



**USAID** | **SUDAN**  
FROM THE AMERICAN PEOPLE

# SUDAN INFRASTRUCTURE SERVICES PROJECT

## ENVIRONMENTAL MANAGEMENT PLAN

JULY 2008

This report was produced for review by the United States Agency for International Development (USAID). It was prepared by Robert Resseguie and K. Santi Duewel for The Louis Berger Group, Inc.

Contract No. 650-I-00-06-00010-00

# SUDAN INFRASTRUCTURE SERVICES PROJECT

JULY 2008

## ENVIRONMENTAL MANAGEMENT PLAN

**Sudan Infrastructure Services Project (SISP)  
Environmental Management Plan**

**The Louis Berger Group, Inc.**

**July 2008**

*Table of Contents*

**1. Introduction..... 3**

**2. TO2: Juba – Nimule Road..... 3**

    2.1 General ..... 3

    2.2 Activities ..... 3

    2.3 Outputs ..... 4

    2.4 Future Actions..... 4

**3. TO4: Water Supply and Sanitation..... 5**

    3.1 General ..... 5

    3.2 Activities ..... 5

    3.3 Future Actions..... 5

**4. Summary ..... 5**

**Appendix A: Recommended Contract Provisions  
Environmental Management, Safety and Traffic  
Control Requirements..... 6**

**List of Acronyms:**

- Programmatic Environmental Assessment (PEA)
- GOSS Ministry of Transport and Roads (MTR)
- Sudan Transitional Environment Program Programmatic Environmental Assessment (STEP PEA)
- Sudan Infrastructure Services Project (SISP)
- USAID General Contractor (GC)
- Environmental Management, Safety and Traffic Control Plan (EMSTCP)
- Environment/Safety Officer (ESO)
- Government of Southern Sudan (GOSS)
- Unexploded Ordnance (UXO)

## 1. Introduction

Environmental management is an integrated component of the Sudan Infrastructure Services Project (SISP), including:

- Task Order 2 (TO2): Juba – Nimule Road Rehabilitation, and
- Task Order 4 (TO4): Water Supply and Sanitation.

This report provides the proposed environmental management procedures for both of these task orders to help ensure compliance with USAID environmental regulations and Government of Southern Sudan (GOSS) requirements.

## 2. TO2: Juba – Nimule Road

### 2.1 General

In 2006, a Programmatic Environmental Assessment (PEA) was undertaken for Road Rehabilitation Activities in Southern Sudan. The PEA formed part of USAID's Sudan Transitional Environment Program (STEP). The PEA serves several purposes, the most relevant to the Juba – Nimule Road are as follows:

- *'Meet the requirements of USAID Environmental Regulations (22CFR216) as related to the present program of road rehabilitation.'*
- *'Generate a set of environmental guidelines that can be incorporated into the Special Provisions and Specifications for contracts being awarded by the GOSS and its donor partners (WFP, USAID, the World Bank Multi-Donor Trust Fund, and others) to design consultants and contractors engaged in road rehabilitation in the future in Southern Sudan. Such guidelines will streamline the review process and thereby accelerate the implementation of the large-scale road rehabilitation and re-construction activities that are seen as fundamental to peace and relief and development in the country.'*<sup>1</sup>

The PEA provides various environmental guidelines and measures that will be incorporated into the bid and contract documents for the Juba – Nimule Road.

### 2.2 Activities

LBG mobilized their Environmental Specialist, Mr. Nick Skinner, on May 12, 2008 to Juba to assess the environmental management requirements for the Juba – Nimule Road. The following provides details of Mr. Skinner's activities during the mobilized period. From May 12 to 21, the following activities were undertaken:

- i. Meeting with USAID Mission Director Mary Hobbs and LBG Resident Engineer Ray Sawyer (13/05/08) – The purpose of the meeting was to discuss the present status of SISP and the Juba – Nimule Road from an environmental perspective. The meeting concluded that all USAID

---

<sup>1</sup> Programmatic Environmental Assessment of Road Rehabilitation Projects in Southern Sudan. USAID, 2006.

environmental requirements for the Juba – Nimule Road project had been met with the completion of the PEA and that no further works were required from LBG from a compliance standpoint. However, LBG recommended that they would review the document, to ensure that the recommended environmental mitigation measures set out in the PEA would be included in the bid and contract documents for the Juba – Nimule Road Rehabilitation works.

- ii. Review of existing environmental documentation including:
  - USAID Programmatic Environmental Assessment (PEA) of Road Rehabilitation Activities in Southern Sudan (STEP, June 2006);
  - Juba – Nimule Road Environmental Study (LBG, March 2007), and
  - USAID Environmental Guidelines for the Directorate of Roads and Bridges, GOSS (LBG, November 2007).

The purpose of the review was to ensure that all of the relevant mitigation measures from these documents were applied to the recommended contract provisions to be included with the bid and contract documents.

- iii. A site visit to the Juba – Nimule Road was undertaken to reassess the situation on the ground and identify any new potential environmental and social impacts that may result from activities such as returning Internally Displaced Persons (IDPs). No additional significant issues were noted during the visit. The returning IDPs did not appear to be encroaching within the Right-of-Way.

## **2.3 Outputs**

The following outputs resulted from the activities described above:

- i. Recommended Environmental Contract Provisions were prepared using the guidelines and mitigation measures outlined in the reviewed documents. The finalized version of these Contract Provisions will be used as part of the bid documents and contract for the Juba – Nimule Road civil works. These Contract Provisions were prepared by Mr. Skinner and reviewed internally by LBG environmental specialist Mr. Mike Ross. The subsequent review led to an updated version of the Recommended Contract Provisions that are provided as **Appendix A**.
- ii. In addition to the above, ‘best practice’ guidelines for environmental management of the current contracted bridge construction and road re-grading works on the Juba – Nimule Road were separately prepared as part of the draft Environmental Guidelines prepared by LBG for the Directorate of Roads and Bridges.

## **2.4 Future Actions**

To ensure the continued environmental management of the Juba – Nimule Road the following actions are recommended:

- i. Upon completion of the final bid and contract documents, LBG environmental specialists will review the documents to ensure that they contain the recommended contract provisions provided by **Appendix A**.

- ii. A program of monitoring should be undertaken during the rehabilitation of the Juba – Nimule Road by LBG environmental staff. Monitoring should be undertaken in three stages, firstly after completion of the main construction camps to ensure compliance with the proposed contract provisions, secondly at a midway point during construction, and lastly, at the completion of works to ensure that the sub-contractor has made good his contraction camps, borrow pits, etc, according to his contractual conditions. Monitoring would be linked to a payment schedule to ensure that the sub-contractor is fulfilling his environmental obligations as set out in **Appendix A**.

