



REPUBLIC OF GHANA

MINISTRY OF ROADS & HIGHWAYS

Department of Feeder Roads

TRANSPORT SECTOR PROJECT

Environmental and Social Management

Plans [ESMPs] v. 4

**13 SELECTED FEEDER ROADS
DRY EQUATORIAL ZONE**

DRY 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
MRH	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 Programme
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 Dry Equatorial Zone, and presents the ESMPs for the thirteen selected feeder roads in ten districts in the Greater Accra, Central and Volta (southern) Regions.

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 or cultural interests are within or near the RoW of any of the 13 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, Legislation and Administrative Frameworks

The relevant policy and legislative frameworks applicable to the road sector and the project and therefore considered included:

- 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;
- Environmental and Social Management Framework - Transport Sector Project (TSP); and
- The World Bank's Environmental Assessment Requirements.

General Project and Zonal Information

All the selected roads already exist, but are in deplorable conditions. The total length of the roads for the maintenance works is approximately 64.96km .Settlements, schools, farms and other rural infrastructure are located along some of the project routes. These works will, however, not affect any structure or facility within the corridor, since the RoW already exists. The maintenance works to be carried out are mainly spot improvement and minor rehabilitation as provided in the Table 1 below.

Table 1: Selected Roads for Maintenance in the Dry Equatorial Zone

No.	Road Name	Proposed Works	Municipality/District	Total (km)
Greater Accra Region				
1	Kasunya – Area A	Minor Rehabilitation	Dangme West	5.4
2	Obeyeyie – Afuaman	Minor Rehabilitation	Ga West Municipal	6.26
3	Kasunya – Nyapienya	Minor Rehabilitation	Dangme West	3.45
4	Ayikuma – Kordiabe	Minor Rehabilitation	Dangme West	8.05
5	Korluedor Junction – Korluedor	Minor Rehabilitation	Dangme East	1.8
6	Big Ada – Agorkokpopanya	Minor Rehabilitation	Dangme East	3.0
7	Adenta – Commando	Minor Rehabilitation	Adenta Municipal	2.3
8	Oyarifa – Frafraha	Minor Rehabilitation	Ga East Municipal	2.5
Sub-Total				32.76
Central Region				
9	Sampa-Ohuam	Spot Improvement	Gomoa West	4.20
10	Mayenda-Obodakaba	Spot Improvement	Awutu-Effutu-Senya	3.20
11	Akotsi-Gyinankoma-Ekroful	Spot Improvement	Mfantseman Municipal	5.60
12	Tayedo-Afonakrom-Dadagua	Spot Improvement	Abura-Asebu-Kwamankese	9.70
Sub-Total				22.7
Volta Region				
13	Sogakofe-Dzokplenu	Rehabilitation	South Tongu	9.35
Sub-Total				9.35
Total				64.96

The Dry Equatorial Zone has a double maxima rainfall pattern, with a marked dry season. Mean annual rainfall of between 74 and 89 cm are recorded. This zone is the driest in the country also recording mean monthly temperatures of 30°C between March and April and 26°C in August. Highest average relative humidity does not exceed 75% with the lowest being about 60%. The three regions (Central, Greater Accra and southern part of the Volta) make up the zone.

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 CO₂ emissions. With the spot improvement works, farmers will be able to transport farm produce easily, which will help reduce post harvest losses.

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

Mitigation measures include: culverts and drains designed with adequate capacity to direct and contain flows and run-off, to prevent overflow and erosion of road; 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; segregation and composting of waste as well as maintaining high hygiene standards. In addition to mounting warning signs and directing traffic at 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 traffic direction.

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;
- Environmental and social (E&S) safeguards implementation plan and schedule;
- Rehabilitation/project commencement;
- Capacity building on E&S safeguards (and other awareness program);
- 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; and
- Waste management;
- Road diversion and accident prevention; and.
- Temporary office site 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 two hundred and forty thousand, six hundred and forty dollars (\$240,640) 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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1.0 INTRODUCTION

1.1 Background

Under the Transport Sector Project (TSP) by the Ministry of Roads and Highways (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 base 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. The Dry Equatorial Zone which comprises the Greater Accra Region and some portions of Central and Volta (southern) Regions is expected to benefit from the maintenance works of 13 feeder roads. This report covers the ESMPs for the selected 13 feeder roads in the Dry Equatorial Zone.

The feeder road network in the Greater Accra Region is given as 1,327.54km in total. Out of this 1,194.62km is engineered; 43.57km is partially engineered; while 89.35km is un-engineered. In terms of the surface type: 362.53km is classified as good; 447.88km as fair; while 517.88km is classified as poor.

The Central Region has a total feeder road network of 5,559.973km. Out of this 3,736.02km is engineered; 869.213km is partially engineered; while 952.74 km is un-engineered. In terms of the surface type: 2,283.182 km is classified as good; 1,724.356 km is fair; while 1,552.44 km is classified as poor.

The Volta Region has a feeder road network of 3,338km. 2,273km is engineered; 467km is partially engineered; while 597km is un-engineered. For surface type: 567.46km classified as good; 1,435.34km is fair; while 1,335.20km is classified as poor.

Feeder roads regularly undergo 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 or cultural interests are within or near the RoW of any of the 13 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 Safeguard Policies such as the 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 ESMP 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 ESMP

The ESMP 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 ESMP 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. A sample of the data capture form is attached in Appendix I. 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).

The scope/structure of the Zonal ESMP report covers the following:

- Policy, legislative/regulatory and administrative frameworks;
- Zonal/Regional (baseline) information on feeder roads;
- Beneficial and adverse impacts for specific project roads;
- Mitigation measures;
- 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 eighteen (18) main chapters, 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 frameworks; and general project zonal information;
- Chapters 4 – 16: Assessment of each of the 13 project roads in the Greater Accra, portions of Central and Volta (southern) Regions;
- Chapter 17: Implementation of ESMPs and associated budget; and
- Chapter 18: Consultation with stakeholders.

2.0 POLICY, LEGISLATIVE AND ADMINISTRATIVE FRAMEWORKS

The principal policy, legal and administrative frameworks which guided the preparation of the road sector 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; and
 - d. Environmental Assessment (Amendment) Regulations, 2002.

- 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) The Environmental and Social Management Framework of the Transport Sector Project.

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

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 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. It also seeks 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 The 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. Additionally, the Agency is required to create environmental awareness and build environmental capacity as relates all sectors, among others. 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, EMPs, AERs, etc of an ‘undertaking’, including road transport sector undertakings 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 given approval/permit conditions, required environmental standard 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, investments, etc) without prior registration and environmental permit. Undertakings/activities 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, fees payment, EMP, 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 (EP), and certificate 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 Wayleave 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 ESMP document has been developed to support a due diligence process, and it defines the management procedures to avoid causing harm or exacerbating social tensions, and to ensure consistent management of environmental and social issues of the proposed feeder roads maintenance works.

2.4 The World Bank Requirements

2.4.1 The Bank's Safeguard Policies

The Bank's 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 relevant ones include:

- Environmental Assessment (OP 4.01);
- Conservation of Natural Habitats (OP 4.04);
- Management of Cultural Property (OPN 11.03); 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 nature and magnitude of potential environmental and social impacts from relatively limited scale and magnitude of feeder roads' maintenance works, the proposed work are likely to be classified as category 'B'.

3.0 GENERAL PROJECT AND ZONAL INFORMATION

3.1 Project Description

The proposed works forms part of DFR's ongoing rehabilitation/maintenance activities which aims at improving access and mobility to and from the beneficiary communities and the districts. The 13 selected roads in the zone have a total stretch of 64.96km and fall in 10 districts. The right of way of all the selected roads already exist, but are in deplorable conditions. Settlements, schools, farms are located along some of the project routes. These works will, however, not affect any structure or facility within the corridor.

The Table 3.1 provides the list/name and length of roads, the district/municipality and region they fall in as well as the type of maintenance works to be carried out.

Table 3.1 Selected Roads for Maintenance in the Dry Equatorial Zone

No.	Road Name	Recommended Works	Municipality/District	Total (km)
Greater Accra Region				
1	Kasunya – Area A	Minor Rehabilitation	Dangme West	5.4
2	Obeyeyie – Afuaman	Minor Rehabilitation	Ga West Municipal	6.26
3	Kasunya – Nyapienya	Minor Rehabilitation	Dangme West	3.45
4	Ayikuma – Kordiabe	Minor Rehabilitation	Dangme West	8.05
5	Korluedor Junction – Korluedor	Minor Rehabilitation	Dangme East	1.8
6	Big Ada – Agorkokpopanya	Minor Rehabilitation	Dangme East	3.0
7	Adenta – Commando	Minor Rehabilitation	Adenta Municipal	2.3
8	Oyarifa – Frafraha	Minor Rehabilitation	Ga East Municipal	2.5
Sub-Total				32.76
Central Region				
9	Sampa-Ohuam	Spot Improvement	Gomoa West	4.20
10	Mayenda-Obodakaba	Spot Improvement	Awutu-Effutu-Senya	3.20
11	Akotsi-Gyankoma-Ekroful	Spot Improvement	Mfantseman Municipal	5.60
12	Tayedo-Afonakrom-Dadagua	Spot Improvement	Abura-Asebu-Kwamankese	9.70
Sub-Total				22.7
Volta Region				
13	Sogakofe-Dzokplenu	Rehabilitation	South Tongu	9.35
Sub-Total				9.35
Grand-Total				64.96

3.1 Description of Activities

Spot Improvement

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

Minor Rehabilitation

The activities undertaken are similar to that of spot improvement works but the extents of works are more involving than in spot improvement. Such works includes clearing, formation activities, blading, gravelling, culvert construction and drain cleaning.

3.2 Zonal Baseline Information

The dry equatorial climatic zone in Figure 3.1 below has a mean annual rainfall of between 74 and 89cm. This region is the driest in the country with mean monthly temperature of 28°C. Highest average relative humidity does not exceed 75% with the lowest being about 60% (Benneh and Dickson, 1988).

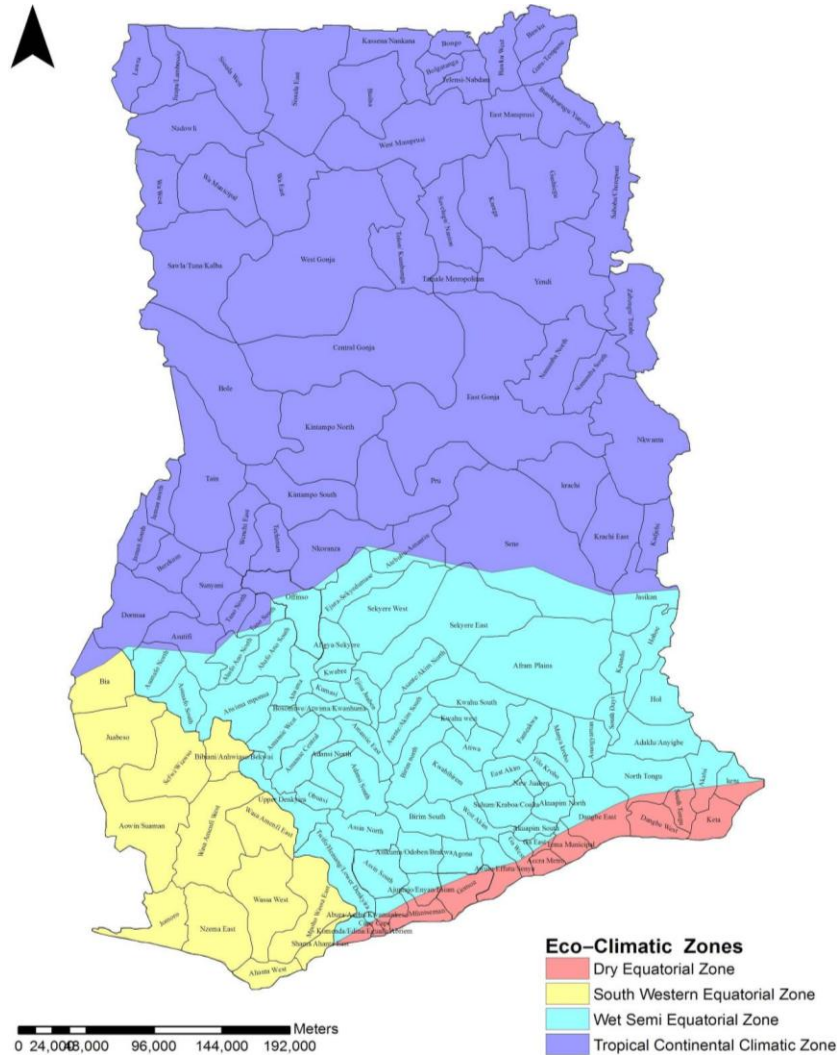


Figure 3.1 A Map of Ghana Showing the Four Climatic Zones

The Greater Accra Region occupies a total land area of 3,245km² about 1.4% of the total land area of Ghana. The region is characterized by shrub land, grassland and coastal vegetation. The region is a hub for various economic activities, including trading and agriculture. The feeder road network is given as 1,327.54km. Out of this 1,194.62km is engineered; 43.57km is partially engineered; while 89.35km is un-engineered. In terms of the surface type: 158.55km is bitumen surface; 719.08km is gravel surface; and

449.91km is earth surface. The road conditions are classified as follows: 362.53km as good; 447.88km is fair; while 517.88km is classified as poor.

The Central Region occupies an area of 9,826 km² or 4.1% of Ghana's land area, making it the third smallest in area after Greater Accra and Upper East. The Region lies within the Dry and Wet-Semi Equatorial Zones and can be broadly divided into two: the coast, which consists of undulating plains with isolated hills and occasional cliffs characterised by sandy beaches and marsh in certain areas; and the hinterland, where the land rises between 250m and 300m above sea level. Along the coast is the coastal savannah with grassland and few trees, while semi-deciduous forest predominates the inland areas. Much of the original forest vegetation has been cleared for the cultivation of cocoa and oil palm.

The feeder road network size in the region is given as 3268km in total. Out of this 2394km is engineered; 405km is partially engineered; while 469km is un-engineered. In terms of the surface type of these roads: 401km (12.27%) is bitumen surface; 2009km (61.48%) is gravel surface; and 858km (26.25%) is Earth surface. The road conditions are classified as follows: 543km (16.62%) classified as good; 1494km (45.72%) classified as fair; while 1231km (37.66%) is classified as poor.

