub-base.

The main beneficial and adverse environmental and social impacts likely to arise from the project road, as well as the relevant mitigation measures are presented in this section.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. It will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade. Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members.

There will be a few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. These include:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety;
5. Potential spread of HIV/ AIDS,
6. Waste generation;
7. Road diversion impacts; and
8. Temporary site office impacts.

12.3.1 Water Resources Impacts, Mitigation and Monitoring

The road crosses twenty one (21) creeks and drainage channels. Impact on these streams during the minor rehabilitation works will largely be siltation during clearing and erosion of top soil into stream during the rainy season. This impact will be compounded by the hilly topography. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the run-off that flow through the water crossing points, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing along the corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.

Excavated materials will be retained away from the water bodies and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts:
  - Sediment-laden run-off from cleared areas of road;

- Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
- Oil and grease waste from equipment servicing and vehicle washing; and
- Construction of drainage channels and culverts.

12.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of:

- Bulldozers and grader in clearing the 8.8km road;
- Concrete mixers to mix concrete for culvert construction; and
- Vibratory roller for sectional filling and gravelling.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. Workers, especially those working with or close to these equipments will be badly exposed.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

12.3.3 Dust Generation and Air Quality Impacts, Mitigation and Monitoring

Land clearing for the entire 8.8km stretch, haulage of material by trucks and laying of sub-base are all dust generating activities. Excavations for the construction of culverts can also lead to dust during windy hours. Generation of dust will occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust pollution can adversely affect health of workers engaged directly or indirectly in the road works. Communities will also suffer from dust and emission impacts. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along the road to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the

flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

12.3.4 Public/ Occupational Health and Safety Impacts, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, excessive vibration from rollers, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

To reduce the incidence of occupational accidents, training will be organised for all workers on health and safety precautions associated with feeder road works, equipment and machinery handling, etc. Personal Protective Equipment (PPE) like helmets, earmuffs, gloves, boots, etc. will be made available to employees. The use of PPE will be mandatory. The contractor or the assigned supervisor will be responsible and answerable for any instance of non-compliance. Non-compliant staff will be reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets and wash rooms will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;

- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercise regularly.

12.3.5 Potential HIV/AIDS and STIs Spread, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the conditions to engage multiple sexual partners and hence increase the risk of HIV/ AIDS infection..

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 4 from the workforce while the nearby communities nominate 4 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

12.3.6 Waste Generation Impacts, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required

to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Daily inspection of emptying of toilets decommissioning after each day's work.

12.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 3culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers will be operating close to moving vehicles, at the risk of falling vehicles or objects on them or even knockdowns.

The current road width has reduced to between 2.5m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

12.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration (of 12months) for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

CHAPTER THIRTEEN

Sefwi Bekwai-Sukusuku Road Spot Improvement Project

- **Project Environment Information**
- **Project Description**
- **Potential Impacts, Mitigation and Monitoring Measures**

13.0 SEFWI BEKWAI–SUKUSUKU ROAD SPOT IMPROVEMENT PROJECT

13.1 Project Environment Information

The project road is located in Bibiani Anhwiase Bekwai District, about 44.4km from Bibiani - the district capital. The road is 0.9km long serving Sukusuku community.

There is a school in Bekwai town at ch.0+500 along the road, 15m from the road corridor and a cemetery at Sukusuku town, 5m from the road corridor.

The vegetation type is forest. The area is generally noted for agricultural activities. No water body crosses this road. The topography is generally undulating.

The total length of feeder roads in the region is 5,468.7km. Out of this 3,149.9km is engineered; 861.6km is partially engineered; while 1,458.1km is unengineered. In terms of the surface type of these roads:

a) 162.1km is Bitumen surface (2.96%);
b) 3586.5km is Gravel surface (65.60%); and
c) 1,720.3km is Earth surface (31.46%).

The road conditions are classified as follows:

a) 2.156.3km classified as good (39.4%);
b) 1214.59km classified as fair (22.21%); while
c) 2,099.48km is classified as poor. (38.39%)

13.2 Project Description

The current road has poor surface and structure conditions (depressions, soft spots, ruts, etc). The width of the road is reduced to 2.5m on the average (instead of 6.0m) despite being improved in 2009.

The objectives of the proposed spot improvement works are to:

- Facilitate easy transportation of agricultural produce and people;
- Provide uninterrupted all-year high quality road; and
- Expand the width of the road to 6.0m all-through.

The specific works intended to be carried out are mainly clearing, formation of road, blading and compaction of road surface, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in the table below.

Table 13.1 Locations / Distances of Specific Works along the Sefwi Bekwai-Sukusuku Road

	Specific Works	**Location or Distance**
1	Clearing	Km 0.000 – 0.900
2	Formation	Km 0.000 – 0.600 and km 0.700 – 0.900
3	Construction of culverts	1No. 700 x 900 u-culvert at km 0.650
4	Laying of sub-base	Km 0.000 – 0.700

Clearing involves removal of bush with a dozer along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works includes blading and compaction of road surface and drains. One type of new culvert, one number will be constructed along the road. The size is as follows:

a) 1 No. 700 x 900 u-culverts;

Filling will be done mainly in the approaches of culvert and also gravelling of the entire stretch of the road. The list of types and numbers of equipment/machinery to be used include:

a) 1 No Dozer
b) 1 No Low Loader
c) 1 No Motor Grader
d) 1 No Vibratory Roller
e) 1 No Tipper Truck
f) 1 No Water tanker
g) 1 No Pay Loader
h) 1 No Concrete Mixture
i) 1 No Excavator
j) 1 No Concrete Vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 13,200 m^3
b) Aggregates - 46,713 m^3
c) Portland cement - 64bags.
d) Filling material - 603m^3

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites.

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase.
It is estimated to employ a workforce of about 20 people for the project. The project implementation will take about three (3) months.

13.3 Potential Impacts and Mitigation Measures

The Sefwi Bekwai–Sukusuku Road was improved in 2009. The proposed Spot Improvement Project is part of regular on-going road works to improve and maintain access in Sukusuku community in particular, and the Bibiani-Anwiase Bekwai District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 2.5m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing bush within the RoW, construction of culverts and Laying of sub-base.

The main beneficial and adverse environmental and social impacts likely to arise from the project road, as well as the relevant mitigation measures are presented in this section.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. It will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade. Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members.

There will be a few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. These include:

1. Noise and vibration impacts;

2. Dust generation and impact on air quality;
3. Occupational health and safety;
4. Potential spread of HIV/ AIDS and STIs;
5. Waste generation;
6. Road diversion impacts; and
7. Temporary site office impacts.

13.3.1 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of:

- Bulldozers and grader in clearing the 0.9km road;
- Concrete mixers to mix concrete for culvert construction; and
- Vibratory roller for sectional filling and gravelling.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. Workers, especially those working with or close to these equipments will be badly exposed. In addition a school in Bekwai town (at ch.0+500 along the road, 15m from the road corridor) will also be a receptor of noise due to its relative distance from the road.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

13.3.2 Dust Generation and Air Quality Impacts, Mitigation and Monitoring

Land clearing for the entire 0.9km stretch, haulage of material by trucks and laying of sub-base are all dust generating activities. Excavations for the construction of culverts can also lead to dust during windy hours. Emissions such as sulphur dioxide (SO_2), nitrogen dioxide (NO_2) and carbon monoxide (CO) from the use of diesel powered equipments, such as the bulldozer, grader and excavator may also affect air quality.

Dust and emission pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth. The Schools in Bekwai town (0+500, 15m) will also be recipient of dust.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along the road to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;
- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

13.3.3 Public/ Occupational Health and Safety Impacts, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, excessive vibration from rollers, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

To reduce the incidence of occupational accidents, training will be organised for all workers on health and safety precautions associated with feeder road works, equipment and machinery handling, etc. Personal Protective Equipment (PPE) like helmets, earmuffs, gloves, boots, etc. will be made available to employees. The use of PPE will be mandatory. The contractor or the assigned supervisor will be responsible and answerable for any instance of non-compliance. Non-compliant staff will be reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets and wash rooms will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;

- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercise regularly.

13.3.4 Potential HIV/AIDS and STIs Spread, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the conditions to engage multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 3 from the workforce while the nearby communities nominate 3 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval.