### **3. TO4 - Water Supply and Sanitation**

#### **3.1 General**

Unlike TO2, TO4 has not been subject to a PEA or Environmental Assessment. As such the environmental management requirements for this task order require clarification.

#### **3.2 Activities**

LBG (Nick Skinner, Environmental Specialist; Matt Harder, Water Supply and Sanitation Manager; Ray Sawyer, Resident Engineer) met with USAID's Health Advisor and to discuss the environmental requirements of TO4 on May 21, 2008. The issue of whether any environmental documentation was required for this task order was posed to USAID. USAID stated that for a program of this type it maybe beneficial to undertake some kind of environmental assessment. Both parties agreed that LBG would prepare a scope of works for such an assessment and present the SoW to USAID for their thoughts and recommendations.

#### **3.3 Future Actions**

Some information regarding the exact scope of TO4 is still outstanding. As soon as this information is received, LBG's environmental specialists will prepare a draft scope of works for environmental management of TO4. This activity is anticipated to occur within the next two to three weeks.

### **4. Summary**

- As discussed with USAID, the PEA has met 'the requirements of USAID Environmental Regulations (22CFR216) as related to the present program of road rehabilitation'. Accordingly no further form of environmental assessment is deemed necessary for the Juba – Nimule Road;
- LBG have therefore drafted environmental contract provisions using the PEA and other relevant SISP documents. The aim of the contract provisions is to ensure that all the recommendations of the PEA are implemented during the lifecycle of the project. These contract provisions are attached as **Appendix A**;
- LBG have also drafted 'best practice' environmental guidelines for those projects already in progress on the Juba – Nimule Road. These Environmental Guidelines have been separately submitted by LBG to USAID and the Directorate of Roads and Bridges for their review and comments;
- The required level of environmental management for TO4 has yet to be determined.

## APPENDIX A

### Recommend Contract Provisions Environmental Management, Safety & Traffic Control Requirements

**Introduction.** The following contract provisions build on the requirements and recommendations of the:

- Applicable rules and regulations of the GOSS Ministry of Transport and Roads (MTR) and other GOSS ministries and local authorities;
- Sudan Transitional Environmental Program Programmatic Environmental Assessment (STEP PEA; June 2006), including Appendix E: Environmental Design Checklist (copy attached), and
- Sudan Infrastructure Program (SIP) Environmental Guidelines for the MTR Directorate of Roads and Bridges (November 2007)

The sub-contractor is referred to these respective agencies and guidance documents in preparing, implementing and monitoring their environmental management plan for this road project.

**General Provisions.** The sub-contractor shall take all necessary measures and precautions and otherwise ensure that the execution of the Works and all associated operations on the Work Sites or off-site are carried out in conformity with statutory and regulatory environmental requirements of the Government of Southern Sudan. The sub-contractor shall take all measures and precautions to avoid any nuisance or disturbance arising from the execution of Project Activities. This shall, wherever possible, be achieved by suppression of the nuisance at source rather than abatement of the nuisance once generated. The sub-contractor will also be required to compensate for any damage, loss, spoilage, or disturbance of the properties and health of the project affected people during construction. Sub-contractors are encouraged to recruit local skilled and unskilled labor to increase direct benefits in the Project Area and to minimize potential environmental issues related to construction camps, disease transmission and cultural disputes. Specific requirements in this regard are noted below. In conformance with the Contract Specifications of which these Environmental Provisions are a part, the USAID General Contractor (GC) reserves the right to withhold payments and/or stop construction in the event of serious or repeated violations of the conditions stipulated herein.

**Requirement for Environmental Management, Safety and Traffic Control Plans.** The sub-contractor is required to prepare and submit an Environmental Management, Safety and Traffic Control Plan (EMSTCP) to the GC for review and approval no later than 30 days after Notice to Proceed. The EMSTCP (or the Plan) shall be organized in six sections as follows:

- Management Acknowledgements (Item 1.0)
- Organization & Staffing (Item 2.0)
- Communications And Reporting (Item 3.0)
- Environmental Management Provisions (Item 4.0)
- Safety Provisions (Item 5.0)
- Traffic Provisions (Item 6.0)

Review and approval of the EMSTCP will be provided by the GC following the receipt of all necessary information and documentation. Approval may be conditional as specified by the GC. The GC may also require periodic reviews, updating and supplements to the EMSTCP in the course of the work. Sub-

contractors should particularly note that aspects of the EMSTCP will affect the ability to commence work, including the following:

- Appointment and approval of an Environment/Safety Officer (ESO) is required before work can commence. The ESO shall be subject to the GC approval. The sub-contractor shall not undertake any works on the Site until the ESO has commenced duties on Site unless specifically agreed in writing by the GC.
- Initial Safety Induction Courses are required for all workmen within their first week on the Site.

## **A.1 MANAGEMENT ACKNOWLEDGEMENTS**

**A.1.1 Certification and Commitment.** The EMSTCP submitted by the sub-contractor shall provide a signed statement from the sub-contractor's managing directors attesting to a commitment that all environmental protection, safety, and industrial health aspects of the Project will be given highest priority in the discharge of contractual obligations and certifying a commitment to the provisions specified by the EMSTCP as approved by the GC.

**A.1.2 Statutory Understanding and Compliance.** The Plan shall provide a statement attesting the firm's understanding of, and means of ensuring due compliance with, the statutory regulations relating to construction work in the Government of Southern Sudan (GOSS).

**A.1.3 Availability of Documents.** The Plan shall state where copies of safety and industrial health regulations and documents will be available on the construction Site and verify that all regulations and documents have been or will be available and displayed or kept alongside each other.

## **A.2 ORGANIZATION AND STAFFING**

**A.2.1 Organization Chart.** The Plan shall include an organization chart identifying (by job title and by the name of the individual) the personnel to be engaged solely for environmental protection, safety, traffic control. The chart and the supporting text shall identify the designated ESO and at least one Deputy ESO, and identify other participants and their areas of responsibility.

**A.2.2 Identification of Responsibilities.** The Plan shall provide a description of the responsibilities of the Environment/Safety Staff appearing on the Organization Chart.

**A.2.3 Certification Related to the Environment/Safety Officer.** The Plan shall certify that:

The ESO will be appointed and assigned duties throughout the period of the Contract entirely connected with the environmental, safety, and traffic control activities on the Site.