The Volta Region is located along the southern half of the eastern border of Ghana, which it shares with Togo. Greater Accra, Eastern and Brong Ahafo Regions share boundaries with it on the west, on the north by the Northern Region, and on the south by the Gulf of Guinea. The region occupies an area of about 20,570km² or 8.6% of the total land area of Ghana. The region has a length of about 500km, stretching from the south to the north. It encompasses most of the vegetation zones found in the country, that is, the coastal grassland and mangrove swamps, replete with sandy beaches, the guinea savannah through moist semi-deciduous forests in the central highland areas to the undulating sahel-savannah and the mountainous wooded savannah in the north.

The total feeder road network in the region is 3,338km. Out of this 567.46 (17%) is classified as good, 1,435.34km (43%) is fair and 1,335km (40%) is poor. 567.46km is engineered; 467km is partially engineered; while 597km is un-engineered. In terms of the surface type: 195km is bitumen surface; 2,085km is gravel surface; and 1,058km is earth surface.

**ROADS IN THE GREATER
ACCRA REGION**

4.0 ADENTA – COMMANDO MINOR REHABILITATION PROJECT

4.1 Project Environment

The 2.3km Adentan-Commando Road lies within the Adentan Municipality. It serves the Adenta, Commando and Frafraha communities. There is a nursery, basic primary and the Nightingale Nursing schools as well as market and health centres along the road corridor.

The vegetation of the municipality is savannah grassland with isolated mangrove patches at some locations. The dominant land use is however, settlements. The road is crossed by one stream through a mid-shift culvert. The soil is clayey and floods with heavy rainfall. The area is heavily built up. The topography is flat. There are no sensitive areas (such as cemeteries, reserve and watershed) nearby.

4.2 Project Description

The road condition has deteriorated due to loss of camber and drains. The situation gets worse during the rainy season when, due to inadequate drainage, numerous potholes develop. Maintenance works involving spot improvement was carried out in 2007. The road has become narrow (reducing from 8m to 5m) and difficult to travel on because of the potholes.

The objectives of the rehabilitation works are to reduce the travel time along the stretch thereby improve access to the adjoining communities and social facilities such as schools (nursery and basic schools [4 in number], Benji Computer School and the Nightingale Nursing School), churches (Methodist, Baptist Pentecost and Presbyterian) hotel (Anyeb Hotel), pharmacies (Healthy Vita Pharmacy and Pebserb Pharmacy), Adenta Shopping Mall and the Adenta Police Station within the Adenta Estates.

The specific works intended to be carried out are mainly blading, sub-base, drain and culvert construction. The specific works (according to mileage (location) and/or distance) are provided in Table 4.1

Table 4.1 *Locations/Distances of the Specific Works along the Adenta-Commando Road*

	Specific Works	Location/Distance
1	Blading	Km 0+000 – 2+300
2	Construction of drains	600x600 U-drain between km 0+000 – 0+300 LHS and 600x600 U-drain between km 0+000 – 0+700 RHS
3	Construction of culverts	Cross Culvert (900x700) @ Km 1+00. Access Culvert (900x700) @ Km 1+200 LHS; 1+250 LHS; 1+500 RHS; 1+550 LHS; 1+600 RHS; 1+650 RHS; 1+900 LHS; 2+050 RHS; Cross Culvert (2No 1800x1800) @ Km 2+250
4	Raising of road	Km 0+000 – 1+050; km 1+150 – 1+300; km 1+450 – 1+700; Km 1+850 – 1+950; km 2+000 – 2+100; & km 2+200 – 2+300
5	Sub-base Filling and gravelling	Km 0+000 – 2+300

Clearing involves getting rid of vegetation along the corridor to widen the width of the road to 8.0m. It will also allow enough space for other works. Formation works include blading, drains and camber construction. The list of types and numbers of equipment/machinery to be used include:

1No. Bulldozer D7 or equivalent;
1No. Motor grader 140G or equivalent;
1No. Loader (1m³);
2No. Tipper trucks (6m³);
1No. Water tanker (9000litres);

1No. Vibratory or Static roller (10 tonnes);
1No. Pick-up;
1No. Concrete mixer (0.5m³); and
1No. Poker vibrator.

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

- Portland cement (1400 bags);
- Fine aggregates (300m³);
- Coarse aggregates (450m³); and
- Gravel (3,800m³).

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 twenty-five (25) is estimated to be employed. The project implementation will take about 8 months.

4.3 Potential Impacts, Mitigation and Monitoring Measures

The right of way (RoW) already exists. The effective width of the road which has been reduced at some sections to about 5.0m will be restored to its original 8.0m. 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:

- Potential air quality impacts;
- Water resource, erosion and flooding impacts;
- Potential increase in ambient noise and vibration;
- Potential spread of HIV/AIDS and STIs;
- Occupational health and safety concerns;
- Waste generation;
- Potential road diversion impacts; and
- Temporary site office impact.

4.3.1 Potential Air Quality Impacts, Mitigation and Monitoring

Dust will be generated from haulage, tipping and loading of construction materials such as sand, cement, gravel and granite chippings during works. 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. The use of machinery and the rehabilitation works can create dusty conditions within and around the project sites. Dust (PM₁₀) is known to cause upper respiratory tract infections. Dust also has effect on plant growth. Workers are likely to be the most affected since structures, such as schools bordering the road are out of impact range.

Dousing of the active sections of the road with water at scheduled intervals (twice daily in the dry season) will be used to control dust. Speed limit of 40km/h when approaching school areas will be observed by construction vehicles. Drivers of vehicles that transport materials will be trained on impacts of dust. Speed ramps will be constructed at least 200m from either side of the road from the location of schools. Personal Protective Equipment such as nose masks and safety goggles shall be provided for all workers.

Visual inspection of schools and farms within the project's area of influence will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

4.3.2. Water Resource, Erosion and Flooding Impacts, Mitigation and Monitoring

The road is crossed at a low-lying section by a major stream. This section of the road is prone to erosion during the rainy season when the stream flow increases. Severe erosion leads to this section of the road becoming unmotorable. Culverts construction activities and earthworks such as excavation could generate increased amounts of silt entering the stream. Fuelling of vehicles and machinery on the project site could result in spills which could end up in the stream. This may also affect stream water quality and cause stress to aquatic life.

Construction of a culvert over the stream crossing will forestall the situation of road damage due to the stream flow. Construction of drains along the sides of the road will ensure adequate channelling for peak flows and run-off during the rainy seasons. Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from the stream and will have spill containment structures such as drains, oil trap, sump and bins in the sites to prevent seepage of oil. Location for heaping construction materials (e.g. sand and other aggregates) will not be less than 50m from the stream and drainage channels. The provision of toilets and urinal will be at locations not less than 50m away from the stream.

The Site Engineer (SE) will be responsible to ensure observance and compliance by contractors. Monitoring will cover the following parameters:

- A separation distance of 50m for heaping construction materials from the stream and channels;
- Sites for fuelling of machinery and servicing of equipment located at a minimum distance of 100m from the stream and drainage channels;
- Embankment erection around fuelling and other liquid or spillable storage sites;
- Provision of toilets and urinal at locations not less than 100m away from the stream; and
- Adequate worker awareness on sanitation and measures to avoid water resource contamination. 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; and
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs.

4.3.3 Noise and Vibration Impacts, Mitigation and Monitoring

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

- Bulldozers and grader in clearing the 2.3km 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 the public would 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 quiet 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.

4.3.4 Potential Spread of HIV/AIDS, Prevention 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. This would be because the provision of jobs to local people would enhance their financial status, which may make them susceptible to having more 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.

4.3.5 Occupational and Public Health and Safety Risks and Measures

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 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.

4.3.6 Waste Generation, 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.

The waste management system will be monitored to ascertain its effectiveness and remedial measures introduced. Monitoring areas will include: segregation of waste, littering, state of the bins and toilets, compost making and use, workplace hygiene standards and the level of worker awareness. General

sanitation will be monitored to verify if workers defecate in the surrounding area. Monitoring covers the following parameters and will have their frequency of monitoring being:

- 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 10 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 8 months 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;
- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

5.0 AYIKUMA-KORDIABE MINOR REHABILITATION

5.1 Project Environment

The Ayikuma–Kordiabe road is located 7.2km from Dodowa, the district capital of Dangme West District. Aside Ayikuma and Kordiabe, the 8.05km, 6m wide feeder road provides access to adjoining communities, namely Agomeda, Doryumu and the Manya Krobo area. There are mini markets at Kordiabe and Ayikuma communities. A cluster of schools (Ayikuma DA Basic Primary and JHS, Catholic Primary and JHS, and Methodist Primary and JHS) at Ayikuma is located 50m from the road. Two schools (Kordiabe DA Basic Primary and JHS, and Presbyterian Primary and JHS) are located at Kordiabe about 50m from the road. The road serves as the main link between the farming areas and the adjoining communities.

The area is characterized by savannah grassland and has topography that alternate between flat and undulating. The area is drained by 6 streams with 23 drainage channels across various sections of the road.

5.2 Project Description

Spot improvement work was carried out in 2008. The objectives of the rehabilitation works are; to improve access to schools and markets at Kordiabe and Ayikuma, reduce travel time between communities served by the road, to facilitate economic activities and to reduce the cost of maintaining vehicles.

The specific works to be undertaken involves reshaping of the entire 8.05km stretch, widening of a 3km portion, gravelling of a 5km stretch, construction of 5 culverts and 700m of concrete drains. The other works include clearing, formation, filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 5.1.

Table 5.1 *Locations of Specific Works along Ayikuma – Kordiabe Road*

	Specific Works	Location or Distance
1	Clearing	Km 0+000 – 7+000
2	Blading	Km 0+000 – 7+000
3	Construction of drains	450x450 U-drain between km 6+300 – 7+000 LHS and RHS
4	Construction of culverts	Cross Culvert (900x700) @ Km 0+450; 0+900; 1+100; 1+600; 2+400
5	Raising of road	Km 0+400 – 0+500; km 0+850 – 0+950; km 1+550 – 1+650; Km 2+100 – 2+750; km 6+000 – 6+500
6	Sub-base	Km 0+000 – 7+000

Clearing involves getting rid of vegetation 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 construction of drains. Five (5) new culverts will be constructed along the stretch.

Filling will be done mainly in the approaches of culverts and also 7km of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

1No. Bulldozer D7 or equivalent,

3No. Vibratory or Static roller (10 tonnes);

1No. Motor grader 140G or equivalent;
 1No. Loader (1m³);
 2No. Tipper trucks (6m³);
 1No. Water tanker (9000litres);

1No. Pick-up;
 1No. Concrete mixer (0.5m³); and
 1No. Roller

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

- Portland cement (1250 bags)
- Gravel (6,986m³);
- Granite chippings (400m³); and
- Sand (300 m³)



Figure 5.1 Portion of the Ayikuma Kordiba Roads and a Section showing Broken 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. It is estimated to employ a workforce of twenty (20) for the project. The project implementation will take about 12 months.

5.3 Potential Impacts, Mitigation and Monitoring Measures

The current proposed minor rehabilitation project is part of regular on-going road works to improve and maintain access in the Ayikuma, Kordiabe, Agomeda, Doryumu and Manya communities in particular, and the Dangme West District in general. The RoW already exists. The effective width of the road which has been reduced at some sections to about 4.0m will be restored to its original 6.0m width.

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:

- Potential air quality impacts;
- Water resource, erosion and flooding impacts;
- Potential increase in ambient noise and vibration;
- Potential spread of HIV/AIDS and STIs;
- Occupational health and safety concerns;
- Waste generation;
- Potential road diversion impacts; and
- Temporary site office impact.

5.3.1 Dust and Air Quality Impacts, Mitigation and Monitoring

Dust will be generated from haulage, tipping and loading of construction materials such as sand, cement, gravel and granite chippings during works. 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. The use of machinery and the rehabilitation works can create dusty conditions within and around the project sites.

Dust (PM₁₀) is known to cause upper respiratory tract infections. Dust also has effect on plant growth. Workers are likely to be the most affected and also pupils and others in the schools located about 50m from the road at Kordiabe.

Dousing of the active sections of the road with water at scheduled intervals (twice daily, especially in the dry season) will be used to control dust. Speed limit of 50km/h at approaches to school areas will be observed by construction vehicles. Drivers of vehicles that transport materials will be trained on impacts of dust. Speed ramps will be constructed at least 200m from either side of the road from the location of schools and road signage posted. Nose masks and safety goggles shall be provided for use by all workers.

Visual inspection of schools and farms within the works area will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

5.3.2 Water Resources Impacts, Mitigation and Monitoring

The road crosses 23 drainage channels usually at low-lying sections. The affected sections are prone to erosion, which become unmotorable during the rainy season when run-off increases. Land clearing, excavations for the construction of culverts, other earth-cutting maintenance works could generate increased amounts of silt entering the stream. Fuelling of vehicles and machinery on the project site could result in spills which could end up in the stream. These activities can affect stream water quality and cause stress to aquatic life.

Construction of culverts over stream crossings will forestall damage to road due to the stream flow. Construction of drains along the sides of the road will ensure adequate channelling for peak flows and run-off during the rainy seasons. Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from the streams and will have spill containment structures such as drains, oil trap, sump and bins in the sites to prevent seepage of oil. Locations for heaping construction materials (e.g. sand and other aggregates) will not be less than 50m from water bodies and drainage channels. The provision of toilets and urinals will be at locations not less than 50m away from streams.

The Site Engineer (SE) will be responsible to ensure observance and compliance by contractors. Monitoring will cover the following parameters:

- A separation distance of 50m for heaping construction materials from the stream and channels;
- Sites for fuelling of machinery and servicing of equipment located at a minimum distance of 100m from the stream and drainage channels;
- Embankment erection around fuelling and other liquid or spillable storage sites;
- Provision of toilets and urinal at locations not less than 100m away from the stream; and
- Adequate worker awareness on sanitation and measures to avoid water resource contamination.
- 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; and
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs.