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

13.3.5 Waste Generation Impacts, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used

as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;
- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

13.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 1culvert during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers will be operating close to moving vehicles, at the risk of falling vehicles or objects on them or even knockdowns.

The current road width has reduced to between 2.5m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

13.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration (of 3months) for which the site office will be in use. Though the proposed road works

will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;
- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

CHAPTER FOURTEEN

Sefwi Wiawso-Amafie-Aboboyaa Road Spot Improvement Project

- **Project Environment Information**
- **Project Description**
- **Potential Impacts, Mitigation and Monitoring Measures**

14.0 SEFWI WIAWSO-AMAFIE-ABOBOYAA ROAD SPOT IMPROVEMENT PROJECT

14.1 Project Environment Information

The road project is located in Sefwi Wiawso District of the Western Region. The 6.3km long road stretches from Sefwi Wiawso through Amafie and Aboboyaa communities.

The following are located along the corridor:

- School (km 3+000; 25m from road corridor); Aboboyaa town.
- Cocoa Shed (km 3+300; 10m from road corridor); and
- Refuse dump (km 2+200; 8m from road corridor).
- A number of farmlands along the road corridor.

14.2 Project Description

The road is engineered but has poor surface and structure conditions (depressions, soft spots, ruts, etc). The width of the road is reduced to 5.0m on the average (instead of 6.0m). It was recently reshaped in 2009.

The objective of the spot improvement works will be to facilitate easy transportation of agricultural produce and people to the nearest market centre at Sefwi Wiawso town.

The specific works intended to be carried out are mainly clearing, formation of road, blading and compaction of road surface, construction of culverts and filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in the table below.

Table 14.1 Locations / Distances of Specific Works along the Sefwi Wiawso-Amafie-Aboboyaa Road

	Specific Works	**Location or Distance**
1	Clearing	Km 0.000 – 3.000 on the Sefwi Wiawso – Amafie road and km 0.000-3.300 on the Aboboyaa Jn. – Aboboyaa road
2	Formation	Sefwi Wiawso – Amafie road – km 0.000-1.650, 1.850-1.950 and 2.150-3.000. Aboboyaa Jn. – Aboboyaa road – km 0.000-0.050, 0.150-0.750, 0.850-1.150, 1.250-1.450, 1.550-1.650, 1.750-1.900, 2.000-2.150, 2.250-2.750 and 2.850-3.300.
3	Construction of culverts	Sefwi Wiawso – Amafie road: 5No. 700 x 900 u-culverts at ch. 1+700, 1+800, 2+000, 2+050 and 2+100; Aboboyaa Jn. – Aboboyaa road: 5No. 700 x 900 u-culverts at ch. 0+100, 1+500, 1+700, 1+950 & 2+200; 2No. 2/900x1200 u-culverts at ch. 0+800 & 1+200 and 1No. 1250 x 1800 u-culvert at ch.2+800.
4	Laying of sub-base	Sefwi Wiawso – Amafie road – km 0.000 – 3.000 Aboboyaa Jn. – Aboboyaa road – km 0.000 – 3.000

Clearing involves removal of bush with a dozer along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culvert construction. Formation works includes blading and compaction of road surface and drains. Three types of new culverts will be constructed, thirteen in number along the road. The sizes and numbers are as follows:

a) 10 No. 700 x 900 u-culverts;
b) 2 No. 2/900x1200 u-culverts and
c) 1 No. 1250x1800 u-c.

Filling will be done mainly in the approaches of culverts and also gravelling of the entire stretch of the road. The list of types and numbers of equipment/machinery to be used include:

a) 2 No Dozer
b) 1 No Low Loader
c) 3 No Motor Grader
d) 1 No Vibratory Roller
e) 2 No Tipper Truck
f) 1 No Water tanker
g) 1 No Pay Loader
h) 1 No Concrete Mixture
i) 1 No Excavator
j) 1 No Concrete Vibrator

The type of raw materials and the estimated quantities will include:

a) Gravel (sub-base) - 180000 m^3
b) Aggregates - 13768 m^3
c) Portland cement - 1,474 bags.
d) Filling material - 4,163 m^3

Construction materials (e.g. sand, laterite and gravel) will be obtained from approved sources, certified by the EPA as fully compliant with the Environmental Assessment Regulations. Where no such source is available, it is the obligation of the contractor to identify potential sources and obtain the necessary Environment Permit (through a Preliminary Environmental Assessment - PEA) to develop and restore borrow pits. Chippings will be sourced from EPA approved quarry sites

There will be a Site Office (SO) erected at a strategic location, of not more than 1 acre in size, along the road corridor which will serve as a place for meeting and keeping equipment and machinery during the construction phase.

A workforce of about thirty two (32) people is expected to be employed for the project. The project implementation will take about eight (8) months.

14.3 Potential Impacts and Mitigation Measures

The Sefwi Wiawso-Amafie-Aboboyaa road was reshaped in 2009. The proposed Spot Improvement Project is part of regular on-going road works to improve and maintain access in Sefwi Wiawso through Amafie and Aboboyaa communities in particular, and the Sefwi Wiawso District in general.

Although the right of way (RoW) already exists, the effective width of the road has to a large extent reduced to about 5.0m in sections, which will be restored to its original 6.0m width. The proposed road works will mainly involve clearing bush within the RoW, construction of culverts and laying of sub-base.

The main beneficial and adverse environmental and social impacts likely to arise from the project road, as well as the relevant mitigation measures are presented in this section.

The current state of the road has poor surface and structure conditions which impede transport of farm produce and general movement, especially during the rainy season to health and market centres, etc. With road improvement from the maintenance works, farmers will be able to move their farm produce easily, reducing post harvest losses. Other benefits include improved access to market centres, reduced vehicle operating cost (VOC), reduced travel time and reduced transportation cost. It will also ease movement, for instance, school attendance, to seek medical care, especially for pregnant women and also enhance trade. Unskilled labourers would be employed from the local communities and this could serve as an employment opportunity for unemployed local community members.

The construction of a culvert on the Akwayiwa and Ngiasue streams will avert the difficulty of crossing in the rainy season. The spot improvement works will thus improve interconnection between communities.

There will be a few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. These include:

1. Impacts on water resources;
2. Noise and vibration impacts;
3. Dust generation and impact on air quality;
4. Occupational health and safety;
5. Potential spread of HIV/ AIDS and STIs;
6. Waste generation;
7. Road diversion impacts;
8. Temporary site office impacts.

14.3.1 Water Resources Impacts, Mitigation and Monitoring

The road crosses Akwayiwa and Ngiasue streams. Impact on these streams during the minor rehabilitation works will largely be siltation during clearing and erosion of top soil into stream during the rainy season. This impact will be compounded by the hilly topography. Blocking of water may lead to flooding upstream, especially in the rainy season; and also water shortage downstream. Servicing and fuelling of equipment and machinery could be a source of water contamination. Exposing large cleared areas for long periods without the expected road works would render such areas susceptible to sheet erosion (in rainy season), resulting in sedimentation. Heaped construction materials such as sand and other aggregates could be carried in run-off into the water course leading to siltation and affecting water quality.

The culvert construction design incorporates measures such as adequate size to direct and contain the Akwayiwa and Ngiasue streams, to prevent overflow or erosion of the adjoining road, thereby avoiding siltation of the water body. Drains will direct storm-water and run-offs. Clearing along the corridor will be restricted to the right of way (RoW), and road works progressively follow clearing. This will avoid exposing large cleared areas to the eroding effects of rainfall. Heaped construction materials will be covered.

Excavated materials will be retained away from the water bodies and covered, to avoid possible losses into the water course. The timing for culvert construction will avoid the rainy season to prevent potential flooding and other water flow and quality impacts. Vehicle washing, servicing and fuelling, etc will be carried out at suitable and confined designated places, away from the river. Containment measures such as drains, oil trap, sump and bins will be provided to receive all wastes (liquid and solid) generated.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of equipment and vehicles such as the bulldozer, grader, etc for potential failures of any hydraulic component or leaks, and operational integrity would be carried out;
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs. Inspection of these would be continuously done by the Site Engineer; and
- There will be weekly monitoring on the following relevant sources of impacts on the Akwayiwa and Ngiasue streams:
  - Sediment-laden run-off from cleared areas of road;
  - Contaminants in run-off from plantation and farms (fuel and oil residue, etc);
  - Oil and grease waste from equipment servicing and vehicle washing; and
  - Construction of drainage channels and culverts.

