

ENVIRONMENTAL IMPACT ASSESSMENT STUDY AND
MITIGATION PLAN

FOR

CONSTRUCTION OF A CARGO STORAGE WAREHOUSE
AT FREETOWN INTERNATIONAL AIRPORT, LUNGI

BY

SKY HANDLING PARTNERS

January 2012

EXECUTIVE SUMMARY

Sky Handling Partners (SHP) is a Sierra Leonean registered private company that has a concession agreement with Sierra Leone Airports Authority (SLAA) to provide aviation ground handling services at the Freetown International Airport (FNA) in Lungi. SHP has secured funds and is desirous to invest part of the funds towards the cost of the construction of cargo storage warehouse facility at FNA. The overall objective of the investment is to improve upon the cargo handling and storage facilities at FNA.

FNA is the only gateway to Sierra Leone by air and it is located in Lungi, Kaffu Bullom Chiefdom, Port Loko District. Lungi is separated from the capital city, Freetown by the Sierra Leone River, which stretches about nine nautical miles between Tagrin and Kissy where ferry landing facilities are located.

The infrastructural development envisaged in this component of the project includes the following;

- Construction of cargo warehouse and associated facilities
- Provision of vehicles parking facilities

Noting that the execution of the above construction works will have both positive and negative impacts on the environment, this environmental impact assessment study, which is part of the detailed design studies for the construction of the cargo warehouse facilities and car park, is conducted to assess the environmental impacts of the project so as to develop an environmental management and mitigation plan which should be cost effective and realistic to be implemented alongside the construction work.

The environmental Impact assessment (EIA) study is done by carrying out the following tasks of the assignment:

- Description and quantification of the effects of the project on the natural resource and the human environment.
- Assessment of impacts due to construction and maintenance especially the pollution of ground water and surface water within drainages and rivers.
- Assessment of all social issues; including legal implications, for example compensation for involuntary displacement, land lost, housing, land, etc.
- Assessment of the project interference with human settlements.

The EIA was carried out taking into consideration Sierra Leone's Environmental Protection Agency's legislation and regulations and other international environmental regulations relating to the project. Furthermore, prevailing demographic, environmental and social issues pertaining to the project locations were analyzed to determine the magnitude of the impact of

the project on the socio-economic development of the project locations and the country as a whole.

The adverse environmental and social issues relating to implementation of the project with reference to the TOR identified are as follows;

- Air Pollution
- Ground and surface water contamination and alteration of water table
- Coastline erosion from sand mining
- Loss of soil resources, vegetation cover and sedimentation
- Changes in land use and topography
- Noise pollution

The mitigating measure recommended for the above environmental impacts are as follows:

Air Pollution Mitigation Measures

The spraying of water around the areas of the construction site, borrow pits and quarry during construction work must be done to mitigate the escape of dust particles to the atmosphere. The process of spraying water should be carried out at least three times on every construction day especially if construction work is carried out during the dry season. Haulage trucks must be covered or the aggregates sprayed with water before loading the haulage trucks.

Ground and Surface Water Contamination Mitigation Measure

Removal of soil vegetative cover should be kept at minimum and should only be carried out with absolute necessity. The development of the landscape and planting of trees and vegetative cover should be carried out after construction work. To avoid oil contaminant into water bodies, a system for the proper collection and disposal of lubricants at both site and maintenance depot should be maintained. In the absence of a sewage system, septic tanks or pit latrines should be located far away from ground water aquifers. The constant monitoring of ground and surface water quality should be maintained.

Coastline Erosion Mitigation Measure

To mitigate the erosion of the coastline from sand mining along the Lungi shoreline, the mining of sand along the residential areas should be discontinued. This activity is to be remotely relocated to places away from developed areas. The identification of shallow areas requiring dredging should be undertaken so that sand mining on those areas will be a win-win situation.

Mitigation Measure against Changes in Land Topography

The mitigation measure against changes in the topography of the land is geared towards minimizing the changes in the natural drainage pattern of the surrounding areas. To ensure this, the changes in the topography of the land should be kept at minimum. Otherwise, the restoration of the natural drainage of the site relating to the surrounding areas should be restored after construction.