5.3.3 Noise and Vibration Impacts, Mitigation and Monitoring

The use of heavy machinery e.g. a bulldozer D7, vibratory or static roller (weighing 10 tonnes) and a poker vibrator in the rehabilitation works may increase the ambient noise and vibration levels above safe levels, especially for the workers. 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 public would 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. The static machines will be sited at least 100m away from homes to reduce their impacts. 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.

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.

5.3.4 Potential Spread of HIV/AIDS, Prevention 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 condition 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.

5.3.5 Occupational and Public Health and Safety Risks, Mitigation and Monitoring

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 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/h) 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.

5.3.6 Waste Generation, 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.

The waste management system will be monitored to ascertain its effectiveness and remedial measures introduced. Monitoring areas will include: segregation of waste, littering, state of the bins and toilets, compost making and use, workplace hygiene standards and the level of worker awareness. General sanitation will be monitored to verify if workers defecate in the surrounding area. Monitoring covers the following parameters and will have their frequency of monitoring being:

- 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.

5.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 5 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:

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- 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.

5.3.8 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 12 months 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;
- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

2No. Tipper trucks (6m³);
1No. Water tanker (9000litres);

1No. Roller.

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

- Portland cement (300) bags;
- Gravel (6,700m³);
- Granite chippings (85m³); and
- Sand (70m³).

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 twenty for the project. The implementation will take about 8 months.

6.3 Potential Impacts, Mitigation and Monitoring Measures

Spot improvement works involving blading was undertaken in 2009. However, 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 few localized potential adverse impacts due to the rather limited and small-scale nature of the project activities. These include:

- Potential air quality impacts;
- Water resource, erosion and flooding impacts;
- Potential increase in ambient noise and vibration;
- Potential spread of HIV/AIDS and STIs;
- Occupational health and safety concerns;
- Waste generation;
- Potential road diversion impacts; and
- Temporary site office impact

6.3.1 Potential Dust and Air Quality Impacts, Mitigation and Monitoring

Dusty conditions will be created due to haulage of construction materials from source to project site; tipping, loading and spreading of gravel, sand and chippings are all activities that could add to the ambient dusty conditions. 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. Workers are the most exposed to the effects of dust (PM₁₀) which include upper respiratory tract infection, irritation of the eyes, etc

Dousing of the active sections of the road with water at scheduled intervals (twice daily in the dry season) will be used to control dust. Speed of 40km/h when approaching the school area will be observed by construction vehicles. Drivers of vehicles that transport materials will be trained on impacts of dust. Speed ramps will be constructed at least 200m from either side of the road from the location of the school. PPEs such as nose masks and safety goggles shall be provided for all workers at project site.

Visual inspection of schools and farms within the project's area of influence will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

6.3.2 Potential Water Quality Impacts, Mitigation and Monitoring

The Agorkpor River crosses the road at Agorkpopanya community. The tunnelling provided to drain the river across the road is inadequate and as such the river floods sections of the road to about 20m during heavy rains. This usually results in the road being damaged due to erosion, most times beyond usage. The Agorkpor River is one of the important water bodies (the rest are Futue River, Sege River, Akplaba, Luhue, Kajah and the Songor lagoon) that drain the Dangme East District.

Excavation activities for U-drain and culvert construction will lead to increased turbidity and siltation. Oil leaks, rubber and metal components resulting from machinery and vehicular wear and tear and servicing as well as human and other wastes could end up contaminating the River Agorkpor.

Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from the streams and will have spill containment structures such as drains, oil trap, sump and bins in the camp to prevent seepage of oil. Locations for heaping construction materials (e.g. sand and other aggregates) will not be less than 50m from water bodies and drainage channels. The provision of toilets and urinals will be at locations not less than 50m away from the stream and creeks.

The Site Engineer (SE) will be responsible to ensure observance and compliance by contractors. Monitoring will cover the following parameters:

- A separation distance of 50m for heaping construction materials from the stream and channels;

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- Sites for fuelling of machinery and servicing of equipment located at a minimum distance of 100m from the stream and drainage channels;
 - Embankment erection around fuelling and other liquid storage sites;
 - Provision of toilets and urinal at locations not less than 100m away from the stream; and
 - Adequate worker awareness on sanitation and measures to avoid water resource contamination.
 - 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; and
 - All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs; and
 - There will be weekly monitoring on the following relevant sources of impacts on the Agorkpor River:
 - 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.

6.3.3 Potential Noise and Vibration Impacts, Mitigation and Monitoring

Noise could be generated during road clearing on the entire 3.0km stretch from the use of bulldozer and grader. The use of concrete mixers to mix concrete for culvert construction will also generate some amount of noise. 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 public would 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. The static machines will be sited at least 100m away from homes to reduce their impacts. 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.

6.3.4 Potential Spread of HIV/AIDS, Prevention 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 condition 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 townfolk. 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.

6.3.5 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 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.

6.3.6 Waste Generation, 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.

The waste management system will be monitored to ascertain its effectiveness and remedial measures introduced. Monitoring areas will include: segregation of waste, littering, state of the bins and toilets, compost making and use, workplace hygiene standards and the level of worker awareness. General sanitation will be monitored to verify if workers defecate in the surrounding area. Monitoring covers the following parameters and will have their frequency of monitoring being:

- 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.

6.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 5 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 traveling 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.

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 8 months 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;
- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

7.0 KASUNYA AREA-A MINOR REHABILITATION PROJECT

7.1 Project Environment

The Kasunya-Area A road is 42km from the Dangme West District capital of Dodowa. Aside Kasunya and Area-A, the 8.6km feeder road provides access to adjoining communities, namely Asutsuare, Klebuse and Gozakope No. 3. There is a school at Kasunya (DA Basic Primary and JHS) located 5.0m from the RoW and a rice market with several rice and plantain farms at 50m from the road at Area-A.

The Dangme West District is noted for agriculture, particularly rice and banana cultivation, which are major economic activities in the area. Rice farms are located 10m from the road in the Area-A community and banana farms about 40m away from the road corridor at Kasunya. The area houses the Golden Exotic banana plantation, the largest banana plantation in West Africa. The road serves as the main link between the farming areas and the adjoining communities.

The area is characterized by savannah grassland and has an undulating topography and drained by two rivers and 4 other minor streams and creeks, three of which cross the road at some points.

7.2 Project Description

Spot improvement work was carried out in 2009, but the road is currently in a bad condition. The drains provided are silted. The objectives of the rehabilitation works are: to reduce travel time between communities served by the road, to facilitate farming activities by providing easy access between farms at Area A and Kasunya communities as well as reduce the cost of maintaining vehicles.

The specific works will involve light bush clearing, reshaping (7.6km), construction of culverts (5) and gravelling (7.6km). The specific works locations (mileage) and/or distances are provided in Table 7.1.

Table 7.1 *Locations of Specific Works along Kasunya-Area A Road*

	Specific Works	Location or Distance
1	Clearing	0+000 – 7+600
2	Formation	0+000 – 7+600
3	Construction of culverts	Cross Culvert (900x700) @ Km 0+250; 0+500; 0+650; 1+000; 6+200.
4	Raising of road	Km 4+000 – 6+100
5	Sub-base	Km 0+000 – 7+600

The list of types and numbers of equipment/machinery to be used include:

1No. Bulldozer D7 or equivalent,	1No. Vibratory or Static roller (10 tonnes);
1No. Motor grader 140G or equivalent;	1No. Pick-up;
1No. Loader ;	1No. Concrete mixer ; and
2No. Tipper trucks;	2No. Vibrators
1No. Water tanker (9000litres);	

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

- Portland cement (275 bags);
- Granite chippings (90m³); and
- Gravel (8,500m³);
- Sand (75 m³).

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 that a workforce of twenty will be employed for the project of 8 months duration.

7.3 Potential Impacts, Mitigation and Monitoring Measures

The RoW already exists. The effective width of the road which has to a large extent reduced to about 4.0m in sections will be restored to its original 7.0m width. The works will mainly involve reshaping 8.0km of the stretch, gravelling of 2.60km, construction of 5 culverts along the stretch and drain cleaning.

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:

- Potential air quality impacts;
- Water resource, erosion and flooding impacts;
- Potential increase in ambient noise and vibration;
- Potential spread of HIV/AIDS and STIs;
- Occupational health and safety concerns;
- Waste generation;
- Potential road diversion impacts; and
- Temporary site office impact

7.3.1 Dust Impacts on Air Quality, Mitigation and Monitoring

Dust emission will be as a result of vegetation clearing, haulage, loading and unloading/heaping of construction materials such as sand, chippings and gravel. 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. The impact on air quality will affect primarily workers, but also community facilities such as schools at the Kasunya Community, which is located only 10m from the road. 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. Dousing of the active sections of the road with water at scheduled intervals (twice daily in the dry season) will be used to control dust. Speed limit of 40km/h when approaching the school area at the Kasunya community and the rice and plantain farms at Area-A community will be observed by construction vehicles. Drivers of vehicles that transport materials will be trained on impacts of dust. Speed ramps will be constructed at least 200m from either side of the road from the location of the school. PPEs such as nose masks and safety goggles shall be provided for all workers at project site.

Visual inspection of schools and farms within the project's area of influence will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

7.3.2 Impacts on Water Resources, Mitigation and Monitoring

Culverts are in place for the seven (7) drainage channels crossing the road. The drains and culverts are however choked with silt and hence do not provide adequate channelling. The result is an induced change in stream flow courses and erosion of parts of the road. The project will involve earthworks such as digging up silt from culverts and drains. These activities can potentially affect streams by increased siltation and stream turbidity. Oil leaks, rubber and metal components resulting from machinery and vehicular wear, tear and servicing as well as human waste could end up contaminating streams.

Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from the streams and will have spill containment structures such as drains, oil trap, sump and bins in the camp to prevent seepage of oil.

Locations for heaping construction materials (e.g. sand and other aggregates) will not be less than 50m from water bodies and drainage channels. The provision of toilets and urinals will be at locations not less than 50m away from the streams and drainage channels.

The Site Engineer (SE) will be responsible to ensure observance and compliance by contractors. Monitoring will cover the following parameters:

- A separation distance of 50m for heaping construction materials from the stream and channels;
- Sites for fuelling of machinery and servicing of equipment located at a minimum distance of 100m from the stream and drainage channels;

- Embankment erection around fuelling and other liquid storage sites;
- Provision of toilets and urinal at locations not less than 100m away from the stream; and
- Adequate worker awareness on sanitation and measures to avoid water resource contamination.
- 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; and
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs.

7.3.3 Potential Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of bulldozers and grader in clearing the 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 public would 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. The static machines will be sited at least 100m away from homes to reduce their impacts. 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.

7.3.4 Potential Spread of HIV/AIDS, Prevention 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 condition 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.

7.3.5 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 borrow 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.

7.3.6 Waste Generation, 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.

The waste management system will be monitored to ascertain its effectiveness and remedial measures introduced. Monitoring areas will include: segregation of waste, littering, state of the bins and toilets, compost making and use, workplace hygiene standards and the level of worker awareness. General sanitation will be monitored to verify if workers defecate in the surrounding area. Monitoring covers the following parameters and will have their frequency of monitoring being:

- 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 5 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 traveling 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.

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 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;

- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

8.0 KASUNYA-NYAPIENYA ROAD REHABILITATION PROJECT

8.1 Project Environment

The Kasunya-Nyapienya road is about 45km from Dodowa, the Dangme West District capital. The road is 3.45km long and 7m wide with Kasunya and Nyapienya communities along the stretch. There are schools at Kasunya (DA Primary and JHS) and Nyapienya (Nyapienya DA Primary and JHS).

The vegetation type is savannah grassland. The area is generally noted for agriculture (rice and banana cultivation and livestock grazing land). The area is drained by River Nyapienya and 3 streams (2 streams crossing the road). The topography is generally undulating.

8.2 Project Description

The current state of the road is poor, though it benefited from some reshaping works in 2007. The road has developed a corrugated surface and the side drains are in bad condition with sections rendered almost unmotorable in the rainy season. The width of the road is reduced to 4.0m on the average (instead of 7.0m). The objective of the proposed rehabilitation works include improving access to farming areas, schools, markets and health centres as well as interconnection between communities.

The specific works intended to be carried out are mainly reshaping (3.6km), clearing (3.6km), formation, construction of culverts, ditch cleaning and gravelling (1.7km). The specific works (according to mileage (location) and/or distance) are provided in Table 8.1.

Table 8.1 *Locations of Specific Works along Kasunya-Nyapienya Road*

	Specific Works	Location or Distance
1	Clearing	0+000 – 3+450
2	Formation	0+000 – 3+450
3	Construction of culverts	Cross Culvert (900x700) @ Km 0+000; 0+150; 0+200; 0+450; 1+500; 1+900; 2+750; 3+000.
4	Raising of road	Km 0+000 – 0+250; 2+000 – 2+800; 2+950 – 3+200
5	Sub-base	Km 0+000 – 3+450

Clearing involves getting rid of weeds along the corridor to widen the width of the road to 7.0m. It will also allow enough space for other works such as reshaping and culvert construction. Formation works include drainage construction and camber formation. A total of 8 new culverts will be constructed. Filling will be done mainly in the approaches of culverts and also 1.0km of gravel sub-base.

The list of types and numbers of equipment/machinery to be used include:

- | | |
|--|---|
| 1No. Bulldozer D7 or equivalent, | 3No. Vibratory or Static roller (10 tonnes); |
| 1No. Motor grader 140G or equivalent; | 1No. Pick-up; |
| 1No. Loader (1m ³); | 1No. Concrete mixer (0.5m ³); and |
| 2No. Tipper trucks (6m ³); | 1No. Poker Vibrator. |
| 1No. Water tanker (9000litres); | |

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

- Portland cement (450 bags);
- Chippings (140 m³); and
- Fine aggregates (110 m³);
- Gravel (6,000 m³).

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 fifteen (15). The project implementation will take about 8 months.

8.3 Potential Impacts, Mitigation and Monitoring Measures

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:

- Potential air quality impacts;
- Water resource, erosion and flooding impacts;
- Potential increase in ambient noise and vibration;
- Potential spread of HIV/AIDS and STIs;
- Occupational health and safety concerns;
- Waste generation;
- Potential road diversion impacts; and
- Temporary site office impact.