14.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of:

- Bulldozers and grader in clearing the 6.3km road;
- Concrete mixers to mix concrete for culvert construction; and
- Vibratory roller for sectional filling and gravelling.

These machines generate noise levels of between 78dB – 95dB at 15m and 96dB – 111dB at 1.5m. Though the nature of the works will be such that noise generation will be intermittent, the noise levels by the machinery far exceed 85dB, above which hearing impairment can occur. The effects of excessive noise and vibration on humans include stress, hearing impairment, communication problems, etc. Workers, especially those working with or close to these equipments will be badly exposed. In addition a school in Aboboyaa town (km 3+000; 25m from road corridor) will also be a receptor of noise.

Noise protection devices such as ear muffs and plugs will be provided to all workers on site. Additionally workers exposed to loud noise and vibration will not be allowed to work with the machines for more than 3 hours in a day. Maintenance of machinery and equipment schedule will be observed and made available for inspection to ensure minimal noise generation. Static machines will be sited at least 100m away from homes, schools and clinics and to reduce their impacts. Construction works close to schools would be carried out after close of school while works close to clinics will be restricted to the hours of 10:00 am to 3:00pm to avoid the relatively quit periods (mornings evenings, and nights). Impacts from machines such as bulldozers would be transient and their use will be to a set work schedule to avoid delays. The operators would be made conscious of working in sensitive locations. The Contractor or designated supervisor will be accountable for any instance of non-compliance.

Monitoring will cover the following parameters and their frequency of monitoring:

- The use of appropriate PPEs for noise protection will be closely monitored twice a day;
- Weekly checks with school and clinic authorities to ascertain possible noise impacts affecting the school and clinic by the District Engineer; and
- Maintenance records for all equipment and machinery will be inspected weekly to ensure that regular maintenance is followed to reduce noise from operations.

14.3.3 Dust Generation and Air Quality Impacts, Mitigation and Monitoring

Land clearing for the entire 6.3km stretch, haulage of material by trucks and laying of sub-base are all dust generating activities. Excavations for the construction of culverts can also lead to dust during windy hours. Generation of dust will occur during haulage of construction materials on site, trips to the stockpile depot and haulage from the borrow pit to the feeder road construction site.

Dust pollution can adversely affect health of workers engaged directly or indirectly in the road works. The effects include silicosis, asthma attacks and other respiratory infections. Dust may also result in eye and skin irritation and affect plant growth.

Water dousing will be used at the work sites and immediate adjoining road twice daily (morning and afternoon) in the dry season, in order to minimize dust generation. Speed control rumps will be erected along the road to control dust generation. Construction trucks will be restricted to speed limit of 40km/hr. A programme of servicing for all machinery and equipment to ensure optimum performance will be observed. When transporting construction materials, trucks will be covered with tarpaulin to prevent the flying of aggregates and sand. Servicing and maintenance scheduled book will be kept for inspection. This will help reduce emission of noxious gases commonly associated with incomplete combustion.

Monitoring will cover the following parameters and their frequency of monitoring:

- Twice daily inspection of water dousing will be conducted on the road in the morning and afternoon, especially during the dry season;
- Twice daily inspection of PPE use by workers exposed to dust;
- Twice weekly checks on adherence to speed limit (40km/hr) within the catchment communities by the Site Engineer;

- Weekly inspection of records on servicing of project vehicles and equipments; and
- The use of tarpaulin to cover haulage trucks will also be checked daily. Local communities will be sensitized on the need to report non-compliant contractor to the DE.

14.3.4 Public/ Occupational Health and Safety Impacts, Mitigation and Monitoring

Accidents commonly associated with feeder road works and which may result in injuries could come from the use of concrete mixer, bulldozer, grader and vibratory rollers. Others include cuts, falls, etc from vegetation clearing, excavation, etc. Accidents risks would arise from attempts to save haulage time and cost by overloading vehicles and speeding, as well as poorly shaped haul routes. Other sources of potential health and safety risks are noise from machinery, excessive vibration from rollers, vehicular knock downs, etc. The public could be affected through poor reinstatement of borrow pits which could serve as grounds for breeding of mosquitoes.

To reduce the incidence of occupational accidents, training will be organised for all workers on health and safety precautions associated with feeder road works, equipment and machinery handling, etc. Personal Protective Equipment (PPE) like helmets, earmuffs, gloves, boots, etc. will be made available to employees. The use of PPE will be mandatory. The contractor or the assigned supervisor will be responsible and answerable for any instance of non-compliance. Non-compliant staff will be reprimanded and subsequently a fine of GH¢5 and then outright dismissal.

First aid kits will be provided, with trained personnel taking charge. Warning signs will be clearly displayed at excavations and other obstructions to caution the workers and the public. Reversing alarms will be installed on all machinery and used to alert people when machines are backing up, to avoid accidents. Contractors will apply a Safety First rule to govern all activities and operations within the work camp and along the route. DFR's reinstatement/ restoration plan, giving details of final shape, method of achieving it, drainage and sediment control, re-soiling and re-vegetation measures would be implemented to cater for developed borrow pits.

Monitoring activities will be carried out in order to maintain the health and safety of the public and all workers. These include:

- Sanitary facilities such as mobile toilets and wash rooms will be checked whether they have been provided before the start of the project;
- Weekly checks would be done to ascertain that the mobile toilets are provided at designated distances;
- Weekly review of records of incidents (injuries, cuts, falls, knockdowns), their investigation and implementation of recommended actions;
- The Site Engineer will monitor the use of appropriate PPEs by workers twice daily;
- Records of appropriate training for each worker will be inspected monthly to ensure that all workers have the appropriate training needed for their work;
- Reinstatement plan for burrow pits will be reviewed at the beginning of the project by the DE to check for compliance;
- Tool box meeting records will also be reviewed weekly to further identify training needs of workers and address them appropriately;
- Adherence to stipulated speed limit (40km/hr) will be checked twice weekly by the Site Engineer; and
- The education exercises of first aid team will be recorded and inspected monthly by the contractor to ensure they undertake the education exercise regularly.

14.3.5 Potential HIV/AIDS and STIs Spread, Mitigation and Monitoring

The threat of potential spread of HIV/AIDS and other STIs arises since the introduction of the projects could also lead to an increase in sexual promiscuity. The provision of jobs to local people would enhance their financial status, which may create the conditions to engage multiple sexual partners and hence increase the risk of HIV/ AIDS infection.

Continued education on the issues of transmission and prevention has been recommended by the Ghana AIDS Commission (GAC) and some HIV prevention and control organizations as an efficient means of getting the message across to the populace. Management of the contracting firm in collaboration with the District Health Directorate will ensure that workers are briefed on the nature, transmission mode and the implication of HIV at two months interval. Since there is apathy toward the reality of the disease even among groups of people who are privy to the seriousness of the pandemic, regular sensitization of the workers will emphasize the deadly effects of the disease. The contractor will select 4 from the workforce while the nearby communities nominate 4 members to form a peer group team. There will be free condom supplies to workers and community members. Private discussions, counselling and testing will be promoted. This team will undertake HIV/AIDS awareness campaigns at two months interval..

Monitoring will cover the following parameters and their frequency of monitoring:

- There will be quarterly HIV/AIDS awareness workshops, to be held by qualified health personnel, to assess the level of awareness and understanding of workers and townsfolk. Assessment will be done at each workshop in the form of questions and answers, where the participants will be required to respond to questions designed to elicit particular views;
- Records on the training of Peer Educators would be checked every two months; and
- There would be monthly checks on records of condoms distributed.

14.3.6 Waste Generation Impacts, Mitigation and Monitoring

The main sources of waste will include cleared vegetation and construction debris (e.g. removed old culverts), packaging materials (e.g. cement bags), plastics and organic wastes from activities at the sites, and also sanitary waste. Improper handling of waste generated can become a source of nuisance, disease and infections, e.g. breeding grounds for flies and mosquitoes. Indiscriminate defecation by workers could lead to health problems, e.g. cholera and other diarrhoea diseases among workers and in nearby communities. Waste may also be carried by run-off into the stream contaminating it.