Mitigation Measure against Noise

Mitigation measure to reduce noise around the vicinity of the site is geared towards ensuring that surrounding inhabitant and people working in offices around the site are not adversely affected by noise due to the activities at the construction sites, quarry and borrow pit areas. The proposed quarry and borrow pit areas to be used for the extraction of aggregates for construction work is remotely located away from residential and office areas. However, due to artisanal extraction of aggregates by locals, a few shanty dwellings are erected some 100 meters radius away from the quarry site. Therefore the following measures are deemed to mitigate the impact of noise to the surrounding environment.

- Fitting proper mufflers to vehicles and construction equipment to minimize noise pollution.
- Sensitization and discussion with residential and office workers around the sites about the working hours and the impact of noise.
- The use of hearing protection gears by workers when exposed to noise levels above 85 dB(A)
- Construction and haulage activities to be limited to daytime.

Socio-Economic Impacts of the Projects

Positive socio-economic development especially relating to the development of the inbound and outbound cargo activities within the transport sector and the stimulation of private sector participation in the transport sector development are deemed to be achieved from the implementation of the project.

On the other hand, adverse social issues due to the implementation of the project such as the risk of the spread and contamination of HIV-AIDS and other sexually transmitted diseases and unwanted pregnancies were identified. However, the sensitization of workers for the use of appropriate preventive measures such as abstinence and the use of condoms by workers are recommended as appropriate management tools to be implemented by the Contractor.

The following is proffered as a plan deemed appropriate and cost effective in managing the adverse environmental and social impacts.

Requirements for Contractor Facilities, Plant and Operations

Any facilities installed by the Contractor for the purpose of conducting construction works should meet appropriate standards of responsible environmental management and safety practice. These include:

- a) Legally approved and environmentally acceptable extraction of materials from any borrow pits or quarries with proper restoration.
- b) Minimal clearance of natural vegetation and interference with natural drainage flows, avoidance of any significant degradation of freshwater.
- c) Environmentally sensitive location of temporary construction yard sites and space for plant and materials storage.
- d) Safe location and protection of fuel facilities, safe storage of hydrocarbons and other chemicals, re-use/disposal of used oil at approved sites.

- e) Adequate facilities for collection and treatment of wastewater (as required), storage and legal disposal of general construction waste, solid waste, chemicals etc.
- f) Appropriately restored and unencumbered work sites, yards, camps and other facilities at project completion.

Requirements at Contractor Work Sites

At all times Contractors should be required to conform to the following particular stipulations in implementing construction works:

- (a) There should be clear demarcation of the extent of Contractor's work sites including areas for material storage, working yards and plant storage.
- (b) Health and safety equipment (including protective clothing and boots) should be available and in use at work sites and construction facilities/camps. First Aid boxes will be mandatory at all sites.
- (c) Fuel storage sites should be bonded by breams so as to confine and mitigate the effects of spillage. The capacity of the confined area to be 100% of volume of fuel stored and protected from rainwater.
- (d) Discharge of dust and fumes should be minimized and there should be no burning of toxic substances.
- (e) Noise abatement on construction sites should minimize avoidable inconvenience to local populations.
- (f) Dump trucks should be equipped with devices to prevent material spillage and roads should be kept clean of mud and construction debris.
- (g) There should be no disposal of non-biodegradable materials on site without the expressed permission of the Supervising Engineer's Representative (SER) or local authorities. Oil collection traps should be in use in workshop areas.
- (h) There should be no removal of sand or dredged material without an official mining permit and written approval of the SER.
- (i) Used oils should be containerized and transported to an approved local agent for safe disposal or transported with other scrap equipment to an approved facility elsewhere.
- (j) There should be no disposal of material in environmentally sensitive areas, e.g wetlands, protected vegetation, and the marine environment.
- (k) Spoil should be removed to licensed/permitted sites only.
- (l) The contractor should remove all construction equipment and scrap waste from his sites on completion.