8.3.1 Potential Air Quality Impacts, Mitigation and Monitoring

Dust emission (PM₁₀) will be as a result of haulage, loading and unloading and deposition of construction materials such as sand, chippings and gravel. 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. These activities are all potential sources of dust generation which could affect ambient air quality. The impacts will bear primarily on the workers; the effects on the communities will be negligible since all structures are about 150m from the road and as such less likely to be affected. 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.

Dousing of the active sections of the road with water twice daily will help to minimize dust emission during construction activities at the section of the road bordering the school. The contractor shall ensure that drivers of vehicles that transport materials to and from the project site are informed to slow down to a speed of 50km/h when approaching the school area. Temporal speed ramps will be constructed at least 100m before and after the approaches of farms and at every 100m intervals over the stretch of road bordering farms to check over speeding of haulage vehicles such as pick-ups and tipper trucks. Personal Protective Equipment such as nose masks and safety goggles shall be provided for all workers at project site.

Visual inspection of schools and farms within the project's area of influence will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

8.3.2 Potential Impacts on Water Resources

The two water crossings are at low-lying sections of the road. Absence of proper channelling makes those sections susceptible to erosion. The road is rendered unusable during heavy downpours when these sections are completely flooded.

The project activities will involve earthworks such as digging up silt from drains and excavation for culverts and are likely to increase stream turbidity and siltation, especially when done near the River Nyapienya and the streams. Oil leaks, rubber and metal components resulting from machinery and vehicular wear and tear as well as human waste could end up contaminating the streams. The contractor will ensure that works around the River Nyapienya and other streams are completed on schedule to prevent prolonged impacts. Toilets will be provided at the SOs.

Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from the streams and will have spill containment structures such as drains, oil trap, sump and bins in the camp to prevent seepage of oil. Locations for heaping construction materials (e.g. sand and other aggregates) will not be less than 50m from water bodies and drainage channels. The provision of toilets and urinals will be at locations not less than 50m away from the stream and creeks.

The Site Engineer (SE) will be responsible to ensure observance and compliance by contractors. Monitoring will cover the following parameters:

- A separation distance of 50m for heaping construction materials from the stream and channels;
- Sites for fuelling of machinery and servicing of equipment located at a minimum distance of 100m from the stream and drainage channels;
- Embankment erection around fuelling and other liquid storage sites;
- Provision of toilets and urinal at locations not less than 100m away from the stream; and
- Adequate worker awareness on sanitation and measures to avoid water resource contamination.
- 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; and
- There will be weekly monitoring on the following relevant sources of impacts on the River Nyapienya:
 - 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.

8.3.3 Potential Noise and Vibration Impacts, Mitigation and Monitoring

Noise could be generated during road clearing on the 3.6km stretch, and from the use of bulldozer and grader. The use of concrete mixers to mix concrete for culvert construction will also generate some amount of noise. 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 public 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. The static machines will be sited at least 100m away from homes to reduce their impacts. 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.

8.3.4 Potential Spread of HIV/AIDS, Prevention 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 condition 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 townfolk. 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.

8.3.5 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 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.

8.3.6 Waste Generation, 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.

The waste management system will be monitored to ascertain its effectiveness and remedial measures introduced. Monitoring areas will include: segregation of waste, littering, state of the bins and toilets, compost making and use, workplace hygiene standards and the level of worker awareness. General

sanitation will be monitored to verify if workers defecate in the surrounding area. Monitoring covers the following parameters and will have their frequency of monitoring being:

- 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.

8.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 8 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 traveling 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.

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 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;
- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

9.0 KORLUEDOR JUNCTION – KORLUEDOR MINOR REHABILITATION

9.1 Project Environment

The project road is located in the Dangme East District, 30km from the district capital Ada Foah. Aside Korluedor, the 1.8km, 3m wide un-engineered feeder road provides access to adjoining communities, namely Kasseh, Mahem and Matsekope. There is a school and Church at Korluedor (Roman Catholic Primary and JHS and the Roman Catholic Church respectively). There are also markets at Kasseh, Ada Foah and Sege (10m, 10m and 30m respectively from the road). A cemetery for the Mahem community is located about 100m from the road and some houses at Mahem are close to the road with the nearest as close as 5m from the road.

The area is noted for farming and livestock rearing. Salt and fish trade are also common in and around surrounding towns. The road is a main link for carting such produce from the communities to the markets. The area is characterized by savannah grassland and has a generally flat topography. The area is devoid of any water body.

9.2 Project Description

The road is currently un-engineered and in need of complete rehabilitation. The objectives of the rehabilitation works are; to reduce travel time between communities served by the road, to facilitate economic activities and carting of salt between the communities and to reduce vehicle maintenance cost.

The specific works to be undertaken involves light bush clearing, culvert construction, reshaping and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 9.1.

Table 9.1 Locations or Distances of Specific Works along the Project Road

	Specific Works	Location or Distance
1	Clearing	0+000 – 1+800
2	Formation	0+000 – 1+800
3	Construction of culverts	Cross Culvert (900x700) @ Km 0+300; 0+500; 1+300
4	Raising of road	Km 0+225 – 0+350; 0+450 – 0+550; 1+250 – 1+350
5	Sub-base	Km 0+000 – 1+800

The list of types and numbers of equipment/machinery to be used include:

- | | |
|--|---|
| 1No. Bulldozer D7 or equivalent, | 3No. Vibratory or Static roller (10 tonnes); |
| 1No. Motor Grader 140G or equivalent; | 1No. Pick-up; |
| 1No. Loader (1m ³); | 1No. Concrete mixer (0.5m ³); and |
| 2No. Tipper trucks (6m ³); | 2No. Vibrators. |
| 1No. Water tanker (9000litres); | |

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

- Portland cement (75 bags);
- Granite chippings (60m³); and
- Gravel (2,500m³);
- Sand (45 m³).

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 twenty for the project. The implementation will take about 8 months.

9.3 Potential Impacts and Mitigation Measures

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:

- Dust generation and impact on air quality;
- Potential increase in ambient noise and vibration;
- Potential spread of HIV/AIDS and STIs;
- Occupational health and safety concerns;
- Waste generation;
- Potential road diversion impacts; and
- Temporary site office impact.

9.3.1 Impact on Air Quality, Mitigation and Monitoring

Dusty conditions will be created due to haulage of construction materials from source to project site; tipping, loading and spreading of gravel, sand and chippings. 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. Workers are the most exposed to the effects of dust (PM₁₀), which include upper respiratory tract infection, asthma attacks, irritation of the eyes and skin diseases.

Dousing of the active sections of the road with water twice daily will minimize dust emission, especially at the section of the road bordering the school. The contractor shall ensure that drivers of vehicles that transport materials to and from the project site observe a speed limit of 50km/h when approaching the school area. Temporal speed ramps will be constructed at least 100m before and after the approaches of farms and at every 100m intervals to check speeding of haulage vehicles such as pick-ups and tipper

trucks and others. Personal Protective Equipment such as nose masks and safety goggles shall be provided for all workers at project site.

Visual inspection of schools and farms within the project's area of influence will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

9.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of bulldozers and grader in clearing the 1.8km 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. The static machines will be sited at least 100m away clinics or homes to reduce their impacts. 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.

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.

9.3.3 Potential Spread of HIV/AIDS, Prevention 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 condition 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.

9.3.4 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 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 Waste Generation, 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.

The waste management system will be monitored to ascertain its effectiveness and remedial measures introduced. Monitoring areas will include: segregation of waste, littering, state of the bins and toilets, compost making and use, workplace hygiene standards and the level of worker awareness. General sanitation will be monitored to verify if workers defecate in the surrounding area. Monitoring covers the following parameters and will have their frequency of monitoring being:

- 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.

9.3.6 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 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.

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 8 months) 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;
- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

10.0 OBEYEYIE - AFUAMAN REHABILITATION PROJECT

10.1 Project Environment

The project road lies in the Ga West Municipality, about 4.7km from Amasaman, the district capital. The road is 6.26km long and 7.8m wide with Manhean and Ayikai-Doblo communities along the stretch. Other adjoining towns such as Nsakina and Oduman are also served by the road. There are six (6) schools at Obeyeyie, Manhean and Afuaman, and markets and a lorry station at Manhean. The road also serves a clinic at Oduman. A number of farms and houses along the road between Obeyeyie and Manhean are located 15m and 25m respectively from the road.

The vegetation type is savannah grassland and has a generally flat topography. The area is noted for agriculture (crop cultivation and grazing land for livestock). The area is drained by one main river, the Nsaki which crosses the road at about 500m from Obeyeyie.

10.2 Project Description

The current state of the road is poor; the last time it had a complete rehabilitation was 10 years ago and though it benefited from some spot improvement works in 2006, the present condition makes it under-utilized. Sections are rendered unmotorable in the rainy season.

The objective of the proposed spot improvement works includes improving access to farming areas (Motherwell Farms and others), schools (Obeyeyie Anglican Primary School, Methodist Primary School, M. A. Primary and JHS School, Presby Primary school, Afuaman Primary and JHS and Roman Catholic Primary School), markets (with lorry station at Manhean) and a clinic at Oduman, as well as interconnection between the Manhean, Ayikai-Doblo, Nsakina and Oduman communities.

The specific works intended to be carried out are mainly raising of the road, construction of culverts, filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 10.1.

Table 10.1 Locations/Distances of Specific Works along the Project Road

	Specific Works	Location or Distance
1	Clearing	0+000 – 6+000
2	Formation	0+000 – 6+000
3	Construction of culverts	Cross Culvert (900x700) @ Km 1+050. Access Culvert (900x700) @ Km 4+300 RHS; 4+500 RHS; 4+600 L/RHS; 4+800 RHS; 5+000 RHS; 5+100 L/RHS; 5+250 LHS; 5+300 LHS; 5+450 LHS; 5+600 L/RHS; 5+700 L/RHS
4	Construction of drains	48m length of 600x600 U-drain between km 4+000 – 6+000
5	Raising of road	Km 0+500 – 0+750; 1+000 – 1+350; 2+200 – 2+250; 2+450 – 2+600; 3+400 – 3+550; 5+850 – 5+950
6	Sub-base	0+000 – 6+000

Formation works include camber formation and drainage construction. Filling will be done mainly in the approaches of culverts and also 1.0km of gravel sub-base.

The list of types and numbers of equipment/machinery to be used include:

- | | |
|--|---|
| 1No. Bulldozer D7 or equivalent, | 3No. Vibratory or Static roller (10 tonnes); |
| 1No. Motor Grader 140G or equivalent; | 1No. Pick-up; |
| 1No. Loader (1m ³); | 1No. Concrete mixer (0.5m ³); and |
| 2No. Tipper trucks (6m ³); | 1No. Poker Vibrator. |
| 1No. Water tanker (9000litres); | |

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

- Portland cement (820 bags);
- Coarse aggregates (220m³); and
- Fine aggregates (200 m³);
- Gravel (14,000m³).

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 twenty one (21) is expected to be employed. The project implementation will take about 10 months.

10.3 Potential Impacts, Mitigation and Monitoring Measures

The right of way (RoW) already exists. The effective width of the road which has been reduced to about 5.0m in some sections will be restored to its original 7.8m width. 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:

- Potential air quality impacts;
- Water resource, erosion and flooding impacts;
- Potential increase in ambient noise and vibration;
- Potential spread of HIV/AIDS and STIs;
- Occupational health and safety concerns;
- Waste generation; and
- Potential road diversion impacts.

10.3.1 Dust Generation and Impact on Air Quality, Mitigation and Monitoring

Dust emission (PM₁₀) will result from haulage, loading and unloading and heaping of construction materials such as sand, chippings and gravel. 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. These activities are all potential sources of dust generation which could affect ambient air quality. The impacts will bear primarily on the workers; the effects on the communities will be negligible since all structures are about 150m from the road and as such less likely to be affected. 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.

Dousing of the active sections of the road with water twice daily will help to minimize dust emission during construction activities at the section of the road bordering the school. The contractor shall ensure that drivers of vehicles that transport materials to and from the project site are informed to slow down to a speed of 40km/h when approaching the school area. Temporal speed ramps will be constructed at least 100m before and after the approaches of farms and at every 100m intervals over the stretch of road bordering farms to check over speeding of haulage vehicles such as pick-ups and tipper trucks. Personal Protective Equipment such as nose masks and safety goggles shall be provided for all workers at project site.

Visual inspection of schools and farms within the project's area of influence will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

10.3.2 Potential Water Quality Impacts, Mitigation and Monitoring

The road is crossed by River Nsaki at about 500m from Obeyeyie. The tunnelling provided to drain the river across the road is inadequate and as such the river floods sections of the road during heavy rains. This usually results in the road being damaged due to erosion, most times beyond usage. Digging within or near the river for purposes of U-drain installation or culvert construction will lead to increased turbidity and siltation. Oil leaks, rubber and metal components resulting from machinery and vehicular wear and tear as well as human and other waste could end up contaminating River Nsaki. The contractor will ensure that works around the River Nsaki and other streams are completed on schedule to prevent prolonged impacts. Toilets will be provided at the SO.

Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from the river and will have spill containment structures such as drains, oil trap, sump and bins in the

camp to prevent seepage of oil. Locations for heaping construction materials (e.g. sand and other aggregates) will not be less than 50m from water bodies and drainage channels. The provision of toilets and urinals will be at locations not less than 50m away from the stream and creeks.

The Site Engineer (SE) will be responsible to ensure observance and compliance by contractors. Monitoring will cover the following parameters:

- A separation distance of 50m for heaping construction materials from the stream and channels;
- Sites for fuelling of machinery and servicing of equipment located at a minimum distance of 100m from the stream and drainage channels;
- Embankment erection around fuelling and other liquid storage sites;
- Provision of toilets and urinal at locations not less than 100m away from the stream; and
- Adequate worker awareness on sanitation and measures to avoid water resource contamination.
- 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; and
- There will be weekly monitoring on the following relevant sources of impacts on the River Nsaki:
 - 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.

10.3.3 Potential Noise and Vibration Impacts, Mitigation and Monitoring

Noise could be generated during road clearing on the entire 6.2km stretch from the use of bulldozer and grader. The use of concrete mixers to mix concrete for culvert construction will also generate some amount of noise. Filling and compaction on the entire road surface using compactors will also contribute to the noise level as well as cause vibration. 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 general public would 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. The static machines will be sited at least 100m away from homes to reduce their impacts. 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.