Waste bins will be provided at all working sites and at the SOs. Waste will be segregated at source into two – organic and then waste plastics and glass. Organic wastes and cleared vegetation will be composted near the work site to enrich the soil, while plastics and glass will be taken to the nearest district's dump sites or sold. Zoomlion will be contracted to provide the waste disposal services. Workers will be trained on the need and benefits of waste segregation for full cooperation. Suitable construction debris will be used as part of the filling materials. Sanitary facilities (including toilets) will be provided. Toilets and urinals will be located at a minimum distance of 100m away from any stream or drainage channels, and from marshy and low lying areas to prevent potential pollution of ground and surface water. The sanitary facilities will be decommissioned at the completion of the maintenance project. In a case where any community expresses interest in the facility (through its chief), the DE will be duly informed and required to hand over the facility to the community. It is only under such a circumstance that the contractor will be absolved from the obligation to decommission the facility.

Monitoring will cover the following parameters and their frequency of monitoring:

- Daily monitoring of waste segregation and littering;
- Weekly monitoring of emptying of bins at waste dump sites;
- Weekly monitoring of waste composting;

- Daily inspection of work site to detect indiscriminate defecation; and
- Toilets decommissioning on project completion.

14.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 13culverts during the maintenance works can obstruct road traffic. The options considered for maintaining road access to vehicular traffic during culvert construction included:

- A temporal diversion of access completely from the existing road by by-passing the culvert section; and
- Closing one lane of the road for culvert construction, while the other lane (restricted access) is opened to traffic.

While the latter alternative (with restricted access), avoids potential 'trespassing' farmlands, etc and therefore eliminates the need to pay compensation; it nevertheless exposes workers and the general public to imminent accident risks. Since only one lane will be accessible at any one time, vehicles travelling in opposite directions may be involved in accidents at or near the culvert crossing (construction site). Speeding vehicles are likely to fall into 'culvert trenches' or ditches or involved in head-on collision at the culvert site. Construction workers will be operating close to moving vehicles, at the risk of falling vehicles or objects on them or even knockdowns.

The current road width has reduced to between 5m, although the RoW is 6m. Thus adequate space is available to allow for construction works without affecting any adjoining land. Before closing one lane for culvert construction, a temporary structure will be installed on the other lane to be opened to traffic. The closed lane will be blocked at a location 100m away from the culvert, with appropriate warning signals and reflectors, with speed limit of 20km/h, but 10km/h at the narrow crossing, speed control ramps and traffic attendants directing vehicular movement. The actual working areas will be secured with barricades. The construction period will be effectively scheduled and strictly followed.

Monitoring will cover the following parameters and their frequency of monitoring:

- Effective traffic flow as well as vehicular and worker safety will be monitored daily;
- Daily inspection of appropriate positioning of road signs, reflectors, speed ramps, control limits, and the role of traffic attendants; and
- Daily inspection of records on accidents and near misses by contractor and the DE for immediate remedial action. In the event of any accident the first aid team would attend to the victims and convey them to the nearest health centre.

14.3.8 Temporary Site Office Impacts, Mitigation and Monitoring

The site office required for the project will have to be strategically located along the road corridor. The selected site may however affect farm crops, physical assets or other properties of land owners, in spite of the short duration (of 8months) for which the site office will be in use. Though the proposed road works will be of benefit to the land owner, it is important that he/she does not suffer any social and economic loss from the temporary use of the land for project office. In the arrangement with the contractor for use of the land, the land owner may not have the negotiation skills to secure a fair deal or may end up being cheated. The contractor may also fail to deliver any agreed terms and disappear after the project to the detriment of the land owner.

As a common practice, a site for use as field office is usually identified during site visit by bidders, before submission of bids. The contractor (winning bidder) will however, be required to observe the following conditions in selecting the site:

- Identify a potential site, which must not be a farmland with crops or any physical asset;
- Identify the landowner through the Assembly member and/or Chief of the community;

- Seek the consent of the landowner to erect the proposed site office on the land for the specified duration of the road project;
- Agree with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agree on other measures to render the site safe and usable to the satisfaction of the landowner.

The agreement will be documented and signed by the contractor and the owner with the District Engineer and Assembly member or Chief of the community as witnesses.

In addition to periodic visits (twice a month) to the site office, the District Engineer will be in communication with the land owner to ascertain whether the conditions agreed on between owner and contractor are being met. The contractor will be required to include the state of fulfilment of the agreement terms in the quarterly report to be submitted to the District Engineer. It will be required of the contractor (by the DE) to reinstate the site and hand over the structure to the owner after completion of construction.

CHAPTER FIFTEEN

Environmental and Social Management Plan Implementation

- **Implementation Stages, Safeguard Measures and Institutions**
- **Institutional Roles**
- **Institutional Arrangements**
- **Environmental and Social Management Measures**
- **Capacity Building**
- **ESMP Implementation Budget**

15.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN IMPLEMENTATION

The plan for implementation of enhancement and mitigation measures and monitoring activities in the ESMP is presented in this chapter. The plan highlights the relevant institutional roles/responsibilities for monitoring and reporting on the environmental and social safeguards performance and results, as well as a proposed capacity building provision to facilitate the ESMPs implementation. Cost estimates for implementation of the various measures, monitoring plan and capacity building are also given. The implementation budget will enable financing for the ESMPs to be an integral part of financing for the rehabilitation/maintenance projects.

15.1 Implementation Stages, Safeguard Measures and Institutions

The general outline of the ESMP implementation by the various actors will involve the following stages:

- ESMP preparation and approval;
- Contract specifications on E&S safeguards obligations;
- Rehabilitation/project contract award;
- E&S safeguards implementation plan and schedule;
- Rehabilitation/project commencement;
- Capacity building on E&S safeguards (and other awareness programme);
- E&S safeguards and mitigation implementation;
- Monitoring of safeguard/mitigation measures;
- Reporting; and
- Compliance and other periodic verification monitoring.

The main environmental and social safeguard measures in the ESMPs cover the following:

- Water resources, erosion control and flood prevention management;
- Noise and vibration exposure management;
- Dust control management;
- Public and occupational health and safety management;
- HIV/AIDS and health awareness management;
- Waste management;
- Road diversion and accident prevention; and
- Temporary office site management.

The key actors in the implementation of the ESMPs include:

- The contractor- to be awarded the rehabilitation contract and be required to implement the environmental and social safeguard measures;
- DFR - to ensure that E&S safeguards and other mitigation measures are duly implemented;
- EPA - to ensure compliance with the ESMP and other relevant approval conditions;
- MRH - to oversee the effective implementation of the road works and related E&S safeguards;
- MEST - to address complaints of any aggrieved parties on E&S safeguards, especially with respect to any ‘unfavourable’ decision (action or inaction) by the EPA.

The other components of the ESMPs include capacity building for the relevant actors and a proposed budget to facilitate implementation. The specific E&S safeguard obligations of the contractor that can be incorporated into the contract specifications are provided in Appendix 2. This is in addition to other contractual provisions made in the General Items of the Bills of Quantities, such as the following:

- Reinstatement of borrow pits (Item no. E790.1);
- Safe drinking water for site employees including storage facilities (Item no. A420.1);
- Protective clothing, safety equipment for use by site employees (Item no. A420.2);

- Temporary latrines, relocate as necessary, remove and backfill on completion (Item no. A420.3)
- Assistance to and facilitate site visits by MoH personnel to educate workers and local communities in STDs, HIV/AIDS awareness and consultation meetings (Item no. A420.5).

15.2 Institutional Roles

The key actors in the implementation of the ESMPs whose specific roles are listed below are DFR, EPA, MRH and MEST, as well as the contractor.

15.2.1 Department of Feeder Roads

The DFR is responsible for ensuring that all the environmental and social safeguards associated with the projects are implemented. The system for addressing E&S safeguards comprise of DFR District Engineers, Environmental Desks at Head office and Regional offices and the Planning and Policy Unit. The National Environmental Desk (NED) facilitates preparation of the ESMPs and ascertains the quality for necessary approvals; takes custody of the final ESMPs and makes copies available to the Regional and District offices. The NED also plays a lead role in E&S safeguards capacity building at Regional and District offices as well as for contractors.