Health and Safety Management

During the construction period there should be opportunities to increase awareness of health and safety issues and implement appropriate standards of performance. Occupational and environmental health in and around the contractor's camps and facilities should be subject to such scrutiny. It should be a requirement that the contractors supervising foremen will have basic First Aid training which should be available from hospitals and medical NGOs. There should also be plans for coping with emergencies. A fully stocked First Aid kit (and set of emergency numbers) will be available at each worksite and workshop.

Appropriate safety protection equipment should be worn at all workshops, yards and construction sites to conform with national regulations and/or as specified by the Supervising

Engineer's Representative. Protective equipment includes hard boots and hats, protection for eyes and ear muffers (when using pneumatic drills, grinders, etc.). Likewise fire prevention measures should be in place, including the deployment of adequate functional extinguishers and simple dry sand buckets. The project monitoring programme should include inspection of safety equipment use.

Basic hygiene standards should be required at all residential and other contractor facilities, with proper approved waste disposal arrangements. HIV Aids awareness development and disease spread mitigation should be fostered by the contractor among his staff. Contact with a appropriate specialist to conduct basic training and awareness among workers should be facilitated.

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1.0 INTRODUCTION

1.1 Project background

Sky Handling Partners is a Sierra Leonean registered company engaged in the provision of aviation ground handling services at the Freetown International Airport. SHP has secured funds and is desirous to invest in the construction of cargo warehouse facility at FNA. The objective of the investment is to provide the much needed infrastructural facility for cargo activities at FNA.

Freetown International Airport is the only gateway to Sierra Leone by air and it is located in Lungi, Kaffu Bullom Chiefdom, Port Loko District. Lungi is separated from the capital city Freetown by the Sierra Leone River (SLR), which stretches about nine nautical miles between Tagrin and Kissy where ferry landing facilities are located. The Airport is accessible from Freetown by the means of vehicular ferries at Kissy in the eastern part of the Freetown, and at Government Wharf and the central parts of the capital city.

Cargo haulage by air serves as one of the key activity in the aviation industry in Sierra Leone. This is due to the fact that a substantial percentage of the import of goods into Sierra Leone is done by air through cargo services. The existing facilities at the Freetown International Airport (FNA) are old and cannot meet the current and medium term needs for cargo handling and storage. Therefore the need to develop the capacity of FNA to meet the demands of cargo handling and storage facilities cannot be overemphasized.

This environmental impact assessment study, which is part of the detailed design studies for the construction of the cargo storage and handling facility, is conducted to assess the environmental impacts of the project so as to develop an environmental management and mitigation plan to be implemented alongside the construction work. Cost effective recommendations will be made for appropriate mitigation measures towards minimizing the environmental impacts.

1.2 Brief of Environmental Impact Assessment (EIA) Study

The environmental Impact assessment (EIA) study is done by carrying out the following tasks:

- Description and quantification of the effects of the project on the natural resource and the human environment.
- Assessment of impacts due to construction and maintenance especially the pollution of ground water and surface water within drainages and rivers.
- Assessment of all social issues; including legal implications, for example compensation for involuntary displacement, land lost, housing, land, etc.
- Assessment of the project interference with human settlements

The environmental management and mitigation measure is conducted by carrying out the following task;

- Recommendation of feasible and cost-effective measures to prevent significant impacts to an acceptable level.
- Development of a work programme to implement the mitigation measures
- Monitoring of implementation of the mitigating measures.

1.3 Methodology Adopted

Observation on the physical environment at the project site was carried out with the other members of the study team. Secondary data on policy issues relating to environmental protection in Sierra Leone were collected to quantify the nature and magnitude of environmental impacts envisage from construction activities, and to analyze how the impacts relates within the context of the legislation and policy matters.