The proposed ESO is suitably qualified and experienced to supervise and monitor compliance with the EMSTCP and will, in particular but without limitation, carry out auditing of the operation of the EMSTCP in accordance with a rolling program to be submitted, from time to time, to the GC for his consent.

The ESO will not be removed from the Site without the express written permission of the GC. Within fourteen (14) days of any such removal or notice of intent of removal, a replacement ESO will be nominated for the GCs approval.

The ESO will be provided with supporting staff in accordance with the staffing levels set out in the Plan. The supporting staff shall include at least one (1) Deputy ESO whose appointment is also subject to the GCs approval. The Deputy ESO is required to be capable of assuming the duties and functions of the ESO whenever necessary.

The ESO and his staff will be empowered to instruct all employees of the sub-contractors at any level to cease operations and take urgent and appropriate action to make safe the Site and prevent unsafe working practices or other infringements of the Plan or the statutory regulations.

The ESO shall maintain a daily Site Diary comprehensively recording all relevant matters concerning Site environmental management, safety and traffic control, inspections and audits, related incidents and the like. The Site Diary shall be available at all times for inspection by the GC.

**A.2.4 Contact Information.** Contact information for all Environment/Safety Staff shall be provided in the Plan.

### **A. 3 REPORTING PROCEDURES**

**A.3.1 Radio Communications & Routine Reporting Procedures.** The Plan shall explain the proposed interaction and communication procedures between construction personnel and environmental protection, safety and traffic control staff, including:

- Radio communication facilities; and
- Routine communication and reporting systems.

**A.3.2 Environmental and Safety Reports.** The following environmental and safety reports shall be submitted:

- ***Weekly Environmental and Safety Reports.*** Documented safety and environmental audits shall be undertaken on weekly basis. Environmental and Safety Reports summarizing the results of the audits shall be submitted on a monthly basis.
- ***Incorporation of Summaries in the Project Monthly Report.*** Summaries of the Weekly Environmental and Safety Reports will be included in the Project's Monthly Progress Report.

**A.3.3 Notification of Accidents.** The Plan shall verify that provisions have been made to ensure that:

- The GC will be notified immediately of any accidents which occur whether on-Site or off-site in which the sub-contractor, his personnel or construction plant are directly or indirectly involved and which result in any injuries to any persons.
- Such initial notification may be verbal and shall be followed by a written comprehensive report within 24 hours of the accident.

#### A.4 ENVIRONMENTAL CONTROL PROVISIONS

The required EMSTCP shall contain:

- A Site Plan for each construction Site indicating the major environmental requirements as noted below;
- Verification of Arrangements for Required Equipment; and
- Other Environmental Provisions as noted below.

Detailed requirements for each of these provisions are as follows.

**A.4.1 Site Plans.** The EMSTCP shall include Site Plans for each construction Site and staging areas indicating the locations and arrangements of all storage areas and work Sites subject to activities that may result in environmental impacts. At a minimum, the Site Plans must indicate the following:

- **The Basic Site Organization.** The basic Site organization shall be provided by a Site Plan at a scale of 1:1,000.
- **Hard Surface Areas.** Areas within the Site where there is a regular movement of vehicles shall have an acceptable hard surface and be kept clear of loose surface material and shall be so indicated on the required Site Plan.
- **Waste Disposal and Site Drainage Systems.** The following conditions shall apply:
  - Waste Disposal. All water and waste products arising on the Site shall be collected, removed from the Site via a suitable and properly designed temporary drainage system and disposed of at locations and in manners that will cause neither pollution nor nuisance. The Site Plan shall indicate the system proposed and the locations of related facilities on the Site, including latrines, holding areas, etc. There shall be no direct discharge of sanitary or wash water to surface water. Disposal such as, but not limited to, lubricating oil and similar materials, onto the ground or into water bodies shall be prohibited. Liquid material storage containment areas shall not drain directly to surface water. Liquid material storage containment areas equipped with drains shall be valved and the valve shall be maintained locked in the closed position with supervisory control of the key. Lubricating and fuel oil spills shall be cleaned up immediately and spill clean-up shall be materials be maintained at the storage area.
  - Drainage. The Site Plan shall be devised to ensure that rain run-off from the construction Sites is not deposited directly into any watercourse, stream, or canal and shall indicate the system proposed, including the locations of retention ponds and other facilities. There shall be no direct discharge of sanitary wastewater, wash water, chemicals, spoil, waste oil or solid waste to surface water bodies. Fuel, lubricating oil and chemical spills shall be contained and cleaned-up immediately. Spill clean up equipment will be maintained on Site.
  - Locations Relative to Watercourses. The Site Plans shall be devised to ensure that, insofar as possible, all temporary construction facilities are locate at least 50 meters away from a water course, stream, or canal.

- Locations of Fueling Operations. Fueling operations shall occur only within containment areas.
- Other Water-Related Facilities. The sub-contractor is required to construct, maintain, remove and reinstate as necessary temporary drainage works and take all other precautions necessary for the avoidance of damage by flooding and silt washed down from the Works. Site Plans must indicate adequate precautions to ensure that no spoil or debris of any kind are allowed to be pushed, washed down, fallen or be deposited on land or water bodies adjacent to the Site.
- Locations Relative to Urban Areas. To avoid potential conflicts with local communities construction camps should, insofar as possible, be located at least two kilometers from urban and village areas.
- **Location of Batching Plant(s).** Dry mix batching shall be carried out in a totally enclosed area with exhaust to suitable fabric filters. The locations of these facilities should be clearly illustrated by the Site Plans.
- **Location of Wheel Washing Facilities.** If determined warranted by the GC or ESO, the sub-contractor shall provide a wash pit or a wheel washing and/or vehicle cleaning facility at the exits from the Sites. If so requested, the sub-contractor shall ensure that all vehicle are properly cleaned (bodies and tires are free of sand and mud) prior to leaving the Site areas. The sub-contractor shall provide necessary cleaning facilities on Site and ensure that no water or debris from such cleaning operations is deposited off-site. The locations of these facilities shall be clearly illustrated by the Site Plans.
- **Location of Sand and Aggregate Storage Provisions.** The sub-contractor shall implement dust suppression measures that shall include, but not be limited to the following:
  - Stockpiles of sand and aggregate greater than 20 cubic meters for use in concrete manufacture shall be enclosed on three sides, with walls extending above the pile and two (2) meters beyond the front of the piles.
  - Cement and other such fine-grained materials delivered in bulk shall be stored and covered.
- **Locations of Liquid and Toxic Material Storage Areas.** The EMSTCP Site Plans shall specify the locations for the storage of liquid materials and toxic materials. The following conditions to avoid adverse impacts due to improper fuel and chemical storage:
  - All fuel and chemical storage (if any) shall be sited on an impervious base within a bund and secured by fencing. The storage area shall be located away from any watercourse or wetlands. The base and bund walls shall be impermeable and of sufficient capacity to contain 110 percent of the volume of tanks.
  - Filling and refueling shall be strictly controlled and subject to formal procedures and will take place within a bounded area to contain spills / leaks of potentially contaminating liquids.
  - All valves and trigger guns shall be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use.