15.2.2 District Engineer (DE)

The DEs are the first line of contact with the contractors awarded the rehabilitation works and for implementing the project E&S safeguards. The DEs:

- Have custody of copies of ESMPs;
- Obtains contractors work plan and E&S implementation schedule;
- Adopts a monitoring plan and schedule;
- Conducts bi-weekly site inspection and monitor implementation of E&S safeguards;
- Receives and reviews reports from the contractor;
- Prepares and submits monthly and subsequent quarterly and annual reports to the Regional Environmental Desk.

15.2.3 Regional Environmental Desks (RED)

The RED serves as a link between the District DFR offices and the NED and provides back stopping on safeguard issues for DEs. The RED:

- Conducts bi-monthly monitoring on implementation of project E&S safeguards;
- Receives and reviews reports from the districts;
- Collates performance on the implementation of E&S safeguards in the district; and
- Submits monthly and subsequent quarterly and annual reports to the NED.

15.2.4 National Environmental Desk

The NED:

- Notifies EPA on commencement of the rehabilitation works/project;
- Reviews and collates reports from the REDs;
- Collates quarterly reports on E&S safeguards performance for the attention of Director (DFR) and submission to EPA head office;
- Shares lessons/recommendations with the Policy and Planning Unit (DFR), in order to incorporate E&S safeguards adaptive management in road project designs; and
- Submits quarterly and annual reports to the Ministry of Roads and Highways.

15.2.5 Environmental Protection Agency

EPA is the lead regulator on E&S safeguards and has the mandate to determine the form an ESMP should take. Other specific roles include:

- Review and verify ESMPs in order to grant environmental approval for the ESMPs (with accompanying schedule of conditions);
- Receive quarterly monitoring reports (EPA Head office) from DFR;
- Act on the DFR quarterly monitoring reports (Regional EPA office);
- Conduct quarterly compliance monitoring (Regional offices);
- Submit quarterly monitoring (compliance) reports to EPA Head Office;
- Collate and submit sector (feeder roads) annual report to Head office; and
- Include the sector E&S performance in the overall EPA annual report.

15.2.6 Ministry of Roads and Highways

MRH is the supervising ministry for the DFR and the other road sector agencies. It is responsible for road sector policy formulation. The Ministry:

- Receives quarterly reports on the E&S safeguards from DFR during the project works as well as post-rehabilitation lifecycle of the road; and
- Conducts various impromptu and one annual end of year monitoring of the project sites.

15.2.7 Ministry of Environment, Science and Technology (MEST)

MEST is responsible for policy formulation relating to the environment. In respect of the ESMPs, the Ministry may carry out grievance redress or act on complaints by DFR on decisions or actions by the EPA to which DFR may not be in agreement.

15.2.8 Contractor

The E&S safeguards will be included in the contract specification and costed as appropriate, in order that there will be budget to implement the safeguards and other mitigation measures. The contractor will be required to:

- Develop a plan of work which incorporates schedule for E&S safeguards implementation;
- Submit the plan of work and schedule of E&S safeguard implementation to the DE;
- Implement all E&S safeguards and other mitigation measures as planned;
- Train/create awareness of all personnel/workers on relevant E&S safeguard measures and on their obligations; and
- Submit implementation reports on E&S safeguards to DE.

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15.3 Institutional Arrangements

The implementation of this ESMP requires the collaboration and involvement of the key institutions. The Figure 15.1 below illustrates the institutional roles and arrangement in the implementation of the ESMPs.

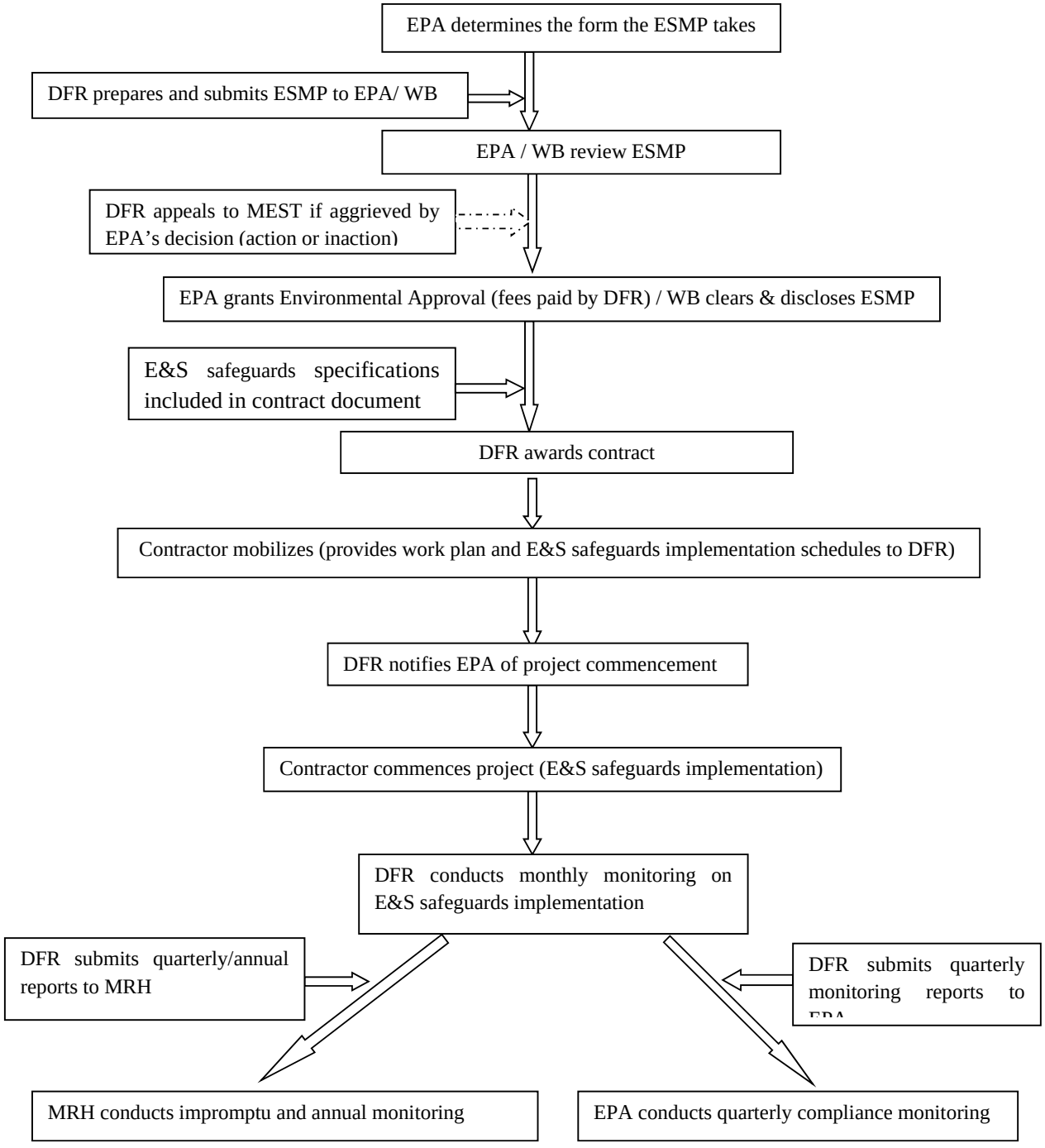

Figure 15.1 Institutional Arrangement Flow Chart

15.4 Environmental and Social Management Measures

The environmental and social management measures presented below will be implemented or adhered to by the Contractor (Site Engineer), and will also serve as the basis for monitoring.

15.4.1 Water Resources, Erosion Control and Flood Prevention Management

Management measures for affected water resources, erosion control and flood prevention include:

- Location (heaping) of construction material (e.g. sand and other aggregates) not less than 50m from water bodies and drainage channels (i.e. a separation distance of 50m will be observed);
- Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from water bodies, wetlands and drainage channels;
- Embankment erection around fuelling and other liquid or spillable storage sites in order to limit or contain such material from escape to potentially pollute water resources;
- Side drains (where appropriate) will be provided with settling basins near water bodies to remove silt and debris from road surface and construction site run-off, before discharge to adjoining streams or rivers;
- Adequate side drains provided to carry run-off into drainage channels to prevent erosion;
- Culverts of suitable capacity constructed to contain and direct flow, especially at peak flow and run-off;
- Road maintenance works to be carried out off peak rainy season;
- Provision of toilets and urinal at locations not less than 50m away from water bodies; and
- Adequate worker awareness on sanitation and measures to avoid water resource contamination.