1.4 Environmental Regulations and Policies

The Environmental Protection Act of 2000 enacted by the parliament of the Republic of Sierra Leone requires that an EIA should be conducted for projects of civil engineering nature such as this one. The rationale of carrying out an EIA is to identify the environmental impacts of the project work so that appropriate mitigation measures are implemented to reduce/eradicate the impacts. The study will also enhance the issuance of an environmental permit for the implementation of the project. In the absence of environmental regulations of the funding agency of the project, the environmental assessment undertaken in this study is therefore largely based on the regulations of the Sierra Leone Environmental Protection Agency.

1.4.1 Nature and Magnitude of Environmental Issues

Potential impacts from construction works may include dust generation, air pollution, and ground water pollution, noise, loss of soil resources and vegetation, sedimentation and changes in land use and topography at the sites and around the quarry and borrow pit environment.

1.4.2 Classification of Project with Respect to Environmental Impacts

The Environmental Protection Act 2000 of Sierra Leone which saw the establishment of the National Environmental Protection Board established criteria for the classification of projects with regards to their environmental impacts. With reference to the criteria, this project falls under the classification of category B; projects' requiring limited environmental analysis.

1.5 Nature and Magnitude of Social Issues

The nature of the social issues investigated includes land use activities within and around the project sites, legal implications in acquiring the project sites and compensation for involuntary resettlement. The magnitude of the issue of compensation for involuntary resettlement at the project site is insignificant since the site is a private property specifically planned for the

construction of cargo warehouse facility. The magnitude of the legal implications in the acquisition of the site is also estimated to be moderate since the land required for the project is property of the Sierra Leone Airports Authority.

2.0 POLICY, LEGAL AND ADMINISTRATIVE FRAMEWORK OF ENVIRONMENTAL ISSUES

2.1 National Legislation

The following Acts pertinent to the study were analyzed in order to comply with legal and policy regulations related to the environmental and social impact assessment and to propose a mitigation and management. These include;

- The Environmental Protection Act -2000
- The Sierra Leone Airports Authority Act - 1988

2.1.1 The Environmental Protection Act - 2000

The enactment of the Environmental Protection Agency (EPA) Act of 2000 by the parliament of Sierra Leone brought into law regulation and policy framework for the protection of the environment. The act brought about the establishment of the National Environmental Protection Board (NEPB) which supervises the activities of EPA. Among the main objectives of the Board is to ensure that an EIA is conducted for all projects including civil engineering projects proposed to be implemented. The NEPB is further empowered to issue environmental permits to projects implementation who's EIAs has been conducted and for the mitigation and management plan to be implemented alongside the project implementation phase. The Board is also required to prescribe environmental regulations and standards relating to water and air quality, pollution control and the monitoring of environmental issues in Sierra Leone.

2.1.2 The Sierra Leone Airports Authority Act

The Act of Parliament that establishes the Sierra Leone Airports Authority (SLAA) is very silent on environmental issues within the vicinity of the operational areas of SLAA. However, SLAA's mission statement mandates SLAA to utilize resources with minimal impairment to the environment. The Act on the other hand outlines the management responsibilities of SLAA over FNA and all other infrastructural facilities at FNA and Hastings Airfield. Noting that SLAA is charged with the responsibilities of managing these facilities, it can also be inferred that the management of environmental issues are within the management responsibilities of SLAA. However, FNA being a member of Airports Council International is also subject to environmental regulations prescribed in Annex 16 of International Civil Aviation Organization's (ICAO) standards and recommended practices for International Airports. However, ICAO's Annex 16 details environmental regulations related to aircraft noise and aircraft engine emissions, while the implementation of this project relates to environmental impacts from construction work.

In view of the literature review of EPA and SLAA Acts, this study will focus mainly on EPA's regulations for the issuance of the necessary environmental permit for the construction work.