- The contents of any tank or drum shall be clearly marked. Measures shall be taken to ensure that no contaminated discharges enter any drain or watercourses.
  - Disposal of lubricating oil onto the ground or water bodies will be prohibited.
  - Should any accidental spills occur immediate clean up will be undertaken and all cleanup materials stored in a secure area for disposal to a Site authorized to dispose of hazardous waste.
- **Explanations of Proposed Site Drainage Systems.** Locations likely to be subject to water quality impacts or significant runoff (construction camps, staging areas, etc.) and an explanation of the proposed Site drainage system shall be indicated on the Site Plans.

**A.4.2 Standards and Required Equipment.** Sub-contractors are required to meet the prevailing standards and regulations of the GOSS. In instances in which the requirements of the General Specifications and those of the GOSS differ (if any), the more stringent shall apply.

**A.4.3 Camp Provisions.** Prior to commencement of any camp establishment activities, the sub-contractor shall provide the relevant Local Authorities with details of his proposed arrangements and shall obtain all necessary permits and consents, copies of which shall be supplied to the GC. To ensure the well-being and health of construction workers, the sub-contractor shall provide the following:

- The camps shall have septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use.
- Construction camps shall be provided with kerosene/LPG to avoid dependence on firewood for cooking to the extent possible.
- An adequate number of lavatory and ablution facilities is to be provided for workers, the former type of facility for the work camp (when separate from the accommodation camp) and both types in the accommodation camp. The number—ratio of workers to lavatory/ablution facility—is to be determined using regional or international regulations and standards.
- Toilet wastes/wastewater are to be retained and treated onsite; VIP latrines (sealed vault) or conventional toilets with water-borne connections to a septic system are to be provided; and greywater produced from bathing and clothes washing is to be collected separately and used for supplemental water, such as for irrigating landscaping or gardens.
- The sub-contractor's vehicle and plant maintenance areas shall be provided with an impervious base to collect any spillage of fuel, oil or lubricants, and shall be provided with suitable drainage systems. The edges of the base shall be raised to prevent spillage leaking off the base. The sub-contractor shall mop up any spillage as soon as they occur.
- Oil and grease traps shall be installed in drainage systems associated with vehicle and plant washing facilities, service, fuel storage and fuelling areas, and kitchen wastewater disposal facilities. The drainage systems shall be maintained in an effective condition throughout the construction period.
- After completion of construction works, location of campsites shall be restored to its previous state by undertaking clean up operations.
- Operational boreholes shall be left for local community use after departure of the sub-contractor.

**A.4.4 Other Environmental Provisions.** Additional environmental requirements shall apply as follows:

**Related to Public Consultations and Dispute Resolution.** The Plan shall indicate understanding of, and a commitment to, the requirements that:

- Public consultations shall be conducted as an on-going process as required by the procedures established for the Work. Prior to beginning construction the sub-contractors shall conduct consultations with local affected persons to familiarize them with the Work to be done, the predicted impacts and mitigation to be used;
- Periodic meetings between the sub-contractor, GC and other organizations shall be required as determined warranted to explain implementation plans, results of monitoring activities and actions taken in regard thereto, and/or other issues as determined warranted.
- Disputes in regard to issues of facts and compensation for damages, spoilage or disturbance of properties and/or the health of project-affected persons shall be referred to the Ministry of Transport and Roads (MTR).

**Related to Air Quality.** The Plan shall indicate understanding of, and a commitment to, the requirements that:

- The sub-contractor shall give special attention to dust avoidance. The laterite based murram currently in use in road rehabilitation and reconstruction in Southern Sudan requires the sub-contractor to take special actions to avoid dusty conditions, particularly in built-up areas which these roads traverse. A sealed coat approach to containing dust within the boundaries of urban areas is recommended along with speed bumps to slow traffic which also diminishes dust generation.
- During road construction, the sub-contractor should apply water at regular intervals in high traffic and/or high population areas and also consider some of the road treatment alternatives (enzymes) where they might be cost effective. Diverting a main road to avoid town or city centers should also be considered, if possible.
- No furnaces, boilers or other similar plant or equipment using any fuel that may produce air pollutants will be installed without prior written consent of the GC / ESO.
- No burning of debris or other materials will occur on the Site unless authorized by the GC.
- Dust suppression measures including but not limited to the following will be implemented:
  - Stockpiles of sand and aggregate greater than 20 cubic meters for use in concrete manufacture shall be enclosed on three sides, with walls extending above the pile and two (2) meters beyond the front of the piles. Locations should be indicated by the accompanying Site Plan(s).
  - Effective water sprays shall be used during the delivery and handling of all raw sand and aggregate, and other similar materials, when dust is likely to be created and to dampen all stored materials during dry and windy weather.
  - Areas within the Site where there is a regular movement of vehicles shall have an acceptable hard surface and be kept clear of loose surface material. Locations should be indicated by the accompanying Site Plan(s).

- Conveyor belts shall be fitted with wind-boards, and conveyor transfer points and hopper discharge areas shall be enclosed to minimize dust emission.
- The provision of adequate dust suppression plant including water bowsers with spray bars.
- Areas of reclamation shall be completed, including final compaction, as quickly as possible consistent with good practice to limit the creation of wind blown dust.
- All vehicles, while parked on the Site, will be required to have their engines turned off.
- All equipment and machinery on the Site will be checked at least weekly and make all necessary corrections and or repairs to ensure compliance with safety and air pollution requirements.
- All trucks used for transporting materials to and from the Site will be covered with canvas tarpaulins, or other acceptable type cover (which shall be properly secured) to prevent debris and/or materials from falling from or being blown off the vehicle(s).
- Construction walls will be provided in all locations where strong winds could cause the blowing of dust and debris.
- At any concrete batching plant or crushing plant being operated on the Site the following additional conditions shall be complied with:
  - Dust nuisance as a result of its activities will be avoided.
  - Any vehicles with an open load carrying area used for moving potentially dust-producing materials shall have properly fitting side and tailboards. Materials having the potential to create dust shall not be loaded to a level higher than the side and tail boards, and shall be covered by a clean tarpaulin in good condition. The tarpaulin shall be properly secured and shall extend at least 300 millimeters over the edges of the side and tailboards.
  - The concrete batching plant and crushing plant sites and ancillary areas will be frequently cleaned and watered to minimize any dust emissions.