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.

10.3.4 Potential Spread of HIV/AIDS, Prevention 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 condition 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 townfolk. 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.

10.3.5 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 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.

10.3.6 Waste Generation, 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.

The waste management system will be monitored to ascertain its effectiveness and remedial measures introduced. Monitoring areas will include: segregation of waste, littering, state of the bins and toilets, compost making and use, workplace hygiene standards and the level of worker awareness. General sanitation will be monitored to verify if workers defecate in the surrounding area. Monitoring covers the following parameters and will have their frequency of monitoring being:

- 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 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 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 are:

- 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 10 months) 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;
- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

11.0 OYARIFA – FRAFRAHA MINOR REHABILITATION

11.1 Project Environment

The 2.5km Oyarifa–Frafraha stretch lies in the Ga East Municipality. It serves the Oyarifa and Frafraha communities. Other surrounding towns such as Abokobi and Ashiyie will benefit from the improvement works. There are schools (Oyarifa Presby Primary and JHS, Monaque School Complex, Royal Community School and Victoria St. Clair Academy), Guest Houses (Lumina Lodge and Visitors Home Guest House), health centre (Wispa Horizon Medical Centre) and pharmacy/chemical shop (Merchant Pharmacy and Beatrice Addo Chemical Shop) at both Oyarifa and Frafraha. The Ga East Regional Office of the NHIS is located at Oyarifa.

The vegetation of the area is savannah grassland with isolated swamp patches. The dominant land use is settlement with no water body near the project location.

11.2 Project Description

The road has deteriorated due to loss of camber and drains. Maintenance works involving spot improvement was carried out in 2007. The situation gets worse during the rainy season when, due to inadequate drainage, numerous potholes develop. The road has become narrow (reducing from 10m to 7m) and difficult to travel on because of the potholes.

The objectives of the rehabilitation works are to reduce travel time along the stretch thereby improving access to the adjoining communities and other social facilities such as schools and hospitals.

The specific works intended to be carried out are mainly clearing, formation, filling and gravelling. The specific works (according to mileage (location) and/or distance) are provided in Table 11.1.

Table 11.1 Locations/Distances of Specific Works along the Project Road

	Specific Works	Location or Distance
1	Clearing	0+000 – 2+500
2	Formation	0+000 – 2+500
3	Construction of culverts	Cross Culvert (900x700) @ Km 1+900. Access Culvert (900x700) @ Km 0+100 RHS; 0+200 RHS; 0+300 LHS; 0+350 RHS; 0+400 LHS; 0+600 LHS; 0+650 LHS; 0+800 RHS; 0+900 LHS; 1+000 LHS; 1+100 LHS; 1+300 RHS; 1+400 LHS; 1+500 RHS; 1+600 RHS
4	Construction of drains	600x600 U-drain between km 2+000 – 2+500 LHS & RHS
5	Raising of road	Km 0+000 – 0+450; 0+550 – 0+700; 0+750 – 1+150; 1+250 – 1+650; 1+850 – 1+950
6	Sub-base	0+000 – 2+500

Clearing involves getting rid of vegetation along the corridor to widen the width of the road to 10m. It will also allow enough space for other works. Formation works includes blading, drains and camber construction.

The list of types and numbers of equipment/machinery to be used include:

1No. Bulldozer D7 or equivalent,
 1No. Motor Grader 140G or equivalent;
 1No. Loader (1m³);
 2No. Tipper trucks (6m³);
 1No. Water tanker (9000litres);

3No. Vibratory or Static roller (10 tonnes);
 1No. Pick-up;
 1No. Concrete mixer (0.5m³); and
 1No. Poker Vibrator.

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

- Portland cement (1000)
- Coarse aggregates (300m³); and
- Fine aggregates (225m³);
- Gravel (11,000m³)

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 twenty-five (25). The project implementation will take about 8 months.

11.3 Potential Impacts, Mitigation and Monitoring Measures

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:

- Dust generation and impact on air quality;
- Noise and vibration impacts;
- Potential spread of HIV/AIDS and STIs;
- Occupational health and safety concerns;
- Waste generation;
- Potential road diversion impacts; and
- Temporary site office impact.

11.3.1 Impact on Air Quality, Mitigation and Monitoring

Dusty conditions will be created due to haulage of construction materials from source to project site; tipping, loading and spreading of gravel, sand and chippings are all activities that could add to the ambient dusty conditions. 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. Workers are the most exposed to the effects of dust (PM₁₀) which include upper respiratory tract infection, irritation of the eyes, etc.

Dousing of the active sections of the road with water at scheduled intervals (twice daily in the dry season) will be used to control dust. Speed of 40km/h when approaching the school area will be observed by construction vehicles. Drivers of vehicles that transport materials will be trained on impacts of dust. Speed ramps will be constructed at least 200m from either side of the road from the location of the school. PPEs such as nose masks and safety goggles shall be provided for all workers at project site.

Visual inspection of schools and farms within the project's area of influence will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

11.3.2 Potential Noise and Vibration Impacts, Mitigation and Monitoring

The use of heavy machinery e.g. Bulldozer D7, Vibratory or Static roller weighing 10 tonnes and a Poker vibrator in the rehabilitation works could result in cumulative increase in the ambient noise and vibration. 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 schools and clinic would also be receptors 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. Works close to schools would be done after school hours. Static machines will be sited at least 100m away from clinics or homes to reduce their impacts. 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.

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 Occupational/Public Health and Safety Risks, Mitigation and Monitoring

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 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.

11.3.4 Potential Spread of HIV/AIDS, Prevention 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 condition 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.

11.3.5 Waste Generation, 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.

The waste management system will be monitored to ascertain its effectiveness and remedial measures introduced. Monitoring areas will include: segregation of waste, littering, state of the bins and toilets,

compost making and use, workplace hygiene standards and the level of worker awareness. General sanitation will be monitored to verify if workers defecate in the surrounding area. Monitoring covers the following parameters and will have their frequency of monitoring being:

- 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.

11.3.6 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 traveling 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 are:

- 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.

11.3.7 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 8 months) 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;
- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

**ROADS IN THE CENTRAL
REGION**

12.0 SAMPA-OHUAM SPOT IMPROVEMENT PROJECT

12.1 Project Environment

The project road is located in the Gomoa West District, about 4.2km from Apam, the district capital. The road is 4.2km and 2.0m wide, linking Sampa to Ohuam. The vegetation type is Semi deciduous forest with patches of grassland and shrubs. The area is generally noted for farming. The area is drained by 12 drainage channels. The topography can be generally described as undulating.

12.2 Project Description

The road benefited from maintenance works about 16 years ago and is currently in a deplorable state. It has earth surface without any formation works. There are no existing drainage structures and during the rainy season, sections are rendered unmotorable thereby affecting transportation services for the haulage of food items and other goods.

The objective of the proposed spot improvement works includes among others, to facilitate easy transportation of agricultural produce and people living within the road corridor to the nearest market and health centres and to ensure all-year-round accessibility at optimum cost,.

The specific works intended to be carried out are mainly rising of road, construction of culverts, blading, and laying of sub-base. 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 Project Road

	Specific Works	Location or Distance
1	Raising of road	0+480-0+600, 0+980-1+130
2	Blading	0+000-4+000
3	Construction of culverts	0+500,0+900, 1+200, 1+900
4	Laying of sub-base	0+000-4+000

The work will involve raising some sections of the road, blading and compaction of road surface, and laying of sub-base by gravelling of the entire road stretch. 'U' type new culverts will be constructed, 4 in number along the road. The sizes and numbers will be 4No. 900 x 700.

The list of types and numbers of equipment/machinery to be used include:

1No. Bulldozer	1No. Loader (1m ³);
1No. Motor Grader	2No. Tipper trucks (6m ³);
1No. Water tanker (9000litres);	1No. Concrete mixer.
1No Wheel loader	

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

- Sand (28.34 m³);
- Chippings (45.46 m³); and
- Gravel (1112 m³).

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.



Figure 12.1 Sections of the Sampa- Ohuom Road covered by Weeds and Water

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 that to employ a workforce of 65 for the project. The implementation will take about 6 months.

12.3 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 3.0m in sections, which will be restored to its original 6.0m width. 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:

- Potential air quality impacts;

- Water resource, erosion and flooding impacts;
- Potential increase in ambient noise and vibration;
- Potential spread of HIV/AIDS and STIs;
- Occupational health and safety concerns;
- Waste generation;
- Potential road diversion impacts; and
- Temporary site office impact.

12.3.1 Potential Impacts on Air Quality, Mitigation and Monitoring

Clearing of vegetation, blading, formation works, tipping and offloading of construction materials such as sand (28.34m³), chippings (45.46m³), and gravel (1,112m³) may generate dust in the immediate environment. 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. These activities are all potential sources of dust generation which could affect ambient air quality. The impacts will bear primarily on the workers; the effects on the communities will be negligible since all structures are about 150m from the road and as such less likely to be affected. 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.

Dousing of the active sections of the road with water at scheduled intervals (twice daily in the dry season) will be used to control dust. Speed of 40km/h when approaching the school area will be observed by construction vehicles. Drivers of vehicles that transport materials will be trained on impacts of dust. Speed ramps will be constructed at least 200m from either side of the road from the location of the school. PPEs such as nose masks and safety goggles shall be provided for all workers at project site.

Visual inspection of schools and farms within the project's area of influence will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

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 4.2km 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 public would 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. The static machines will be sited at least 100m away from homes to reduce their impacts. 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.

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 Impacts on Water Resources, Mitigation and Monitoring

Spot improvement works may result in deterioration in water quality of the twelve streams that cross the road. Delay in the expected works after the vegetation has been cleared will lead to soil particles being put in suspension in the streams, especially after a downpour. Other potential sources of impacts are heaping of materials, earthworks, blocking and narrowing the river flow at the crossing points to make way for construction of culverts at chainages: 0+500, 0+900, 1+200, and 1+900. The speed of flow of the streams may be increased resulting in flooding, ponding, and siltation of the rivers. Other sources of water pollution include sedimentation, changes in biological activity in streams and on their banks, due to chemicals spillage, contaminated run off from the leakage of petroleum product, among others. The contractor will ensure that works around the streams are completed on schedule to prevent prolonged impacts. Toilets will be provided at the SO.

Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from the streams and will have spill containment structures such as drains, oil trap, sump and bins in the camp to prevent seepage of oil. Locations for heaping construction materials (e.g. sand and other aggregates) will not be less than 50m from water bodies and drainage channels. The provision of toilets and urinals will be at locations not less than 50m away from the stream and creeks.

The Site Engineer (SE) will be responsible to ensure observance and compliance by contractors. Monitoring will cover the following parameters:

- A separation distance of 50m for heaping construction materials from the stream and channels;
- Sites for fuelling of machinery and servicing of equipment located at a minimum distance of 100m from the stream and drainage channels;
- Embankment erection around fuelling and other liquid storage sites;
- Provision of toilets and urinal at locations not less than 100m away from the stream; and

- Adequate worker awareness on sanitation and measures to avoid water resource contamination.
- 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; and
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs.

12.3.4. Occupational Health and Safety Risks, Mitigation and Monitoring

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 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 Spread of HIV/AIDS and STIs, 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 condition 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.

Quarterly assessment of the effectiveness of awareness programmes will be in the form of questions and answers/free discussions, and the campaigns by the peer group educators, led by the SE and health team.

12.3.6 Waste Generation, 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.

The waste management system will be monitored to ascertain its effectiveness and remedial measures introduced. Monitoring areas will include: segregation of waste, littering, state of the bins and toilets, compost making and use, workplace hygiene standards and the level of worker awareness. General

sanitation will be monitored to verify if workers defecate in the surrounding area. Monitoring covers the following parameters and will have their frequency of monitoring being:

- 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.

12.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 4 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 traveling 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 are:

- 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 6 months) 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;
- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

13.0 MAYENDA-OBODAKABA SPOT IMPROVEMENT PROJECT

13.1 Project Environment

The Mayenda-Obodakaba road lies in the Awutu-Effutu-Senya District, about 54.4km from Amenikrom, the district capital. The road is 3.2km long and 2.0m wide, with the following communities along the stretch: Mayenda, Kawanopado, Aboankyire, and Obodakaba. There is a school located at chainage 3+00.

The vegetation type is savannah. The area is generally noted for agriculture (crop cultivation) drained by 4 drainage channels with culverts which need to be extended. The topography is generally undulating.

13.2 Project Description

The road is in a deplorable state. Improvement works was carried out about 15 years ago. It has earth surface with low lying sections and water crossing points. Sections are rendered almost unmotorable in the rainy season which will require the construction culverts.

The objective of the proposed spot improvement works is to facilitate the transportation of agricultural produce to market centres, provide easy access to health centres, as well as interconnect neighbouring communities.

The specific works intended to be carried out are mainly clearing, blading, construction of culverts and laying of sub-base. 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 Project Road

	Specific Works	Location or Distance
1	Clearing	0+000-3+200,
2	Blading	0+000-3+200
3	Construction of culverts	0+000, 2+200, (Extensions 0+500, 0+900, 1+200, 1+800)
4	Laying of sub-base	1+800-2+000

Vegetation along the road corridor will be cleared to widen the width of the road, and also allow enough space for other works such as the construction of drains and culverts. Formation would be carried out on the entire stretch of road, while some low-lying sections along the road will be raised. Two new 'U' culverts will be constructed along the road. The sizes and numbers will be 2 No. 900x700;

The list of types and numbers of equipment/machinery to be used include:

1No. Bulldozer	1No. Loader (1m ³);
1No. Motor Grader	2No. Tipper trucks (6m ³);
1No. Water tanker (9000litres);	1No. Concrete mixer.
1No Wheel loader	

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

- Sand (49.59 m³),
- Chippings (66.52 m³), and
- Gravel chippings (2293 m³).

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 that a workforce of 85 people will be employed for the project. The project implementation will take about 6 months.