15.4.2 Noise and Vibration Exposure Management

Use of machinery in clearing vegetation, earth (soil) movement and other concrete works such as culvert construction and movement of trucks will be the main sources of noise and vibration. The following management measures will be implemented:

- Equipment servicing plan will be prepared and strictly followed to ensure efficient machinery performance and optimum noise generation;
- Stationary equipment shall be sited at safe distances from sensitive areas to minimise noise impacts;
- Workers operating noisy equipment will not be exposed continuously for more than 3 hours a day;
- Workers will be provided with ear plugs;
- Workers handling vibrating equipment or parts will be given pads to absorb the vibrations and will not be exposed continuously for longer than 3 hours a day; and
- Sanctions (ranging from a fine to dismissal) will be instituted by the Contractor against workers who do not observe the use of appropriate PPEs.

15.4.3 Dust Management

Dust generation will be controlled mainly by the use of water, especially in the dry season. The contractor will acquire a water tanker for purposes of water dousing to control dust emission. Others measures will include:

- Erection of speed control signals and ramps mounted in communities;
- Covering of hauling trucks carrying sand and other aggregates;
- Covering of heaped material e.g. sand will be covered: and
- Use of nose masks by all workers at road maintenance/works sites.

Surfaces of vegetation along the maintenance road will be monitored to verify the effectiveness of dust suppression method.

15.4.4 Public and Occupational Health and Safety Management

Public occupational health and safety management will include:

- Erection of warning signals and use of reflective tapes at approaches to excavations, heaped materials, stationary equipment, etc.
- Posting of speed limits of 50km/h at approaches to construction sites;
- Tool box (safety) meetings held twice a week and documented accordingly;
- Inductions and awareness programmes held for all employees on occupational health and safety practices;
- A First Aid team formed to provide first aid services to workers and where appropriate make referrals to the District Health Centre;
- First Aid team to be trained by a medical team from the District Health Centre;
- Accident records at construction site and neighbourhoods to be maintained both for workers and the public;
- Stocks of PPEs to be maintained and supplied to workers regularly as needed; and
- Workers required to wear the appropriate PPEs e.g. helmets, ear plugs, nose masks, vibration pads, hand gloves, etc.

15.4.5 HIV/AIDS and Health Management

The work place HIV/AIDS and general health maintenance plan will include the following:

- Quarterly HIV/AIDS awareness programmes for workers and nearby communities;
- Health and HIV awareness team arranged from the District Health Centre for the quarterly programmes;
- Sponsored educational package put together by the team to be implemented to enlighten both workers and communities;
- Training of peer educators within the work force and in communities by the team; and
- The company to provide free condom supplies and encourage free discussions, counselling and testing.

15.4.6 Waste Management

The following waste management measures will be implemented:

- Waste bins to be provided for the disposal of waste generated;
- Waste will be segregated into two at source - organic and plastic and glass wastes;
- Organic waste to be composted near the site office to enrich the soil, while plastics and glass are taken to the district dump-sites;
- Topsoil removed from the right of way for maintenance work to be spread on the land to avoid disrupting drainage network; and
- Toilets and urinals to be sited at least 100m from any stream or drainage channel and decommissioned at the end of project.

15.4.7 Road Diversion and Accident Prevention

Closing one lane of the road while keeping the other open during construction of culverts would expose workers and the general public to imminent accident risks. The following management measures will be taken:

- A temporary structure to be constructed on one lane to allow for traffic flow while work is on-going on the other lane;
- Traffic wardens to be posted at positions 100m from the construction points on either side of the road to ensure orderly movement of traffic;
- Actual working areas to be secured with barricades;
- Adequate road warning signs to be posted at vantage points to warn and direct traffic;

- All measures shall be effectively monitored by Contractor to ensure their implementation

15.4.8 Temporary Site Office Reinstatement

The plan will require:

- Identification of sites with no crops or physical assets;
- Seeking of the consent of the landowner to erect proposed site office; and
- Reinstatement of the site and agreement to handover structure to the landowner.

Table 15.1 Summary of Environmental and Social Management Measures

Management Area	**Impact Areas**	**Mitigation/Monitoring Actions & Requirements**	**Implementation & reporting Schedule**	**Responsibility**
Dust and Air Quality Management	• Dust generation due to construction activities	➢ Dousing with water ➢ Erection of speed control signals and ramps ➢ Covering of sand (both heaped and in haulage trucks) ➢ Inspection of surfaces of vegetation	Twice daily Continuous Daily Monthly	**Contractor/ SE** **DE**
Water Resources, Erosion Control and Flood Prevention Management	• Siltation of water bodies resulting from excavation works and material deposition • Contamination of water by oil from vehicle	➢ Completing work on schedule ➢ Deposition of construction materials at least 50m from water bodies ➢ Embankment erection around fuelling and servicing area for vehicles ➢ Awareness creation	Continuous Continuous Continuous Continuous	**Contractor/ SE**
Noise and Vibration Exposure Management	• Noise from machine clearing of vegetation • Culvert excavation, construction and other maintenance works • Concrete mixing machines	➢ Controlling exposure of workers to noisy and vibrating equipments ➢ Regulating distance of stationary noisy equipment from public places	Daily Daily	**Contractor/ SE**
Occupational Health and Safety	• Accidents resulting in injury • Noise from machinery	➢ Tool box (safety) meetings will be held twice a week ➢ Awareness creation ➢ Training of first aid team ➢ Maintenance of accident book ➢ Provision and use of PPE	Bi-weekly Monthly Quarterly Weekly Daily	**Contractor/ SE**
HIV/AIDS and STIs Management	• Spread of infection due to neglectful sexual attitudes	➢ HIV/AIDS and STIs Awareness workshops ➢ Provision of free condoms ➢ Peer group education	Quarterly Weekly Twice monthly	**Contractor/ SE**
Waste Management	• Indiscriminate waste dumping and defecation	➢ Segregation of waste ➢ Composting of organic waste ➢ Emptying of waste bins at waste dump sites provided by Zoomlion Waste Management Company ➢ Decommissioning of toilets after project	Daily Weekly Daily	**Contractor/ SE**
Road diversion and traffic Management	• Risk of accidents to workers and general public	➢ Posting of traffic wardens to direct traffic flow ➢ Mounting of road signs ➢ Protecting actual working area	Daily Daily	**Contractor/ SE**

		with barricade ➢ Monitoring the implementation of all management measures	Daily	
Office site reinstatement	• Effect on crops and physical assets	➢ Avoiding crops and physical assets ➢ Seeking landowner's consent ➢ Reinstating site and agreeing to hand over structure	Project commencement Project commencement Project completion	**Contractor/ DE**

15.5 Capacity Building

Capacity building in environmental and social impact management will be essential. Personnel at the forefront of the various road rehabilitation projects need to understand the purpose of the ESMP implementation and their expected roles. This will stimulate the required collaboration.

The target groups for the training will include:

- DFR District Engineers;
- Contractors;
- Construction workers; and
- Selected members from nearby communities.

The district engineers and contractors will require capacity building in the implementation of the E&S safeguards and general project planning and management. Capacity requirements are also in the areas of environmental and social management and reporting as well as monitoring of adherence to required environmental and social measures, standards and commitments. The construction workers and selected members of the project communities will undergo training on public awareness/educational techniques (on environmental, social and health issues) and first aid procedures.

15.6 ESMPs Implementation Budget

The cost estimates provided in the Table 15.2 is for the implementation of mitigation measures, monitoring plan and capacity building requirements.