**Related to Noise.** To avoid potential adverse noise and vibration impacts, the sub-contractor shall:

- Provide public notification of construction operations prior to construction works.
- Ensure that sensitive receptors will be avoided as possible (i.e., aggregate crushers, operators, etc.). Non vibratory rollers (for compaction) will be used near sensitive receptors such as schools and hospitals.
- Ensure that all exhaust systems will be maintained in good working order; properly designed engine enclosures and intake silencers will be employed; and regular equipment maintenance will be undertaken.
- Ensure that stationary equipment will be placed as far from sensitive land uses as practical; selected to minimize objectionable noise impacts; and provided with shielding mechanisms where possible.
- Schedule operations to coincide with periods when people would least likely be affected; work hours and work days will be limited to less noise-sensitive times. Hours-of-work will be approved

by the GC having due regard for possible noise disturbance to the local residents or other activities. Construction activities will be strictly prohibited between 10 PM and 6 AM in the residential areas.

**Related to Water Quality.** Water quality provisions will include but will not be limited to the following:

- All existing stream courses and drains within, and adjacent to, the Site will be kept safe and free from any debris and any excavated materials arising from the Works. Chemicals, sanitary wastewater, spoil, waste oil and concrete agitator washings only be disposed at a location and in a manner approved by the GC.
- All water and waste products arising on the Site will be collected, removed from the Site via a suitable and properly designed temporary drainage system and disposed of at a location and in a manner that is approved by the GC and will cause neither pollution nor nuisance.
- Drainage works will be constructed, maintained, removed and reinstated as necessary and all other precautions necessary for the avoidance of damage by flooding and silt washed down from the Works will be taken. Adequate precautions will be taken to ensure that no spoil or debris of any kind are allowed to be pushed, washed down, fallen or be deposited on land adjacent to the Site.
- In the event of any spoil or debris from construction works being deposited on adjacent land or any silt washed down to any area, then all such spoil, debris or material and silt shall be immediately removed and the affected land and areas restored to their natural state by the sub-contractor to the satisfaction of the GC.
- Downstream slopes will be stabilized with concrete, rock gabions or walls to avoid erosion where warranted.
- Water for construction works shall not be drawn from sources which serve routine needs of local people unless agreed upon by local representatives.
- In case new boreholes are required, permits are to be obtained from the relevant authority or permission from local representatives sought.

**Related to Water Resource Use.** Road rehabilitation and reconstruction in Southern Sudan uses reasonable quantities of water for various activities, including concrete works, dust control and most importantly for wet compaction of applied layers to the road surface. Finding adequate sources of water for these purposes can be a major challenge.

- The sub-contractor is enjoined from using existing water sources, both surface and groundwater, to the detriment of the existing community. Abstraction of water for road construction use from wetlands is to be avoided.
- If borehole water is used in large quantities, a record will be kept by the sub-contractor of the ground water level in the surrounding of the borehole and sufficient care will be given to avoid any effect on other boreholes used by surrounding local communities. The water table level will be reported in the sub-contractor's journal and continuation of pumping will be subject to the Engineer's approval.

- The sub-contractor is required to ensure that the water quality of the borehole be maintained over the life of his use of the facility, with appropriate measures to isolate it from run-off draining down into it.

**Related to Protection of Irrigation Systems.** To avoid potential adverse impacts, the sub-contractor shall ensure irrigation channels diverted during the construction phase will be returned to their original status. Where this is not possible, or where channels are irrevocably altered, consultation will be held with landowners to ensure that an adequate redesign is undertaken to ensure that irrigation channels are returned as closely as possible to their former layout. The sub-contractor will undertake all necessary works to achieve this status, including provision of labor.

**Related to Soils.** To avoid potential adverse soils impacts, the sub-contractor shall:

Regarding Erosion Control

- Vegetation removal at the site-preparation stage (preliminary to actual construction) or for bridge site detours is to be minimized, and all soils disturbed by site earthworks are to be reseeded without delay using indigenous or naturalized grasses (e.g., a creeper grass, *Cynodon dactylon*, that is naturalized in Africa due to the frequency of its use in soil-erosion prevention and control). Proper care shall be taken to increase survival rate of re-vegetation plantings like regular watering, etc. including timely replacement of perished saplings. Cleared vegetation is not to be discarded into any rivers or lakes. Trees felled during site preparation can be made available to the sub-contractor's camp or local communities.
- On steeper slopes, roadside ditches shall be lined with riprap or sow grass or other cover crops to anchor the soil.
- To control erosion from disturbed soils, reseeded should be commenced if grasses have not been re-established on 80 percent of the disturbed area within 1 month after site preparation earthworks are complete (unless weather conditions dictate otherwise).
- If the ROW has been cleared in the dry season, reseeded may be delayed until ample moisture is available to insure seed germination. Conversely, if site preparation occurs during the rainy season, exposed soils should be closely monitored to determine if the resident seed bank *might* be sufficient to re-establish grass cover without supplemental reseeded.
- During land clearing operations, topsoil shall be collected by the sub-contractor, preserved, and reused as a base for turbing of embankment slopes or development of barren areas along roadside.
- The sub-contractor shall ensure that energy dissipaters are installed according to the type and location indicated in the drainage plan.
- The sub-contractor shall ensure that backfilling around headwalls and wingwalls is carried out using proper backfill materials as described in design materials specifications and that fill materials are compacted to design standards and specifications.
- The sub-contractor shall provide erosion control measures around stockpiles to prevent transport of sediments to nearby watercourses, water bodies or wetlands.

Regarding Cut and Fill Activities. The sub-contractor shall ensure that:

- No earth, rock or debris is deposited on public or private rights of way as a result of its operations.
- Final forming and re-vegetation will be completed as soon as possible following fill placement to facilitate regeneration of a stabilizing ground cover.
- Seeding with a fast growing crop and potential native seed mix shall occur immediately after fill placement to prevent scour and to encourage stabilization.
- Stepped embankments are constructed for embankments greater than six meters.
- The cut and fill quantities required for profile correction shall be balanced to the extent possible, to avoid dependence on earth from borrow areas.
- In both cases of cut and fill, top soil shall be preserved and reused for turfing of embankment slopes or redevelopment of borrow areas or any other areas in the vicinity of roads.
- Under no circumstances shall topsoil be allowed for use as a fill material in road construction activities.