3.0 BASELINE STUDY

3.1 Population and Geographical Context

The population of Sierra Leone is estimated to be 5.2 million (World Bank, 2002) with a population growth rate of 2.216% and a total land area of 72,000 square kilometers. The population is relatively young; 15.3 percent are aged under 5 years, 41.7 percent aged 0-14 years, 53.9 percent aged 15-64 years, and only 4.4 percent aged 65 years and over. The country is subdivided into four administrative regions of North, South, East and West. Each region is divided into districts and each district is further subdivided into chiefdoms. Two of the three project sites are located in the western region and in the Urban District while the third is located in the Northern Province, Port Loko district, Kaffu Bullom Chiefdom.

The western region is observed to be the most populated of all the regions especially so when it served a safe haven for most people that lived in other regions of the country that was severely affected by instability during the civil conflict that ended in 2002. However, most of these people that came to the western area during the conflict are still finding it very difficult to return to their homes due to the lack of infrastructural facilities in most regions of the country.

Though the western area is the most populated, most people living in the western area may not be privilege to use the facilities of the project since the project infrastructure will mostly be used by cargo activities at the International Airport in Lungi.

3.2 Coastal Ecosystem and Sierra Leone River Estuary

The Sierra Leone climate traditionally is a two seasonal climate of wet and dry season, though specifically the coastal parts of the country are a monsoon climate, dominated by northeast trade winds. During the months of December to march, dry-cold winds blow from the Saharan towards the sea. These winds are very dry and brings with it dust particles and very little rains. Another season commonly referred to monsoon occurs between the months of June to October. During this season, southwesterly winds prevail, bringing humidity and regular rainfall from the Atlantic ocean towards the coast. The annual average rainfall in the country within the last five years exceeds 400mm with major fluctuations in rainfall intensity and traditional occurrence in the year. The average annual temperature is about 26.5°C. The maximum outdoor temperature is 40°C while the minimum outdoor temperature is 15°C.

Inland, the catchment area of the Sierra Leone River stretches to the Sierra Leone border with Guinea with a total area of approximately 10,000 square kilometers including Rokel and Seli rivers. During the monsoon season, river flows are generally high carrying with it huge amount of suspended sediments towards the Sierra Leone River estuary and adjacent coastal areas. The salinity of the surface water in the estuary is relatively low during the period of the monsoon season and very High River flows. Vertical salinity variations occur during the wet season, however due to the prevalence of high tidal flow velocities, it is very unlikely for stratification with distinct bottom and surface layers to occur. Tides at the Sierra Leone River vary between 1-3 meters between seasons.

SLR estuary bed generally consists of unconsolidated mud, silt and sand. The bed material normally is exposed to rapid redistribution due to the tidal streams and variations in the river outflows. The river turbidity varies along seasonal periods. Turbidity is greatest in the rainy season with low river flows carrying fine sediments, while it is low in the dry season but with very high flow velocities. Downstream, SLR coastal areas are bordered by extensive areas of low tidal mangroves while upstream; the river is boarded by the Freetown peninsula. Off the SLR estuary and towards north, the river is dominated by mud banks, mangroves, swamps and low laying lands with very shallow coastal waters. Towards south, the where the river empties into the Atlantic Ocean, the coastline is bordered by alternating rocks and sandy beaches all around the Freetown peninsula mountains.

Along the coastline of the Freetown Peninsula Mountains a relatively deep natural channel with water depths exceeding 12m is the connection point of the river estuary with the Atlantic Ocean. The natural deepness of the point where the river meets the Atlantic Ocean is exploited to for the location of the Queen Elizabeth II Quay which serves as the sea port of the country. The bordering mangroves of the river estuary are a very productive ecosystem which serves as a very rich habitat for many species of plants, fish, birds and other organisms. The mangrove condition of the river holds very huge potentials for aquaculture.

3.3 Social Context

The United Nations Human Development Index (UNHDI) Report of 2008 and 2009 classified Sierra Leone at the bottom the Index; the classification implies that the country is the poorest among the countries that were classified. Although the country now enjoys some semblance of stability after the end of the civil conflict in 2002, social issues still looms abound with majority of the population living in abject poverty. The provisions of basic social and infrastructural services for improved living standards such as water, housing, roads, electricity, and education are very limited. Apart from a life expectancy of 39 years according to the UNHDI report, infant mortality is very high, though the introduction of free medical services and drugs for pregnant women, children under 5 years old and lactating mothers in April 2010 is expected to alleviate the infant mortality rate.