13.3 Potential Impacts, Mitigation and Monitoring Measures

The Mayenda-Obodakaba road is in a deplorable state. The proposed spot improvement would be part of regular on-going road works to improve and maintain access. 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:

- Potential impacts on air quality;
- Noise and vibration impacts;
- Impacts on water resources;
- Potential health and safety impacts;
- Potential spread of HIV/AIDS and STIs;
- Waste generation; and
- Temporary site office impact

13.3.1 Potential Impacts on Air Quality, Mitigation and Monitoring

Clearing of vegetation, blading, laying of sub-base, tipping and offloading of construction materials such as sand (28.34m³), chippings (45.46m³), and gravel (1,112m³) may generate dust in the immediate environment. 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. The impacts of reduced ambient air quality will bear primarily on the workers; the effects on the communities will be negligible since all structures are about 150m from the road and as such less likely to be affected. 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.

Dousing of the active sections of the road with water at scheduled intervals (twice daily in the dry season) will be used to control dust. Speed of 40km/h when approaching the school area will be observed by construction vehicles. Drivers of vehicles that transport materials will be trained on impacts of dust. Speed ramps will be constructed at least 200m from either side of the road from the location of the school. PPEs such as nose masks and safety goggles shall be provided for all workers at project site.

Visual inspection of schools and farms within the project's area of influence will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

13.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of bulldozers and grader in clearing the 3.2km 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 public would 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. The static machines will be sited at least 100m away from homes to reduce their impacts. 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.

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.

13.3.3 Impacts on Water Resources, Mitigation and Monitoring

Spot improvement works may result in deterioration in water quality of the four streams that cross the road. Delay in the expected works after the vegetation has been cleared will lead to soil particles being put in suspension in the streams, especially after the rains. Other potential sources of impacts are heaping of materials, earthworks, blocking and narrowing the stream flow at the crossing points to make way for construction of culverts (at chainages 0+000, 2+200, and extensions at changes: 0+500, 0+900, 1+200, 1+800). The speed of flow of the streams may be increased resulting in flooding, ponding, and siltation. Other sources of water pollution include sedimentation, changes in biological activity in streams and on their banks, due to chemicals spillage, contaminated run off from the leakage of petroleum product, among others.

The contractor will ensure that works around the streams are completed on schedule to prevent prolonged impacts. Toilets will be provided at the SO. Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from the streams and will have spill containment structures such as drains, oil trap, sump and bins in the camp to prevent seepage of oil. Locations for heaping construction materials (e.g. sand and other aggregates) will not be less than 50m from water bodies and drainage channels. The provision of toilets and urinals will be at locations not less than 50m away from the stream and creeks.

The SE will be responsible to ensure observance and compliance of the following:

- A separation distance of 50m for heaping construction materials from streams and channels;
- Sites for fuelling of machinery and servicing of equipment located at a minimum distance of 100m from the stream and drainage channels;
- Embankment erection around fuelling and other liquid or spillable storage sites;
- Provision of toilets and urinal at locations not less than 50m away from the stream; and
- Adequate worker awareness on sanitation and measures to avoid water resource contamination.

13.3.4 Occupational Health and Safety Risks, Mitigation and Monitoring

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 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.

13.3.5 Potential Spread of HIV/AIDS, Prevention 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 condition 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 7 from the workforce while the nearby communities nominate 7 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 townfolk. 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.

13.3.6 Waste Generation Issues, 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.

The waste management system will be monitored to ascertain its effectiveness and remedial measures introduced. Monitoring areas will include: segregation of waste, littering, state of the bins and toilets, compost making and use, workplace hygiene standards and the level of worker awareness. General sanitation will be monitored to verify if workers defecate in the surrounding area. Monitoring covers the following parameters and will have their frequency of monitoring being:

- 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 2 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 are:

- 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 6 months) 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;
- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

14.0 AKOTSI-GYINANKOMA-EKROFUL SPOT IMPROVEMENT PROJECT

14.1 Project Environment

The Akotsi-Gyinankoma-Ekroful road is located in the Mfantseman Municipality, about 54.4km from Saltpond, the municipal capital. The road is 5.6km long and 3.0m wide, with the following communities along the stretch: Akotsi, Kokodo, Gyinankuma and Ekroful. There are cemeteries located about 3.5m at each side along the road corridor at chainages: 0+850-1+00, 2+700-2+800 and 4+500-4+900. A school is also located at chainage 2+200.

The vegetation type is lush forest. The area is generally noted for agriculture (crop cultivation) and plantation (teak) and drained by 8 drainage channels. The topography is generally undulating.

14.2 Project Description

The state of the road is poor, though engineered. The road is unmotorable and has low lying sections and water crossing points, which will require the construction of new culverts. The objective of the proposed spot improvement works is to facilitate the transportation of agricultural produce to market centres, provide easy access to health centres and to interconnect communities like Saakwa, Obontser, Ogoe, and Essarkyir which are all major Towns on the nearby highway.

The specific works to be carried out are mainly clearing, raising, blading, and construction of culverts. 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 Project Road

	Specific Works	Location or Distance
1	Clearing	0+000-5+600,
2	Raising	1+350-1+450, 3+900-4+100
3	Blading	0+000-5+600
4	Construction of culverts	1+400, 2+100, 2+800, 3+300, 3+600, 4+400, 4+500, 5+300

Vegetation along the road corridor will be cleared to widen the width of the road, and also allow enough space for other works such as the construction of culverts. Certain sections will receive blading, while some low-lying sections along the road will be raised with sand. Three types of new culverts will be constructed, eight (8) in number along the road. The sizes and numbers are as follows: 1) 5 No. 900x700; 2) 2 No. 1200x900; and 3) 1No 1250x1800

The list of types and numbers of equipment/machinery to be used include:

1No. Bulldozer	1No. Roller;
1No. Motor Grader	1No Wheel loader
1No. Water tanker (9000litres);	1No. Concrete mixer.

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

- Sand (35.77 m³),
- Chippings (57.79 m³), and
- Gravel chippings (35823 m³).

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.



Figure 14.1 Typical Bad Section of the Akotsi-Gyinankoma-Ekroful Road

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 that a workforce of 30 people will be employed for the project. The project implementation will take about 6 months.

14.3 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 3.0m in sections, which will be restored to its original 6.0m width. 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:

- Dust generation and impact on air quality;
- Impacts on water resources;
- Noise and vibration impacts;
- Occupational health and safety hazards;
- Potential spread of HIV/AIDS and STIs;
- Waste generation;
- Potential road diversion impacts; and
- Temporary site office impact

14.3.1 Potential Impacts on Air Quality, Impacts, Mitigation and Monitoring

Clearing of vegetation, blading, formation works, tipping and offloading of construction materials such as sand (35.77m³), chippings (57.79m³), and gravel chippings (35,823m³) may generate dust in the immediate environment. 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. These activities are all potential sources of dust generation which could affect ambient air quality. The impacts of reduced ambient air quality will bear primarily on the workers; the effects on the communities will be negligible since all structures are about 150m from the road and as such less likely to be affected. 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.

Dousing of the active sections of the road with water at scheduled intervals (twice daily in the dry season) will be used to control dust. Speed of 40km/h when approaching the school area will be observed by construction vehicles. Drivers of vehicles that transport materials will be trained on impacts of dust. Speed ramps will be constructed at least 200m from either side of the road from the location of the school. PPEs such as nose masks and safety goggles shall be provided for all workers at project site.

Visual inspection of schools and farms within the project's area of influence will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

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 5.6km 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 public would 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. The static machines will be sited at least 100m away from homes to reduce their impacts. 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.

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 Impacts on Water Resources, Mitigation and Monitoring

Spot improvement works may result in deterioration in water quality of the eight streams that crosses the road. Delay in the expected works after the vegetation has been cleared will lead to soil particles being put in suspension in the streams, especially after the rains. Other potential sources of impacts are heaping of materials, earthworks, blocking and narrowing the stream flow at the crossing points to make way for construction of culverts at chainages: 1+400, 2+100, 2+800, 3+300, 3+600, 4+400, 4+500, and 5+300. The speed of flow of the streams may be increased resulting in flooding, ponding, and siltation.. Other sources of water pollution include sedimentation, changes in biological activity in streams and on their banks, due to chemicals spillage, contaminated run off from the leakage of petroleum product, among others.

Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from the streams and will have spill containment structures such as drains, oil trap, sump and bins in the camp to prevent seepage of oil. Locations for heaping construction materials (e.g. sand and other aggregates) will not be less than 50m from water bodies and drainage channels. The provision of toilets and urinals will be at locations not less than 50m away from the stream and creeks.

The Site Engineer (SE) will be responsible to ensure observance and compliance by contractors. Monitoring will cover the following parameters:

- A separation distance of 50m for heaping construction materials from the stream and channels;
- Sites for fuelling of machinery and servicing of equipment located at a minimum distance of 100m from the stream and drainage channels;
- Embankment erection around fuelling and other liquid storage sites;
- Provision of toilets and urinal at locations not less than 100m away from the stream; and
- Adequate worker awareness on sanitation and measures to avoid water resource contamination.
- 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; and
- All heaped material areas would be monitored weekly to ensure that they are not exposed to the wind, rain or areas of run-offs.

14.3.4 Occupational Health and Safety Risks, Mitigation and Monitoring

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 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 Spread of HIV/AIDS and STIs, 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 condition 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 townfolk. 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 Issues, 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.

The waste management system will be monitored to ascertain its effectiveness and remedial measures introduced. Monitoring areas will include: segregation of waste, littering, state of the bins and toilets, compost making and use, workplace hygiene standards and the level of worker awareness. General sanitation will be monitored to verify if workers defecate in the surrounding area. Monitoring covers the following parameters and will have their frequency of monitoring being:

- 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 8 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 traveling 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 are:

-
- 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 6 months) 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;
- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

15.0 TAYEDO-AFONAKROM-DADAGUA SPOT IMPROVEMENT PROJECT

15.1 Project Environment

The project road is located in the Abura-Asebu-Kwamankese District, about 15.0km from Abura-Dunkwa, the district capital. The road is 9.7km long and 4.6m wide, with the following communities along the stretch: Tayedo, Afonakrom, Darmang, Mampong, Adansimam, Dwodwomadze, and Dadagua. There is a cemetery located at chainage: 5+00-5+100 along the road corridor:

The vegetation type is lush forest. The area is generally noted for agriculture (crop cultivation). The area is drained by 2 drainage channels namely Otowaraba and Bruku. The topography is generally undulating.

15.2 Project Description

The current state of the road is poor, though engineered. The road is unmotorable and has low lying sections and water crossing points, which will require the construction of culverts.

The objective of the proposed spot improvement works is to facilitate the transportation of agricultural produce to market centres, provide easy access route to health centres and to interconnect communities.

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

Table 15.1 Locations/Distances Specific Works along the Project Road

	Specific Works	Location or Distance
1	Clearing	0+000-9+350,
2	Raising	0+250-0+350, 1+450-1+550
3	Blading	0+000-9+350
4	Construction of culverts	0+300, 1+500
5	Laying of sub-base	0+000-9+350

Vegetation will be cleared along the road corridor to widen the width of the road, and also allow enough space for other works such as the construction of culverts. Some low-lying portions of the road will be raised, while certain sections will receive blading. Only 1 type of new culvert will be constructed, two (2) in number along the road. The size and numbers will be 2 No. 1200 x 900 'U' culverts.

The list of types and numbers of equipment/machinery to be used include:

1No. Bulldozer	1No Wheel loader;
1No. Motor Grader	1No. Roller; and
1No. Water tanker (9000litres);	1No. Concrete mixer.

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

- Sand (7.22 m³),
- Chippings (11.53 m³), and
- Gravel (13581 m³).

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 that a workforce of 35 will be employed for the project. The project implementation will take about 12 months.

15.3 Potential Impacts, Mitigation and Monitoring Measures

The Tayedo-Afonakrom-Dadagua road is in a deplorable state, although engineered. 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:

- Dust generation and impact on air quality;
- Water resource, erosion and flooding impacts;
- Potential increase in ambient noise and vibration;
- Potential spread of HIV/AIDS and STIs;
- Occupational health and safety concerns;
- Waste generation;
- Potential road diversion impacts; and
- Temporary site office impact.

15.3.1 Potential Impacts on Air Quality, Mitigation and Monitoring

Clearing of vegetation, blading, formation works, laying of sub-base, tipping and offloading of construction materials such as sand (7.22m³), chippings (11.53m³), and gravels (13,581m³) may generate dust in the immediate environment. 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. The impacts of reduced ambient air quality will bear primarily on the workers; the effects on the communities will be negligible since all structures are about 150m from the road and as such less likely to be affected. 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.

Dousing of the active sections of the road with water at scheduled intervals (twice daily in the dry season) will be used to control dust. Speed of 40km/h when approaching the school area will be observed by construction vehicles. Drivers of vehicles that transport materials will be trained on impacts of dust. Speed ramps will be constructed at least 200m from either side of the road from the location of the school. PPEs such as nose masks and safety goggles shall be provided for all workers at project site.

Visual inspection of schools and farms within the project's area of influence will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

15.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of bulldozers and grader in clearing the 9.7km 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 the public would 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. The static machines will be sited at least 100m away from homes to reduce their impacts. 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.

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.

15.3.3 Impacts on Water Resources, Mitigation and Monitoring

Spot improvement works may result in deterioration in water quality of the two streams (namely Otowaraba and Bruku) The project, which will involve earthworks such as digging up silt from drains and excavation for culverts are likely to increase stream turbidity and siltation especially when done near the streams. Oil leaks, rubber and metal components resulting from machinery and vehicular wear and tear as well as human waste could end up contaminating the streams. The contractor will ensure that works around the streams are completed on schedule to prevent prolonged impacts. Toilets will be provided at the SO.

Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from the streams and will have spill containment structures such as drains, oil trap, sump and bins in the camp to prevent seepage of oil. Locations for heaping construction materials (e.g. sand and other aggregates) will not be less than 50m from water bodies and drainage channels. The provision of toilets and urinals will be at locations not less than 100m away from the stream and creeks.

The Site Engineer (SE) will be responsible to ensure observance and compliance by contractors. Monitoring will cover the following parameters:

- A separation distance of 50m for heaping construction materials from the stream and channels;
- Sites for fuelling of machinery and servicing of equipment located at a minimum distance of 100m from the stream and drainage channels;
- Embankment erection around fuelling and other liquid storage sites;
- Provision of toilets and urinal at locations not less than 100m away from the stream; and
- Adequate worker awareness on sanitation and measures to avoid water resource contamination.
- 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; and
- There will be weekly monitoring on the following relevant sources of impacts on the Otowaraba and Bruku 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.