Regarding Borrow Pits. The following conditions shall apply to borrow pits:

- The sub-contractor will be expected to carry out the construction works in such a way as to minimize the need for the use of borrow materials, including careful attention to re-use of excavated material as sub-base/base where technically feasible.
- Borrow areas will not be located within one kilometer of any settlements, water courses, protected areas or national parks.
- The sub-contractors shall observe a minimum allowable offset of borrow pits from the road (set back out of sight of the road) and minimum longitudinal spacing in relation to the allowable free-haul in the Bill of Quantity.
- Topsoil from borrow pit areas will be saved and reused in re-vegetating the pits to the satisfaction of the GC.
- Before moving onto the site and commencing development activities, the entire site must be fenced to deny unauthorized entry and to prevent injury to passersby and livestock.
- The borrow areas are to be demarcated with signboards and operational areas are to be access controlled.
- Topsoil from borrow areas (first 30cm) are to be preserved and used for redevelopment of borrow areas or as a base for turfing along embankment slopes.
- The sub-contractor shall prepare and submit for the General Contractors approval a borrow-pit plan (BP). The BP which takes into account all access roads and any other areas disturbed by the activity, is to contain information, at minimum, describing (1) removal, stockpiling, protection and replacement of topsoil and overburden; (2) reshaping (to original contours, if feasible) and compacting replaced overburden and topsoil; (3) scarifying access-road surfaces prior to

reseeding; (4) free-flowing drainage at and within reinstated sites; (5) soil-erosion controls; (6) revegetation plan to include lists of *indigenous* grass and tree species; (7) operational safety measures; and (8) decommissioning plan at closure of the pit. The decommissioning plan is to specify the procedures for removing all work-related machinery, equipment and supplies as well as cleaning up the site and its environs.

- The excavation and restoration of the borrow areas and their surroundings, in an environmentally sound manner to the satisfaction of the General Contractor will be required before final acceptance and payment under the terms of contracts.
- Additional borrow pits will not be opened without the restoration of those areas no longer in use.

Regarding Contamination of Soils due to Spills. The following conditions shall apply:

- All fuel and chemical storage (if any) shall be sited on an impervious base within a bund and secured by fencing. The storage area shall be located away from any watercourse or wetlands. The base and bund walls shall be impermeable and of sufficient capacity to contain 110 percent of the volume of tanks.
- Petroleum products and dispensing points shall have drip pans.
- All valves and trigger guns shall be resistant to unauthorized interference and vandalism and be turned off and securely locked when not in use.
- The contents of any tank or drum shall be clearly marked. Measures shall be taken to ensure that no contaminated discharges enter any drain or watercourses.

**Related to Quarries.** The sub-contractor shall use only licensed quarry sites. Where no licensed sites exist the sub-contractor shall be responsible for opening and operating their own quarry. The sub-contractor shall ensure that the quarry area is not located in irrigated agriculture land, grazing land, protected areas, water bodies, stream and seepage areas, wetlands, or area supporting rare flora/fauna and not within one kilometer of settlements, and in ecologically stable land. The sub-contractor shall ensure, with oversight from the GC, that the correct compensation has been paid to the landowner of the quarry site.

Prior to opening up the quarry, a quarry operation plan is to be prepared by the sub-contractor and approved by the GC. Particular elements in addition to those required in the plan for reinstating borrow-pits are (1) blasting methodology for suppressing flying rocks and noise; (2) blasting material, storage and transport (if applicable); (3) verification and submission of current license for individual assigned to blasting; (4) intended drilling and blasting schedule; (5) notification system for informing nearby residents and communities about upcoming blasting events; (6) warning system for alerting nearby residents and communities to imminent blasting event; (7) personal protective equipment (PPE) for quarry workers; (8) safety measures for preventing passersby and livestock entry to the site during blasting events; (9) crusher location and times of operation; (10) system used for suppressing crusher dust; (11) scheme for retaining stormwater onsite; and (12) methods for benching walls to reduce steep rock faces. Safety questions are common to hard-rock blasting. To mitigate for them, quarry blasting programs must be rationalized and closely adhered to. Items (1) through (6) in the quarry operation plan are to be carefully monitored for their full implementation. Failure to implement should be accompanied by fines or other appropriate penalties.

A decommissioning plan shall also be prepared by the sub-contractor and approved by the GC. The plan elements are to stipulate the procedures for removing all work-related machinery, equipment and supplies as well as cleaning up the site and its environs. Additionally, the decommissioning plan is to establish measures required for long-term site safety, i.e., perimeter fencing that defies entry, padlocked gates, etc.

To ensure safety of workers and locals, the sub-contractor shall ensure that:

- Measures required to prevent inadvertent entry onto the site by passersby and livestock before or during a scheduled blast shall include full *permanent* perimeter fencing, posting of “NO ENTRY” signs and one or more guards stationed at the entrance/exit gate(s) to the quarry.
- PPE for quarry workers is to include properly fitted hard hats, face masks, gloves and gum boots. Ear muffs are to be provided to the blasting crew. Workers must be trained in the proper use of the equipment, and the routine use of PPE is to be enforced with escalating penalties—first failure to use is to warrant a verbal warning; second failure, dismissal from work for the day; and final failure, permanent dismissal from employment.
- Crusher operating hours are to be scheduled between the hours of 6:00 and 18:00, Monday through Saturday. Working hours extended beyond the scheduled times are to be agreed-upon by nearby residents and communities.
- Irrespective of production pressures and/or production slumps, blasting is **not** to take place outside established blasting schedules without community consent and written permission of the local authority.

**Related to Flora and Fauna.** To avoid potential adverse impacts to flora and fauna, the sub-contractor is required to prohibit workers from hunting, fishing, trapping, killing or other use of natural resources (with the exception of vermin) on the site or on adjacent lands.

**Related to Protected Areas.** To avoid potential adverse impacts to protected areas, the sub-contractor shall ensure that:

- Poaching of wildlife and/or harvesting of hardwoods in Nimule National Park (NNP) by sub-contractor staff is strictly forbidden.
- Any detours and diversions between the Aswa Bridge and Nimule should occur on the east side of the road and not encroach into the NNP buffer zone on the west side of the road.
- No trees and other bush vegetation shall be cut within the NNP buffer zone except for a 10 meter wide strip adjacent to the roadside.
- The sub-contractor shall erect signpost at regular intervals adjacent to the NNP indicating animal migration routes and speed limits.
- Construction camps, maintenance areas, materials storage, borrow pits, quarries and waste disposal sites shall not be constructed within one kilometer of the NNP buffer zone.