Furthermore, formal employment opportunities are very limited. Most people especially the young people who form a huge percentage of the population are not engaged in any means of income generating activities for their livelihoods. This is partly due to the fact that private sector investments which create employment opportunities are very minimal. This project is formulated to create an enviable infrastructural capacity for cargo activities at the International Airport in Lungi in particular and the country in general. One of the objectives of the project is to provide basic infrastructures needed to stimulate private sector investment that is expected to usher in employment opportunities for improved livelihoods of Sierra Leoneans. Means of livelihoods for people is expected to alleviate poverty and hence improved standard of living.

4.0 STRATEGIC ENVIRONMENTAL AND SOCIAL IMPACTS

The strategic environmental and social issues discuss in this section are those envisage from the activities of construction work for the cargo and warehouse facilities.

4.1 Environmental Issues

The development of civil engineering infrastructures such as warehouse and car park are expected to have both direct and indirect impacts on the natural environment. This is because the implementation of the project changes the land use pattern and the natural dimension of the surrounding environment. However, the potential environmental impacts from the construction of the facilities can be that due to the following;

4.1.1 Air Pollution

Air pollution from dust particles is a potential environmental impact from the implementation of the project. The removal of the surface layers of the soil will generate dust particles during the clearing of the site for the terminals, car parks and at the quarry and borrow pits. The generated dust particles will pollute the atmosphere and if inhaled will lead to related health hazards for workers and the surrounding people resident at close proximity to the sites. Furthermore, the dust particles will cause dirt on the surrounding buildings and may cause further destruction to equipment such as computers if the dust settles on the equipment.

4.1.2 Ground and Surface Water Contamination and Alteration of Water Table

Excavation for construction work at the site and blasting at the quarry and borrow pits and improper disposal of solid waste may cause dissolved impurities such as arsenic in the soil and solid waste to contaminate ground water aquifers and surface water bodies. Additionally, other impurities such as oil spills from operational equipment may contaminate surrounding surface water such as streams, which may destroy aquatic organisms and the surrounding ecosystem. Contaminated ground and surface water holds potential health hazards if the contaminated water is exploited for drinking purposes. Additionally, the construction of the warehouse on natural ground surface may cause depression of the water table around the area of construction.

4.1.3 Coastline Erosion from Sand Mining

The construction of the infrastructural facilities of this project requires huge volume of concrete works for which sand is a major material to be used in the production of concrete. The traditional practice of mining sand in Lungi is along the coastline. This has caused the erosion of the coastline and has resulted into the loss of substantial amount of land to the sea. This project is expected to contribute to that loss since the amount of sand required for the production of concrete will be mined along the coast of the Lungi.

4.1.4 Loss of Soil Resources, Erosion and Sedimentation

Construction activities and aggregates mining at the quarry and borrow areas will have negative impacts on soil resources due to the removal of topsoil and other layers of the soil causing loss

of vegetation cover and soil erosion. Additionally, sedimentation of the eroded soil can occur if the eroded soil is carried into nearby water bodies.

4.1.5 Changes in Land Use and Topography

The implementation of the project has the potential to change the topography of the land on which the facilities are constructed and may also disrupt the natural drainage of the area and surrounding areas to the site. This is because the construction of the facilities includes cut and fill earthworks. The cut and fill works will normally change the natural topography of the land which will result in a disruption of the natural drainage of the land and the surrounding vicinity.

4.1.6 Noise Pollution

Construction and vehicular activities at the site and along the haulage route, blasting at the quarry and borrow areas can cause noise pollution to surrounding offices and residential areas. This may cause related health hazards and distress and nuisance to the surrounding residents, workers and people working in offices around the site, quarry and borrow pit areas.

4.2 Social Impacts

The provision of the infrastructural facilities to be constructed in this project is expected to have both positive and negative impacts on the socio-economic development of the project areas and the country in general.