15.3.4 Occupational Health and Safety Risks, Mitigation and Monitoring

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 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.

15.3.5 Potential Spread of HIV/AIDS Prevention 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 condition 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.

15.3.6 Waste Generation Issues, 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.

The waste management system will be monitored to ascertain its effectiveness and remedial measures introduced. Monitoring areas will include: segregation of waste, littering, state of the bins and toilets, compost making and use, workplace hygiene standards and the level of worker awareness. General sanitation will be monitored to verify if workers defecate in the surrounding area. Monitoring cover the following parameters and will have their frequency of monitoring being:

- 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.

15.3.7 Potential Road Diversion Impacts, Mitigation and Monitoring

Construction of 2 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 traveling 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 are:

- 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.

15.3.8 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;
- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

**ROAD IN THE (SOUTHERN)
VOLTA REGION**

16.0 SOGAKOPE GBENORKOPE - DZOGLENU REHABILITATION PROJECT

16.1 Project Environment

The project road is located in the South Tongu District, about 3km from Sogakope, the district capital. The road is 9.35km long with the following communities along the stretch: Sogakope, Gbenorkope, Detawoeme, Dzoglem, Agbonlikpota. There is a hotel (2m), Health Spa (100m), propose Nurses Training Site (10m) along the road.

The area is generally noted for agriculture - production of cassava and cash crops such as maize, mango, pineapple and rice. The Aka Lagoon is 10m wide crossing the road. The topography is generally flat.

16.2 Project Description

The state of the road is poor and has lost its camber and requires sectional gravelling. There was a rehabilitation works on the road in 2009. It is earth surface with low lying sections and water crossing. 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 rehabilitation work is to improve the road condition to reduce travel time and accidents and improving access to farming areas, schools, markets and health centres as well as interconnection between communities.

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

Table 16.1 Locations/Distances of Specific Works along the Project Road

	Specific Works	Location/Distance
1	Clearing	Km 0+000 – 9+350
2	Formation	Km 0+000 – 9+350
3	Construction of culverts	Km 0+000, 0+800, 1+200, 1+300, 2+300, 3+000, 3+220, 3+700, 4+900, 5+400, 5+700, 5+900, 6+000, 7+200, 7+750, 7+900, 9+050
4	Filling and gravelling	Km 0+000 – 9+350

Clearing involves weeding or savannah vegetation removal the along the corridor to widen the width of the road to 6.0m. It will also allow enough space for other works such as culverts construction. Formation works includes blading and drains. 700x900, 1/700x1200 and 2/700x900 types of new culverts will be constructed, 17 in number along the road. The sizes and numbers are as follows:

- a) 15 No. 700x900;
- b) 1 No. 1/900x1200;
- c) 1 No. 2/700x900.

Filling will be done mainly in the approaches of culverts and also 1.0km of gravel sub-base. The list of types and numbers of equipment/machinery to be used include:

- | | |
|---------------------------------------|--|
| 1No. Bulldozer D7 or equivalent, | 1No. Vibratory or Static roller (10 tonnes); |
| 1No. Motor Grader 140G or equivalent; | 1No. Pick-up; |

1No. Loader ;
 2No. Tipper trucks;
 1No. Water tanker (9000litres);

1No. Concrete mixer ; and
 2No. Vibrators

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

- | | |
|--|---|
| a) Portland cement (1,105 bags); | b) Coarse aggregates (14,818m ³); |
| c) Gravel (12,956 m ³); | d) Reinforcement rods (5.78 tonnes). |
| e) Fine aggregates (3,087m 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. The rehabilitation is expected to employ a workforce of thirteen (13) and implementation will take about 12 months.

16.3 Potential Impacts, Mitigation and Monitoring Measures

There was rehabilitation works on the road in 2009. The proposed rehabilitation works for the 9.35km stretch forms part of regular road works to improve accesses to Sogakope, Gbenorkope, Detawoeme, Dzogblem, Agbonlikpota communities.

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 potential adverse impacts will be few and localized due to the relatively small-scale nature of the project road (9.35km) activities. These will include:

- Potential air quality impacts;
- Water resource, erosion and flooding impacts;
- Potential increase in ambient noise and vibration;
- Potential spread of HIV/AIDS and STIs;
- Occupational health and safety concerns;
- Waste generation;
- Potential road diversion impacts and
- Temporary site office impact

16.3.1 Impacts on Water Resources, Mitigation and Monitoring

The rehabilitation works such as savannah clearing, formation, construction of culverts and filling and sectional re-gravelling of the 9.35km road may result in siltation of the Aka Lagoon resulting in deteriorating the water quality and modifications in the flow regimes especially during the rainy season.

Since the topography of the area is flat, run-off flow may increase heavily resulting in flooding and soil erosion, channel modification and siltation of the Lagoon. Other sources of water pollution may include chemicals (cement/concrete) spillage and contaminated run off from petroleum products used in servicing.

The contractor will ensure that works around the lagoon are completed on schedule to prevent prolonged impacts. Toilets will be provided at the SO.

Site for fuelling of machinery and servicing of equipment will be located at a minimum distance of 100m from the streams and will have spill containment structures such as drains, oil trap, sump and bins in the camp to prevent seepage of oil. Locations for heaping construction materials (e.g. sand and other aggregates) will not be less than 50m from water bodies and drainage channels. The provision of toilets and urinals will be at locations not less than 50m away from the stream and creeks.

The Site Engineer (SE) will be responsible to ensure observance and compliance by contractors. Monitoring will cover the following parameters:

- A separation distance of 50m for heaping construction materials from the stream and channels;
- Sites for fuelling of machinery and servicing of equipment located at a minimum distance of 100m from the stream and drainage channels;
- Embankment erection around fuelling and other liquid storage sites;
- Provision of toilets and urinal at locations not less than 100m away from the stream; and
- Adequate worker awareness on sanitation and measures to avoid water resource contamination.
- 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; and
- There will be weekly monitoring on the following relevant sources of impacts on the Aka Lagoon:
 - 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.

16.3.2 Noise and Vibration Impacts, Mitigation and Monitoring

The main sources of noise will be from the use of bulldozers and grader in clearing the 9.35km 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 health spa at Sogakope (about 100m away from the road) and the general public 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. The static machines will be sited at least 100m away from the health spa and homes to reduce their impacts. 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.

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.

16.3.3 Dust Generation and Air Quality Impact, Mitigation and Monitoring

Dust emission (PM₁₀) will be as a result of haulage, loading and unloading and heaping of construction materials such as sand, chippings and gravel. 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. These activities are potential sources of dust generation which could affect ambient air quality in nearby areas at Sogakope, Gbenorkope, Detawoeme, Dzoglem, Agbonlikpota communities and the workers. 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.

Dousing of the active sections of the road with water at scheduled intervals (twice daily in the dry season) will be used to control dust. Speed of 40km/h when approaching the school area will be observed by construction vehicles. Drivers of vehicles that transport materials will be trained on impacts of dust. Speed ramps will be constructed at least 200m from either side of the road from the location of the school. PPEs such as nose masks and safety goggles shall be provided for all workers at project site.

Visual inspection of schools and farms within the project's area of influence will be undertaken to ascertain effectiveness of water dousing. A log book will be kept for monitoring the regularity of vehicle and machinery servicing under the supervision of the Site Engineer. 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.

Records of all monitoring activities will be contained in a quarterly report to the District Engineer.

16.3.4 Occupational Health and Safety Risks, Mitigation and Monitoring

The use of moving machinery, working around unguarded parts of equipment and disregard for health and safety measures could result in injuries. 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.

The contractor shall pick 4 workers for training (by the health team) on first aid procedures. The first aid team will be in charge of educating their fellow workers on safety and first aid procedures. The contractor will also ensure enforcement of safety regulations on the operation of vehicles and machinery. PPEs such as nose masks, ear plugs, gloves, goggles and overalls will be provided for all works. Non-compliant staff will be appropriately reprimanded and subsequently a fine of GH¢5 and then outright dismissal. 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 daily 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 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.

16.3.5 Potential Spread of HIV/AIDS Prevention 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 condition 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 2 from the workforce while the nearby communities nominate 2 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 townfolk. 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.

16.3.6 Waste Generation, 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.

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

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

- 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.

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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;
- Agreement with the landowner to hand over the agreed structure to be erected to the landowner; and
- Agreement 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.

17.0 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.

17.1 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 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 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).

17.2 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.

17.2.1 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.

17.2.2 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.

17.2.3 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.

17.2.4 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.

17.2.5 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.

17.2.6 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.

17.2.7 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.

17.2.8 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.

17.3 Institutional Arrangements

The implementation of this ESMP requires the collaboration and involvement of the key institutions. The Figure 17.1 below illustrates the institutional roles and arrangement in the implementation of the ESMPs.

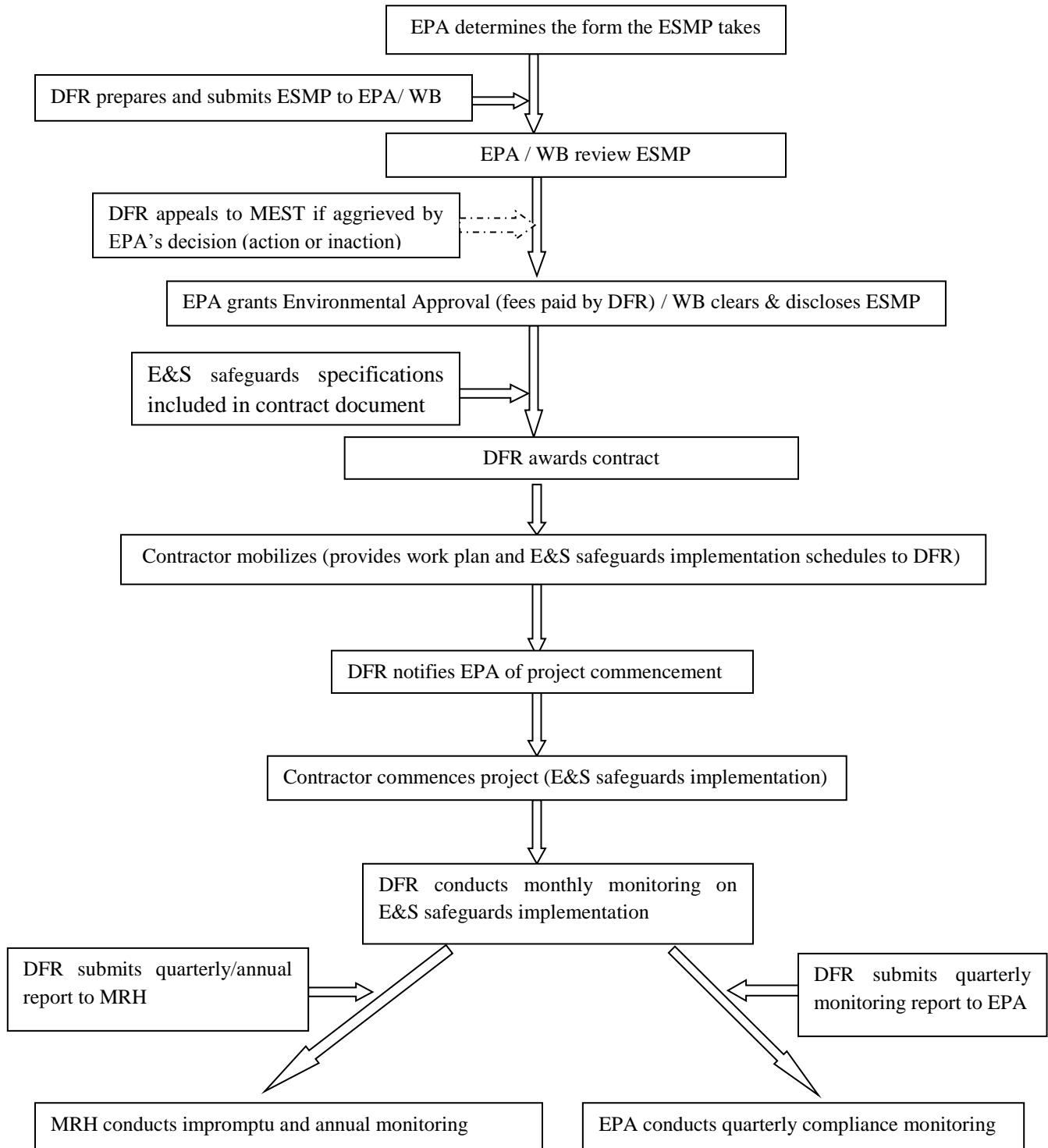


Figure 17.1 Institutional Arrangement Flow Chart

17.4 The 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.

17.4.1 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.

17.4.2 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.

17.4.3 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.

17.4.4 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.

17.4.5 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.

17.4.6 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.

17.4.7 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 caution and direct traffic; and
- All measures shall be monitored by Contractor to ensure effective implementation.