**Related to Social Conditions.** To avoid potential adverse social impacts, the sub-contractor shall ensure that:

- Not less than 50% of the sub-contractor's total labor force shall be Sudanese citizens.
- Before any land belonging to the Host Country or to a private landowner is used for any purposes in connection with the execution of the Work, the General Contractors approval shall be obtained. The sub-contractor shall provide written evidence that he has obtained all necessary agreements.
- On completion of the Contract, or earlier if so directed by the General Contractor, all plant, temporary facilities and any other encumbrances shall be removed, the site and land use areas shall be properly cleaned, all damage made good, and, if necessary, the land-owner paid for the use of the land.

**Related to Unexploded Ordnance (UXO).** Prior to the commencement of construction, mine sweeping must be carried out surrounding the construction Site. The sub-contractor shall be responsible for ensuring mine sweeping has been completed prior to the commencement of works. Erosion control measures will be applied by the sub-contractor for soil surfaces disturbed by de-mining activities.

**Related to Bridges.** To avoid potential adverse impacts resulting from bridge construction, the sub-contractor shall ensure that:

- The construction works are limited to the dry season so that impacts on water quality of stream/river is minimized or avoided.
- Cofferdams, river diversions or other modifications to normal stream/river channels and beds be conducted in the dry season.
- Cofferdams, river diversions or other modifications to normal stream/river channels and beds be built or conducted in non-breeding periods for fish and other important aquatic species.
- Wingwalls, gabions, riprap or other methods be used to prevent soil erosion on stream/riverbanks at or near bridge structures.
- Upon completion of bridge construction, disassemble all cofferdams and settling ponds. Remove any residual or waste concrete and clean the work site.

**Related to Discovery of Cultural or Historical Sites:** The sub-contractor shall give immediate notice to the GC of any remains or artifacts of potential archaeological, historical or scientific interest discovered during the site clearance, excavations or any other construction activities. In the event of any such discovery, work shall be stopped immediately, and all necessary steps shall be taken to protect and secure the site and finds against further disturbance, either by the workforce or others.

**Related to General Site Restoration Requirements:** Restoring the natural landscape as much as possible is a policy goal of the GOSS Ministry of Transport and Roads. Accordingly, the sub-contractor is expected to take every precaution to avoid excess site disturbance and for restoring the road construction site progressively as the work proceeds along it. Special requirements include the following:

- Temporary stockpiles and spoil materials should not be deposited where they can wash into the water courses.

- Compacted surfaces such as within the boundaries of a road construction camp or on the periphery of a borrow pit should be deep ripped to ensure natural regeneration.
- Topsoil should be removed and stockpiled for subsequent rehabilitation, with care taken to avoid it being eroded or contaminated.
- The progress of natural regeneration on restored sites should be monitored and if necessary, revegetated through direct seeding of local species.

**Contingency Provisions.** Special circumstances and conditions may make the imposition of special environmental provisions from time to time. The EMSTCP Plan shall attest to the fact that the sub-contractor understands that such provisions may be imposed by the GC. Such special conditions may result from oil spills or spills of toxic materials or other impacts resulting from Project-related activities.

## **A.5 SAFETY PROVISIONS**

**A.5.1 Emergency Response Plan.** An emergency response plan to deal with accidents and emergencies, including environmental/public health emergencies associated with hazardous material spills and similar events, shall be prepared for the approval of the GC.

**A.5.2 First Aid Base.** A fully equipped first aid base shall provided by the sub-contractor.

**A.5.3 On-Site Safety Publicity.** The sub-contractor shall ensure that safety, rescue and industrial health matters are given a high degree of publicity to all persons regularly or occasionally on the Site. Posters drawing attention to Site safety, rescue and industrial health regulation shall be made or obtained from the appropriate sources and shall be displayed prominently in relevant areas of the Site.

**A.5.4 Safety Training Program.** A Safety Training Program is required and shall consist of:

- Initial Safety Induction Course. All workmen shall be required to attend a safety induction course within their first week on Site.
- Periodic Safety Training Courses. Periodic safety course shall be conducted not less than once every six months. All Sub-contractor employees will be required to participate in relevant training courses appropriate to the nature, scale and duration of the works. Training courses for all workmen on the Site and at all levels of supervision and management,
- Safety Inspections. The sub-contractor shall regularly inspect, test and maintain all safety equipment, scaffolds, guardrails, working platforms, hoists, ladders and other means of access, lifting, lighting, signing and guarding equipment. Lights and signs shall be kept clear of obstructions and legible to read. Equipment, which is damaged, dirty, incorrectly positioned or not in working order, shall be repaired or replaced immediately.
- Safety Equipment and Clothing. Safety equipment and protective clothing are required to be available on the Site at all material times and measures for the effective enforcement of proper utilization and necessary replacement of such equipment and clothing, and all construction plant and equipment used on or around the Site shall be fitted with appropriate safety devices. These shall include but not be limited to:

- Effective safety catches for crane hooks and other lifting devices, and
- Functioning automatic warning devices and, where applicable, an up-to-date test certificate, for cranes and hoists.

## **A.6 TRAFFIC MANAGEMENT PROVISIONS**

A Traffic Control Plan shall be submitted to explain the means and methods to be taken for proper and adequate control of traffic during the course of the Works. This Plan shall include but not be limited to:

- The traffic control equipment the sub-contractor proposes to use for the Works;
- Traffic control signage including location and sign descriptions;
- How and when the sub-contractor proposes to use traffic control flag men;
- Traffic control means during no-working periods; and
- Traffic control means and devices for night and off-hour periods.

**A.6.1 General Traffic Management Requirements.** The following conditions shall apply in regard to traffic management:

- The sub-contractor shall keep open to traffic existing roads during the performance of the Works, provided that when approved by the GC the sub-contractor may bypass traffic over a detour. The sub-contractor shall at all times keep roads and footpaths, affected by his operations, free from soil and material spillage.
- The sub-contractor shall keep the length of the construction areas in such condition that traffic will be accommodated safely. Traffic control devices and services shall be provided and maintained both inside and outside the Project limits as needed to facilitate traffic guidance should this be necessary.
- Prior to the start of construction operations, the sub-contractor shall erect such signs, barricades, and other traffic control devices as may be required by the plans, specifications or directed by the GC. Traffic control devices shall be operated only when they are needed and only those devices that apply to conditions actually in existence shall be operable.
- During non-working hours and following completion of a particular construction operation, all warning signs, except those necessary for the safety of the public, shall be removed or entirely covered with either metal or plywood sheeting so that the sign panel will not be visible.
- Retro-reflective sheeting on signs, barricades, and other devices shall be kept clean. The sub-contractor shall promptly correct stretches, rips, and tears in the sheeting. Retro-reflective sheeting shall have a maintained retro-reflection.
- Nighttime operations shall be illuminated by a lighting system approved by the GC. The lighting system shall be positioned and operated to preclude glare. Incandescent lights will not be permitted.