4.2.1 Socio-economic Development

The construction of the infrastructures will have both direct and indirect impacts on the economic development of the country. Directly, the infrastructures are expected to provide services needed to ease the means of handling and storage of cargo entering and leaving the country. Indirectly, the project is expected to stimulate the participation of private businesses to participate in the transport sector development. Private investments will create employment opportunities which will ultimately create income opportunities and alleviate poverty and consequently improve standard of living of the people.

5.0 ENVIRONMENTAL AND SOCIAL MITIGATION AND MANAGEMENT PLAN

5.1 Environmental Management

Traditional construction environmental mitigation and management including awareness building for health and safety at work sites are regarded as significant adverse environmental impacts mitigation measures. There are obvious advantages to ensuring construction sites and borrow pits are properly managed and the surrounding environment is properly restored after construction work, that erosion is mitigated, and that there is limited off site pollution. These measures can be very effective in mitigating environmental impacts for sustainable infrastructural and economic development. The following measures geared towards environmental mitigation and management is recommended to be implemented during and after construction work to address the various impacts highlighted in section 4.0 to 4.16.

5.1.1 Air Pollution Mitigation Measures

The spraying of water around the areas of the construction site, borrow pits and quarry during construction work must be done to mitigate the escape of dust particles to the atmosphere. The process of spraying water should be carried out at least three times on every construction day especially if construction work is carried out during the dry season. Haulage trucks must be covered or the aggregates sprayed with water before loading the haulage trucks.

5.1.2 Ground and Surface Water Contamination Mitigation Measure

Removal of soil vegetative cover should be kept at minimum and should only be carried out with absolute necessity. The development of the landscape and planting of trees and vegetative cover should be carried out after construction work. To avoid oil contaminant into water bodies, a system for the proper collection and disposal of lubricants at both site and maintenance depot should be maintained. In the absence of a sewage system, septic tanks or pit latrines should be located far away from ground water aquifers. The constant monitoring of ground and surface water quality should be maintained.

5.1.3 Coastline Erosion Mitigation Measure

To mitigate the erosion of the coastline from sand mining along the Freetown Peninsula, the mining of sand along the residential areas should be discontinued. This activity to be remotely relocated to places away from developed areas. The identification of shallow areas requiring dredging should be undertaken so that sand mining on those areas will be a win-win situation.

5.1.4 Mitigation Measure against Changes in Land Topography

The mitigation measure against changes in the topography of the land is geared towards minimizing the changes in the natural drainage pattern of the surrounding areas. To ensure this, the changes in the topography of the land should be kept at minimum. Otherwise, the restoration of the natural drainage the site relating to the surrounding areas should be restored after construction.

5.1.2 Noise Mitigation Measure

Mitigation measure to reduce noise around the vicinity of the site is geared towards ensuring that surrounding inhabitant and people working in offices around the site are not adversely affected by noise

due to the activities at the construction sites, quarry and borrow pit areas. The proposed quarry and borrow pit areas to be used for the extraction of aggregates for construction work is remotely located away from residential and office areas. However, due to artisanal extraction of aggregates by locals, a few shanty dwellings are erected some 100 meters away from the quarry site. Therefore the following measures are deemed to mitigate the impact of noise to the surrounding environment.

- Fitting proper mufflers to vehicles and construction equipment to minimize noise pollution.
- Sensitization and discussion with residential and office workers around the sites about the working hours and the impact of noise.
- The use of hearing protection gears by workers when exposed to noise levels above 85 dB(A)
- Construction and haulage activities to be limited to daytime.

6.0 STRATEGIC ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

6.1 Overview of Critical Issues

Key issues for environmental management on works will be in day to day contractor environmental performance at work sites and at the contractor's workshops. The major concerns will be in the areas of health and safety, pollution mitigation and natural resource conservation.