Table 15.2 Proposed Budget for the ESMPI

No.	E&S Management Area/ Institution	Mitigation Measures/ Capacity Gaps Identified	Expected Outcome/ Capacity Building Measures	Rate	Estimated Cost ($)
1.	Water resources, erosion control and flood prevention	• Construction of embankments • Construction of side drains with settling basins	• Limitation and containment of spilled oil at site offices • Reduction of siltation in nearby water bodies	• $1000 per road • $2000 per road	11,000 22,000
Sub-Total					**33,000**
2.	Dust and air quality	• Water dousing • Covering of sand (heaped and during transportation) • Erection of road signals and ramps	• Reduction in dust generation	• $5000 per road • $2000 per road	55,000 22,000

Sub-Total					**77,000**
3.	Public and occupational health and safety	• Provision of PPEs (nose masks, gloves, ear plugs etc.) for workers	• Reduction in the exposure of workers to hazardous conditions	• $3000 per road	33,000
Sub-Total					**33,000**
4.	HIV/AIDS	• Awareness campaigns • Distribution of condoms	• Reduction in the spread of HIV	• $7000 per road	77,000
Sub-Total					**77,000**
5.	Waste management	• Waste segregation • Provision of toilets • Carting of waste to designated dumpsites	• Ensuring proper waste management	• $10,000 per road	110,000
Sub-Total					**110,000**
6.	Department of Feeder Roads (DFR)	• Capacity enhancement in environmental and social safeguard measures implementation, monitoring and reporting	• Training in environmental and social management for DEs (7) for 2 days	• $ 100/p/d	1400
7.	Contractors	• Inadequate knowledge of staff in environmental & social measures implementation	• Training in environmental and social management implementation for the 11 contractors. (1 SE each) (2 days for 11 persons)	• $ 40/p/d	880
8.	Peer group educators and first aid team	• Inadequate know-how on HIV management and first aid procedures	• Training on HIV awareness creation methods and first aid procedures for 132 persons (8 for HIV and 4 for first aid) for 2 days	• $8/p/d	2,112
9.	Training Consultants	N/A	• Training of DEs & SEs for a total of 4 days (by 4 Consultants including T&T, accommodation & meals) • Training of peer group educators and first aid team for 2 days (by 2 specialists)	• $1,000/p/d • $200/p/d	16,000 800
	Sub-Total				**21,192**
TOTAL					**351,192**

CHAPTER SIXTEEN

Consultations

16.0 CONSULTATIONS

In gathering information for the ESMPs for the selected roads a number of relevant stakeholders were consulted for inputs. The stakeholders included the Ministry of Food and Agriculture (MoFA) and Ministry of Health (MoH) (at the district level), DFR (at national, regional and district levels), and the EPA (at national and regional levels). The responses provided by these stakeholders are given below in Tables 16.1-16.9. Figures 16.1-16.9 also show the consultations that took place with some stakeholders.

Table 16.1 Consultation with the DFR - Jomoro District

No	Name of Respondent(s)	Designation	Contacts
1	Mr. Kodua	Regional Engineer	0246707249
2	Mr Bio Mekaino	District Engineer	0244465787

Capacity Building		
No	**Issues**	**Responses**
1	How limiting and/or available is the capacity in the District Office to perform environmental monitoring and reporting?	Capacity available among the District Engineer Currently District Engineer advises and checks Contractors on Environmental Compliance
2	Is there any relationship between the district and the headquarters to monitor environmental and social safeguard issues?	Yes, the district ensures that all tenders include adequate measures on environmental compliance and reported to the headquarters.
3	What capacity needs would have to be built and what estimated budget would be required?	Additional in-house capacity for the District Engineer is welcome Budget of about GH¢100 if training is to be conducted at Koforidua Centre for the Department.

Figure 16.1 Consulting with the DFR, Jomoro District

Table 16.2 Consultation with the MOFA - Jomoro District

No	Name of Respondent(s)	Designation	Contacts
1	Mr. Kenneth Addai-Buadu	District Director	0244248866
2	Mr. Bernard Donkor	District Crops Officer	0245239186

Importance of Road to Agriculture		
No	**Issues**	**Responses**
1	What is the use of the road in terms of agriculture?	It serves an important route to transport cocoa and other foodstuffs from farmers National Best Cocoa Farmer (2009) has farms in the area
2	Does the current state good enough for the promotion of agriculture in the area?	No, the road is so bad that hundreds of cocoa bags are rather conveyed on human heads.
3	What other agriculture related problems are associated with the current state of the road?	Bad states of the road is encouraging the smuggling of cocoa to Cote d'Ivoire since it is easy by some short routes in the area
Benefits of the Road Rehabilitation to Agriculture		
1	What will be the immediate benefits of the rehabilitation of the road to agriculture?	It will open up the place for the transportation of harvested cocoa beans and other food stuffs to market centres and reduce post harvest losses
2	What other benefits will it bring to the District MOFA?	It will facilitate the agricultural extension services by the officers of the ministry

Figure 16.2 Consultation with the MoFA, Jomoro District

Table 16.3 Consultation with MoH - Jomoro District

No	Name of Respondent(s)	Designation	Contacts
1	Mr. Joseph Asabre	District Disease Control Officer	0242146415
2	Mr. Alhassan Alhassan	District Accountant	0244547325

Disease Prevalence		
No	**Issues**	**Responses**
1	What are the predominant diseases in the district?	Malaria, Anaemia, Schistosomiasis, etc Also suspected guinea worm cases.
2	How does the road contribute to health delivery?	Used be health workers for immunization and educational programmes Use to access health centre at Samanye
Importance of the Road Rehabilitation to Health Delivery		
1	What are the benefits of the road rehabilitation to health delivery?	Will facilitate the establishment of Community Health Posts (CHPs) at Etweakor

Figure 16.3 Consultations with the District Directorate of Health Services, Jomoro District

Table 16.4 Consultation with MoH - Daboase-Mpohor-Wassa East District

No	Name of Respondent(s)	Designation	Contacts
1	Mr. Daniel Jubin	Technical Officer - Disease Control	0242935562
2	Mrs Kate Essilfie	RCH Maternal Health	0242681391

Disease Prevalence		
No	**Issues**	**Responses**
1	What are the predominant diseases in the district?	Malaria, Anaemia, Schistosomiasis, etc Also suspected guinea worm cases.
2	How does the road contribute to health delivery?	Used be health workers for immunization and educational programmes Use to access health centre at Samanye
Importance of the Road Rehabilitation to Health Delivery		
1	What are the benefits of the road rehabilitation to health delivery?	Will make it easier to reach people within the district. Help reduce mortality rate in the district due to the bad roads.

Table 16.5 Consultation with DFR - Ellembelle District

No	Name of Respondent(s)	Designation	Contacts
1	Mr. Kodua	Regional Engineer	0246707249
2	Mr Bio Mekaino	District Engineer	0244465787

Capacity Building		
No	**Issues**	**Responses**
1	How limiting and/or available is the capacity in the District Office to perform environmental monitoring and reporting?	Capacity available among the District Engineer Currently District Engineer advises and checks Contractors on Environmental Compliance
2	Is there any relationship between the district and the headquarters to monitor environmental and social safeguard issues?	Yes, the district ensures that all tenders include adequate measures on environmental compliance and reported to the headquarters.
3	What capacity needs would have to be built and what estimated budget would be required?	Additional in-house capacity for the District Engineer is welcome Budget of about GH¢100 if training is to be conducted at Koforidua Centre for the Department.