17.4.8 Temporary office site Reinstatement

The plan will require;

- Identification of site with no farmland with crops or physical assets;
- Seeking consent of land owner to erect the proposed site office; and
- Reinstatement of site and agreement to handover structure to the land owner;

Table 17.1 Summary of Environmental Management Plan

Management Area	Impact Areas	Mitigation/Monitoring Actions & Requirements	Implementation & reporting Schedule	Responsibility
Dust and Air Quality Management	<ul style="list-style-type: none"> • Dust generation due to construction activities 	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> • Siltation of water bodies resulting from excavation works and material deposition • Contamination of water by oil from vehicle 	<ul style="list-style-type: none"> ➤ 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	<ul style="list-style-type: none"> • Noise from machine clearing of vegetation • Culvert excavation, construction and other maintenance works • Concrete mixing machines 	<ul style="list-style-type: none"> ➤ Controlling exposure of workers to noisy and vibrating equipment ➤ Regulating distance of stationary noisy equipment from public places 	Daily Daily	Contractor/ SE

Occupational Health and Safety	<ul style="list-style-type: none"> • Accidents resulting in injury • Noise from machinery 	<ul style="list-style-type: none"> ➤ 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 	<ul style="list-style-type: none"> Bi-weekly Monthly Quarterly Weekly Daily 	Contractor/ SE
HIV/AIDS and STIs Management	<ul style="list-style-type: none"> • Spread of infection due to neglectful sexual attitudes 	<ul style="list-style-type: none"> ➤ HIV/AIDS and STIs Awareness workshops ➤ Provision of free condoms ➤ Peer group education 	<ul style="list-style-type: none"> Quarterly Weekly Twice monthly 	Contractor/ SE
Waste Management	<ul style="list-style-type: none"> • Indiscriminate waste dumping and defecation 	<ul style="list-style-type: none"> ➤ 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 	<ul style="list-style-type: none"> Daily Weekly Daily 	Contractor/ SE
Road diversion and traffic Management	<ul style="list-style-type: none"> • Risk of accidents to workers and general public 	<ul style="list-style-type: none"> ➤ Posting of traffic wardens to direct traffic flow ➤ Mounting of road signs ➤ Protecting actual working area with barricade ➤ Monitoring the implementation of all management measures 	<ul style="list-style-type: none"> Daily Daily Daily 	Contractor/ SE
Office site Reinstatement	<ul style="list-style-type: none"> • Effect on crops and physical asset 	<ul style="list-style-type: none"> ➤ Avoiding crops and physical assets ➤ Seeking land owner's consent ➤ Reinstating site and agreeing to handover structure 	<ul style="list-style-type: none"> Project commencement Project commencement Project completion 	Contractor/DE

17.5 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 the nearby communities.

The district engineers and contractors will require capacity building in the implementation of the projects' environmental and social safeguards and general project planning and management inter-faced with E&S components. 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 principles, standards and commitments. The construction workers and selected members of the project communities will undergo training on public awareness creation/educational techniques (on environmental, social and health issues) and first aid procedures.

17.6 ESMPs Implementation Budget

The cost estimates provided in the Table 17.2 is for the implementation of mitigation measures, monitoring plan and capacity building requirements.

Table 17.2 Proposed Budget for the ESMPs

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	<ul style="list-style-type: none"> Construction of embankments Construction of side drains with settling basins 	<ul style="list-style-type: none"> Limitation and containment of spilled fuel & oil at the sites Reduction of siltation in nearby water bodies 	• \$1000 per road	13,000
				• \$2000 per road	26,000
Sub-Total					39,000
2.	Dust and air quality	<ul style="list-style-type: none"> Water dousing & covering of sand (heaped and during transportation) Erection of road signals and ramps 	<ul style="list-style-type: none"> Reduction in dust generation Vehicular speed reduction leading to lowering dust generation 	• \$5000 per road	65,000
				• \$2000 per road	26,000
Sub-Total					91,000
3.	Public and occupational health and safety	<ul style="list-style-type: none"> Provision of additional PPEs (nose masks, gloves, ear plugs etc.) for workers Training for First Aid teams (materials, etc) Waste collection, segregation & disposal 	<ul style="list-style-type: none"> Reduction in the exposure of workers to hazardous conditions Quick & effective response to accidents Preventing waste littering & pollution 	• \$2000 per road	26,000
				• \$1000 per road	\$13,000
				• \$2000 per site office	26,000
Sub-Total					65,000
4.	HIV/AIDS	<ul style="list-style-type: none"> Awareness campaigns Distribution of condoms Training of peer group educators 	<ul style="list-style-type: none"> Reduction in the spread of HIV 	• \$2000 per road	26,000
Sub-Total					26,000
5.	Department of Feeder Roads (DFR)	<ul style="list-style-type: none"> Capacity enhancement in environmental and social safeguard principles implementation 	<ul style="list-style-type: none"> Training in environmental and social management for DEs (2 days for 13 persons) 	• \$ 100/p/d	2,600
6.	Contractors	<ul style="list-style-type: none"> Capacity building of staff in environmental & social management implementation 	<ul style="list-style-type: none"> Training in environmental and social management implementation for the 13 contractors. (1 SEs each) (2 days for 13 persons) 	• \$ 40/p/d	1,040

7.	Training Consultants		Training of DEs & SEs for a total of 4 days (by 4 Consultants including T&T, accommodation & meals)	• \$1,000/p/d	16,000
Sub-Total					19,640
TOTAL					240,640

18.0 PUBLIC CONSULTATIONS

In gathering information for the ESMPs for the selected roads a number of relevant stakeholders were consulted for their inputs. These stakeholders included the Ministry of Food and Agriculture (MoFA), Ministry of Health (MoH) and the Department of Feeder Roads (DRF) in selected districts. The responses provided by these stakeholders are summarised in Table 18.1 to Table 18.7 and Figure 18.1 to Figure 18.7 below:

Table 18.1 Responses from the Department of Feeder Roads (DFR) Mfantisman Municipal

	Name of Respondent(s)	Designation	Contacts
	Mr. Christian Kwaku Gameli	District Engineer	0208300364

Capacity Building		
No	Issues	Responses
1	How limiting and/or available is the capacity in the District Office to perform environmental monitoring and reporting?	<i>Capacity available among the District Engineer Currently District Engineer advises and checks Contractors on Environmental Compliance</i>
2	Is there any relationship between the district and the headquarters to monitor environmental and social safeguard issues?	<i>Yes, the district ensures that all tenders include adequate measures on environmental compliance and reported to the Regional officer and headquarters.</i>
3	What capacity needs would have to be built and what estimated budget would be required?	<i>Additional in-house capacity for the District Engineer is welcome Budget of about GH¢200 if training is to be conducted at Koforidua Centre for the Department.</i>



Figure 18.1 Consultation with the Department of Feeder roads, Mfantisman Municipality

Table 18.2 Responses from the Ministry of Food and Agriculture (MOFA), Mfantisman Municipal

	Name of Respondent(s)	Designation	Contacts
1	Madam Diana Isabella Appiah	Secretary/ Administrative Assistant	0276822163/ 02084369
2	Mr. John Kojo Baidoo	Agric Extension Agent	0242685231
3	Mrs. Justina Mireku	Accountant	0244171151

Importance of Road to Agriculture		
1	What is the use of the road in terms of agriculture?	<i>It serves an important route to transport fruits, Vegetable and other foodstuffs from farmer</i>
2	Does the current state good enough for the promotion of agriculture in the area?	<i>No, the road is so bad that it makes it hard for extension Services workers do effective work. Also farmers are not encouraged to produce crops in quantities for fear of crop spoilage especially pineapples.</i>
3	What other agriculture related problems are associated with the current state of the road?	<i>Farmers who borrow money for crop production fail to make profits to pay back debt discouraging them from farming activities.</i>
Benefits of the Road Rehabilitation to Agriculture		
1	What will be the immediate benefits of the rehabilitation of the road to agriculture?	<i>Ease transportation problems and reduce the cost the fruits and vegetable in the municipal and the country as a whole.</i>
2	What other benefits will it bring to the District MOFA?	<i>It will facilitate the agricultural extension services by the officers of the ministry.</i>



Figure 18.2 Consultation with MoFA, Mfantisman Municipality

Table 18.3 Responses from the Ministry of Health (MoH), Mfantisman Municipal

	Name of Respondent(s)	Designation	Contacts
1	Madam Stella Maria-Sackey	Deputy Director of Nursing Services	027425386
2	Mr. Isaac Awittor	Municipal Health Informer Officer	0244248442

Disease Prevalence		
1	What are the predominant diseases in the district?	<i>Malaria, Acute Resp. tract infection, Hypertension, Diarrhoea infections etc.</i>
2	How does the road contribute to health delivery?	<i>Used be health workers for immunization and educational programmes and other outreach services. Although the place has delivery centre, no delivery has be recorded in the facility in it because of the bad road.</i>
Importance of the Road Rehabilitation to Health Delivery		
1	What are the benefits of the road rehabilitation to health delivery?	<i>Will facilitate the establishment of Community Health Posts (CHPs), Smooth transportation of pregnant woman to the centre.</i>



Figure 18.3 Consultations with District Directorate of Health - Mfantisman Municipality

Table 18.4 Responses from the DFR, Awutu- Effutu Senya Municipal

	Name of Respondent(s)	Designation	Contacts
	Mr. Roland Abire	District Engineer	0205597272/ 0244467113

Capacity Building		
1	How limiting and/or available is the capacity in the District Office to perform environmental monitoring and reporting?	<i>Capacity available among the District Engineer Currently District Engineer advises and checks Contractors on Environmental Compliance. But because of the tight schedule, they are sometimes overlooked.</i>
2	Is there any relationship between the district and the headquarters to monitor environmental and social safeguard issues?	<i>Yes, the district ensures that all tenders include adequate measures on environmental compliance and reported to the headquarters.</i>
3	What capacity needs would have to be built and what estimated budget would be required	<i>Additional in-house capacity for the District Engineer is welcome Budget of about GH200 if training is to be conducted at Koforidua Centre for the Department. But the employment of an Environmental Expertise to handle this section of the work will be a better option.</i>



Figure 18. 4 Consultation with the DFR - Awutu-Effutu-Senya Municipality

Table 18. 5 Responses from the DFR, Dangme West District

	Name of Respondent(s)	Designation	Contacts
1	Mrs. Efua Akwetee-Mensah	Regional Operational manager	0244793054
2	Mr. Kakraba Jonas	District Engineer	0244743354

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?	<i>Yes, the district ensures that all tenders include adequate measures on environmental compliance and reported to the Regional officer and headquarters on these issues.</i>
3	What capacity needs would have to be built and what estimated budget would be required?	<i>Additional in-house capacity for the District Engineer is welcome Budget of about GH¢200 if training is to be conducted at Koforidua Centre for the Department.</i>



Figure 18. 5 Consultation with the Department of Feeder roads, Dangme West District

Table 18. 6 Responses from the Ministry of Food and Agriculture (MOFA), Dangme West District

	Name of Respondent(s)	Designation	Contacts
1	Mr. Jonathan K. Nartey	District Officer in Charge of Extension Services	0244895600

Importance of Road to Agriculture

1	What is the use of the road in terms of agriculture?	<i>It serves an important route to transport bananas from the Golden Exotic farm located along the stretch, Mangoes Vegetables and other foodstuffs like maize.</i>
2	Does the current state good enough for the promotion of agriculture in the area?	<i>No, the road is so bad that it makes it hard for extension Services workers do effective work. The transportation mangoes and bananas become a challenge, causing some spoilage cases.</i>
3	What other agriculture related problems are associated with the current state of the road?	<i>Farmers who borrow money for crop production fail to make profits to pay back debt discouraging them from farming activities.</i>
Benefits of the Road Rehabilitation to Agriculture		
1	What will be the immediate benefits of the rehabilitation of the road to agriculture?	<i>Ease transportation problems and reduce the cost the fruits and vegetable spoilage in the municipal..</i>
2	What other benefits will it bring to the District MOFA?	<i>It will facilitate the agricultural extension services by the officers of the ministry.</i>



Figure 18.6 Consultation with the MoFA, Dangme West District

Table 18.7 Responses from the Ministry of Health (MoH), Dangme West district

	Name of Respondent(s)	Designation	Contacts
	Dr Evelyn Ansah	Director, DHD	0244869700

Disease Prevalence		
1	What are the predominant diseases in the district?	<i>Malaria, Hypertension, Diarrhoea infections Acute Resp. tract infection etc.</i>
2	How does the road contribute to health delivery?	<i>Used be health workers for immunization and educational programmes and other outreach services. Health workers who are mostly women on motorbikes are usually afraid to visit these areas because of the state of the roads for fear of accidents.</i>
Importance of the Road Rehabilitation to Health Delivery		
3	What are the benefits of the road rehabilitation to health delivery?	<i>Will facilitate the establishment of Community Health Posts (CHPs), and allow health workers visit these areas. Smooth transportation of pregnant woman to the centre.</i>



Figure 18.7 Consultation with Ministry of Health (MoH), Dangme West District

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APPENDICES

APPENDIX I

Guidelines for Conducting Individual Road Project Assessment

A. Project Description

	Project Features	Responses
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	Objectives of the proposed road works	
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 equipment/machinery to be used	
14	Workforce (numbers)	
15	Type of raw materials and sources (e.g. aggregates/gravels, etc) and distance from the project road	
16	Estimated quantities of raw materials	
17	Duration of the road works	
18	Type of waste (substances) to be generated	
19	Work/ site (area) and facilities to be provided	

B. Project Corridor and Adjoining Area (Baseline) Information

	Baseline Features	Responses
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/resources 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 (rivers, streams, creeks, etc) and drainage channels crossing the road	
6	Names of the water bodies (if known), indication of size and seasonal flow pattern (e.g. extent of flooding)	
7	Elevation and topography of the area – corridor (e.g. flat, hilly, valley, undulating, flood plain)	
8	Existing conditions at potential burrow pit area (vegetation, farms, etc)	
9	Regional baseline information on feeder roads	
10	Any characteristics of feeder roads common or peculiar to the Region	
11	State of feeder roads – statistics	
12	Importance of feeder roads to Districts and the Region	

C. Potential Impacts (Environmental & Social) of the Project (Road Works & Burrow Pits)

1 Air Quality - Will the proposed Project:

- i. Emit during construction

Dust <input type="checkbox"/>	Smoke <input type="checkbox"/>	VOCs <input type="checkbox"/>
-------------------------------	--------------------------------	-------------------------------
- ii. Expose workers or the public to substantial emissions? Yes No
- iii. Result in cumulatively increased emissions in the area? Yes No
- vi. Create objectionable odour affecting workers/people? Yes No

2 Biological Resources - 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 or organisms? Yes No
- vi. Be located within 100m from an 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 archeological 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 <input type="checkbox"/>	Liquid with oily substance <input type="checkbox"/>
Liquid with human or animal waste <input type="checkbox"/>	Liquid with odour/smell <input type="checkbox"/>
- ii. Lead to changes in the drainage pattern of the area, resulting in erosion or siltation? Yes No
- iii. Lead to increase in surface run-off, which could result in flooding on or off-site? Yes No
- iv. Increase runoff, 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 Farms, Houses and Community Property - Will the proposed 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 property/facility/resource?
- xi. In which communities and at what chainage/mileage?

APPENDIX II

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 its 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 district Engineer (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 site 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 sites 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. b) 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.