Detailed contractual requirements are proposed in the Appendices to this plan. However the main stipulations are covered below. Most important is environmental awareness of the contractor's staff and sensitivity in the way that operations are undertaken. There are no serious inherently negative impacts which cannot be avoided or mitigated by careful environmental supervision assisted by environmental monitoring.

Throughout the period of construction, site inspections will need to be made to monitor the effectiveness of environmental protection measures, as well as to check that no previously unforeseen impacts are occurring.

In terms of design, the most significant issues could be at the planning phase for the disposal and reuse of waste materials.

6.2 Requirements for Contractor Facilities, Plant and Operations

Any facilities installed by the Contractor for the purpose of conducting construction works should meet appropriate standards of responsible environmental management and safety practice. These include:

- a) Legally approved and environmentally acceptable extraction of materials from any borrow pits or quarries with proper restoration.
- b) Minimal clearance of natural vegetation and interference with natural drainage flows, avoidance of any significant degradation of freshwater.
- c) Environmentally sensitive location of temporary construction yard sites and space for plant and materials storage.
- d) Safe location and protection of fuel facilities, safe storage of hydrocarbons and other chemicals, re-use/disposal of used oil at approved sites.
- e) Adequate facilities for collection and treatment of wastewater (as required), storage and legal disposal of general construction waste, solid waste, chemicals etc.
- f) Appropriately restored and unencumbered work sites, yards, camps and other facilities at project completion.

6.3 Requirements at Contractor Work Sites

At all times Contractors should be required to conform to the following particular stipulations in implementing construction works:

- (a) There should be clear demarcation of the extent of Contractor's work sites including areas for material storage, working yards and plant storage.
- (b) Health and safety equipment (including protective clothing and boots) should be available and in use at work sites and construction facilities/camps. First Aid boxes will be mandatory at all sites.
- (c) Fuel storage sites should be bonded by breams so as to confine and mitigate the effects of spillage. The capacity of the confined area to be 100% of volume of fuel stored and protected from rainwater.

- (d) Discharge of dust and fumes should be minimized and there should be no burning of toxic substances.
- (e) Noise abatement on construction sites should minimize avoidable inconvenience to local populations.
- (f) Dump trucks should be equipped with devices to prevent material spillage and roads should be kept clean of mud and construction debris.
- (g) There should be no disposal of non-biodegradable materials on site without the expressed permission of the Supervising Engineer's Representative (SER) or local authorities. Oil collection traps should be in use in workshop areas.
- (h) There should be no removal of sand or dredged material without an official mining permit and written approval of the SER.
- (i) Used oils should be containerized and transported to an approved local agent for safe disposal or transported with other scrap equipment to an approved facility elsewhere.
- (j) There should be no disposal of material in environmentally sensitive areas, e.g wetlands, protected vegetation, and the marine environment.
- (k) Spoil should be removed to licensed/permitted sites only.
- (l) The contractor should remove all construction equipment and scrap waste from his sites on completion.

6.4 Health and Safety Management

During the construction period there should be opportunities to increase awareness of health and safety issues and implement appropriate standards of performance. Occupational and environmental health in and around the contractor's camps and facilities should be subject to such scrutiny. It should be a requirement that the contractors supervising foremen will have basic First Aid training which should be available from hospitals and medical NGOs. There should also be plans for coping with emergencies. A fully stocked First Aid kit (and set of emergency numbers) will be available at each worksite and workshop.

Appropriate safety protection equipment should be worn at all workshops, yards and construction sites to conform with national regulations and/or as specified by the Supervising Engineer's Representative. Protective equipment includes hard boots and hats, protection for eyes and ear mufflers (when using pneumatic drills, grinders, etc.). Likewise fire prevention measures should be in place, including the deployment of adequate functional extinguishers and simple dry sand buckets. The project monitoring programme should include inspection of safety equipment use.

Basic hygiene standards should be required at all residential and other contractor facilities, with proper approved waste disposal arrangements. HIV Aids awareness development and disease spread mitigation should be fostered by the contractor among his staff. Contact with a appropriate specialist to conduct basic training and awareness among workers should be facilitated.

7.0 References

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