Table 16.6 Consultation with the EPA – Head office and Western Region

No	Name of Respondent(s)	Designation	Contacts
1	Mr Ebenezer Appah-Sampong	Director EAA Department	0277 163 050
2	Ms Irene Heathcote	Regional Director	0274112112

Capacity Building		
No	**Issues**	**Responses**
1	Would the EPA be conduct monitoring of implementation of the E&S safeguards?	The EPA conducts its own monitoring of on-going projects
2	What happens to the ESMPs submitted by DFR?	They would be reviewed and approved and a fee paid to the Agency

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APPENDICES

APPENDIX 1

GUIDELINES FOR CONDUCTING ASSESSMENT

A Project Description

No	Project Features	Response
1	Name of project road	
2	District and distance (of road to the District Capital)	
3	Region	
4	Length of road (and also width of road)	
5	Objective of proposed road work	
6	Current state and relevant features of the road that call for the proposed works	
7	History of Rehab/maintenance works (e.g. last time worked on)	
8	Importance or potential importance of the road	
9	Communities and areas served by the road	
10	Benefits to be derived from the road works (i.e. improved road)	
11	List the specific works intended to be carried out (according to chainage /mileage where applicable)	
12	Indicate what each specific work involves	
13	List the types and number of equipments to be used	
14	Work force (numbers)	
15	Type of raw materials and sources(e.g. aggregates and gravel etc.) and distance from the project road	
16	Estimated quantity of raw materials	
17	Duration of road the works	
18	Type of waste(substances) to be generated	
19	Work/Camp site (area) and facilities to be provided	

B Project Corridor and Adjoining Area (Baseline) Information

No	Project Features	Response
1	Number and names of communities located along the road	
2	Other communities and main towns served by the road	
3	Land cover and land use of the area (e.g. vegetation, farming, grazing/ reserve, communities/settlements)	
4	Facilities/resource located along the road corridor(e.g. school, clinic, houses, cemeteries, sacred groves, farms) and proximity (how close) to the road	

5	Number of water bodies (river, streams, etc.) and other drainage channels crossing the road	
6	Name of water bodies(if known) indication of size and seasonal flow pattern (e.g. extent of flooding)	
7	Elevation and topography of the area-corridor (flat, hilly, valley, undulating, flood plain)	
8	Existing conditions of the potential borrow pit area (vegetation, farms, etc.)	
9	Regional baseline information on feeder roads	
10	Features /characteristics of feeder roads common to the region or peculiar	
11	State of feeder roads statistics	
12	Importance of feeder roads to the District and the Region	

C. Potential Impacts (Environmental & Social) of the Project (Road Works & Borrow Pits)

1. **Air Quality**-Will the proposed Project:

i Emit during construction

Dust √ Smoke VOCs

ii. Expose workers or the public to substantial emission? Yes No

iii. Result in cumulative increased emissions in the area? Yes No

iv. Create objectionable odour affecting workers / people? Yes No

2. Biological Resource-Will the proposed Project:

i. Have adverse effect on any reserved (Wildlife / Forestry / area). Yes No

ii. Have adverse effect on wetland areas through removal, filling hydrological interruption or other means? Yes No

iii. Interfere substantially with the movement of any wildlife species of organism? Yes No

iv. Be located within 100mm common Environmentally Sensitive Area? Yes No

3. Cultural Resources-Will the proposed Project:

i. Disturb any burial grounds or cemeteries? Yes No

ii. Cause substantial adverse effect on any archaeological or historic site? Yes No

iii. Affect the existing visual character and sensibilities of communities e.g. through trees and rock removal? Yes No

4. Water Quality and Hydrology-Will the proposed Project:

i. Generate and discharge during the works:

Liquid waste Liquid with only substance

Liquid with human or animal Liquid with odour/smell

ii. Lead to changes in the drainage patterns of the area, resulting in erosion or siltation? Yes No

iii. Lead to increase in surface run-off, which could result in floating on or off-site? Yes No

iv. Increase run-off, which could exceed the capacity of existing storm water drainage? Yes No

5. Noise Nuisance-Will the proposed Project:

i. Expose workers and other persons to excessive vibration and noise Yes No

6. Farm, Houses and Community Property-Will proposal Project affect:

i. Farms? Yes No

ii. How many farms will be affected and at what chainage mileage?

iii. How much farmland (total area of farms) will be affected?

iv. How many farmers will be involved and from which communities?

v. Houses Yes No

vi. How many houses and at what chainage mileage?

vii. In what communities will houses be affected?

viii. How many families will be affected?

ix. Community Property / Facility / Resource? Yes No

x. What community proper / facility / resources?

xi. In which communities and at what chainage / mileage?

Any other potential Environmental and Social Impacts

APPENDIX 2

CONTRACT SPECIFICATIONS FOR CONTRACTOR

1.0 General

a. All Environmental and Social (E&S) safeguards associated with the contract shall be complied with by the contractor. The Contractor shall also update himself about such issue in the ESMP, and prepare his work strategy and plan to fully take into account relevant provisions of the ESMP.

b. The Contractor shall develop a plan of work indicating all Environmental and Social safeguards at the various stages and indicate the period within which site will be maintained to it's original state after completion of works to ensure that significant E&S safeguards have been addressed appropriately.

c. The Contractor shall adhere to the proposed plan implementation schedule and the monitoring plan to ensure effective feedback of monitoring information to the DFR DE.

d. The Contractor shall implement all measures to avoid undesirable adverse environmental and social impacts wherever possible, restore work sites to acceptable standards, and abide by all environmental performance requirements specified in the ESMP

2.0 Dust Mitigation Measures

e. The contractor shall minimize the effect of dust on the surrounding environment resulting from site clearing, vibrating equipments and temporary access roads.

f. During the rehabilitation project, the contractor shall carry out proper and efficient measures, such as water dousing, whenever necessary to reduce the dust nuisance, and to prevent dust originating from the operations.

3.0 Noise Due to Construction Activities

g. The contractor shall ensure the noise levels emanating from machinery, vehicles and noisy construction activities (e.g. excavation) are kept at a minimum for the safety, health and protection of workers within the vicinity of high noise levels and nearby communities.

4.0 Waste Management

h. Construction waste shall not be left in stockpiles along the road, but removed and disposed of/or reused where needed.

i. All waste shall be segregated into organic waste and plastic and glass. The organic waste will be composted near the work camp to enrich the soil while plastics and glass will be taken to the district dump sites

j. All sanitary facilities (e.g. garbage collection and disposal, drinking water facilities, etc.) shall be provided by the contractor in work camps or project sites.

5.0 Water Resource Management

k. No construction water containing spoils or site effluent, especially cement, oil and fuel, shall be allowed to flow into natural water drainage courses.

l. The contractor shall take all possible steps to prevent pollution of streams and other water supplies.

m. Entry of runoff water to the site shall be restricted by constructing diversion channels or culverts to reduce the potential of soil erosion and water pollution.

n. Waste water from washing out of equipment shall not be discharged into water courses.

6.0 Material Excavation and Deposit

o. Vegetation clearing shall be restricted to the area required for safe operation of the rehabilitation work. Vegetation clearing shall not be done more than two weeks in advance of rehabilitation.

7.0 Contractor's Environment and Social Management Plan (ESMP)

p. Within 6 weeks of signing the Contract, the Contractor shall prepare a work plan to ensure the adequate management of E&S aspects of the works, including implementation of the requirements of these general conditions and any specific requirements of an E&S safeguards for the works. The Contractor's work plan will serve two main purposes:

i. For the Contractor, for internal purposes, to ensure that all measures are in place for adequate E&S management, and as an operational manual for his staff.

ii. For the Client, supported where necessary by SE, to ensure that the Contractor is fully prepared for the adequate management of all E&S safeguards issues.

q. The Contractor's E&S document shall provide at least:

- A description of procedures and methods for complying with these general environmental and social conditions, and any specific conditions specified in the ESMP;
- A description of specific mitigation measures that will be implemented in order to minimize adverse impacts;
- A description of all planned monitoring activities and the reporting thereof; and
- The internal organizational, management and reporting mechanisms put in place.

8.0 Health and Safety

r. In advance of the construction work, the Contractor shall mount an awareness and hygiene campaign. Workers and local residents shall be sensitized on health risks particularly of HIV/AIDS.

s. Adequate road signs to warn pedestrians and motorists of rehabilitation activities, diversions, etc. shall be provided at appropriate points.

9.0 Reporting

The Contractor shall prepare monthly progress reports to the SE on E&S monitoring with these general conditions, the project E&S safeguards. It is expected that the Contractor's reports will include information on:

- E&S management actions/measures taken, including approvals sought from DFR, DE and EPA
- Problems encountered in relation to E&S aspects (incidents, including delays, cost consequences, etc. as a result thereof);
- Lack of compliance with contract requirements on the part of the Contractor;
- Changes of assumptions, conditions, measures, designs and actual works in relation to E&S aspects; and
- Observations, concerns raised and/or decisions taken with regard to E&S management during site meetings.

10.0 Cost of Compliance

It is expected that compliance with these conditions is already part of standard of good workmanship and state-of-the-art as generally required under this Contract. The item "Compliance with Environmental and Social Management Conditions" in the Bill of Quantities covers these costs. No other payments will be made to the Contractor for compliance with any request to avoid and/or mitigate an avoidable E&S impact.