- The sub-contractor shall take necessary care at all times during the execution of the works to ensure the existing convenience and safety of residents along and adjacent to the road, and any public highway or port facility that may be affected by the Works.
- The sub-contractor should thoroughly acquaint himself with existing traffic conditions and understand the importance of maintaining traffic safety and the avoidance of excessive traffic delay. The sub-contractor shall co-operate with the pertinent agencies regarding traffic control and all details will be subject to the GCs approval.
- The sub-contractor shall be responsible for investigating and establishing the requirements for traffic control and safety in all work areas and shall submit such details in the required EMSTCP.
- The sub-contractor's requirements shall include, but not be limited to, construction of detours, temporary bridges and approach roads, of traffic control devices and services for the control and protection of traffic through areas of construction.
- Any failure of the sub-contractor to meet these requirements will entitle the GC to carry out such works as he deems to be necessary and to charge the sub-contractor with the full cost thereof plus ten percent of such cost, which sum will be deducted from any money due or which may become due to the sub-contractor under the Contract.

**A.6.2 Temporary Road Works.** The following conditions shall apply in regard to temporary works:

- The sub-contractor shall furnish, maintain, and remove on completion of the work for which they are required, all temporary roads and road works such as sleeper tracks and staging over roads, access and service roads, temporary crossings of bridges over streams or unstable ground, and shall make them suitable in every respect for carrying materials for the work, for providing access for traffic for himself or others, or for any other purpose. Such temporary road works shall be constructed to the satisfaction of the GC, but the sub-contractor shall nevertheless be responsible for any damage done to or caused by such temporary road works.
- Before constructing temporary road works, the sub-contractor shall make all necessary arrangements, including payment if required, with the public authorities or landowners concerned, for the use of the land and shall obtain the approval of the GC. Such approval will be dependent on the GC being satisfied with the sub-contractor's proposals for items such as signing, lighting and riding quality of the temporary road together with the proposed maintenance arrangements. Such approval will not, however, relieve the sub-contractor of his responsibilities under the Contract. Upon completion of the works the sub-contractor shall clean up and restore the land to the satisfaction of the GC.
- The sub-contractor, when required by the GC, shall submit for approval drawings giving full details of temporary roads. Such details shall include alignment, profile, pavement construction, signing, lighting and the duration of the temporary road.
- The sub-contractor shall make all arrangements necessary to permit the passage of materials and employees.

**A.6.3 Temporary Traffic Ramps.** In cases where it is necessary or required by the GC, the sub-contractor shall construct and maintain temporary traffic ramps, and furnish all the labor and materials required.

**A.6.4 Traffic Control.** The following conditions shall apply in regard to traffic control:

- In order to facilitate traffic through or around the Works, or wherever ordered by the GC, the sub-contractor shall erect and maintain at prescribed points on the work and at the approaches to the work, traffic signs, lights, flares, barricades, rubber cones with traffic lamps and other facilities as necessary or required by the GC for the proper direction and control of traffic.
- As necessary for proper control of traffic or when/where directed by the GC, the sub-contractor shall furnish and station competent flagmen whose sole duties shall consist of directing the movement of traffic through or around the work.
- The sub-contractor shall furnish and erect, within or in the vicinity of the project area, such warning and guide signs as may be necessary or ordered by the GC.

**A.6.5 Number of Lanes for Traffic Control.** Insofar as possible, the existing number of traffic lanes shall be maintained insofar as possible during the work and if diversions are provided these must be of the same traffic capacity as the original road. Notwithstanding the above, the GC may give approval to reductions in traffic capacity if the sub-contractor can show that these will not cause excessive delay to traffic. If such approval is given, the GC may specify the hours during the day when the reduction in capacity may be applied and it should be anticipated that these hours may not include the peak period for the traffic movement under consideration.

**A.6.6 Half-Width Construction.** The following conditions shall apply to half-width construction:

- Where, in the opinion of the GC, a detour is not feasible, construction on existing public roads shall be undertaken only over half of the full width of the roadway. The length of such half-width construction shall be kept as short as possible.
- Where half-width construction is necessary, work on culverts commenced in the dry season must be completed and the embankments adjacent to them must be reinstated so that at least half the full width shall be available for use by the public throughout the next rainy season.
- Where single-lane traffic becomes necessary over a particular length of the works or over the approaches thereto, the sub-contractor, in maintaining through traffic, shall provide a single lane at least three and a half meters wide on the roadway or embankment to be kept open to traffic.
- The sub-contractor shall so conduct his operations as to offer the least possible obstruction, inconvenience, and delay to traffic and shall be responsible for the adequate control of the traffic using such lengths of single lane.

**A.6.7 Materials for Traffic Control Devices.** Materials for traffic control devices shall conform to the requirements set forth below:

- Retro-reflective Material. Unless otherwise specified in the contract, sign panels, barricades, cones, vertical panels, and flagger paddles shall have retro-reflective sheeting meeting requirements for retro-reflective material as specified by the GC.
- Sign Panels. Sign panels shall be orange with black legend unless otherwise required.
- Sign Posts. Signposts shall be fabricated from untreated softwood, metal, or other materials acceptable to the GC. Signs shall be capable of remaining in position during normal traffic flow and wind conditions.

- Barricades. Barricades shall be constructed of wood, metal or plastic.
- Cones. Cones shall be a minimum of 75 centimeters in height with a broadened base and shall be capable of withstanding impact without damage to the cones or vehicles. All cones shall be orange/white colored and highly visible both in daylight and darkness. Cones shall be capable of remaining bright and in position during normal traffic flow and wind conditions in the area where they are used. Lamps for cones shall be suitable for purpose.
- Temporary Fencing. Temporary fencing shall be fabricated in panels with timber framework and galvanized metal panels. The panel face towards the traffic shall be painted.
- Vertical Panels. Vertical panels shall be constructed of wood, metal or plastic.
- Warning Lights. Warning lights shall be Type A (low intensity flashing), Type B (high intensity flashing), or Type C (steady burn) as approved by the GC.

The following Environmental Design Checklist is sourced from the STEP Programmatic Environmental Assessment (PEA) for Road Rehabilitation Activities in Southern Sudan (June 2006).



# APPENDIX E: ENVIRONMENTAL DESIGN CHECKLIST

	<p><b>GOVERNMENT OF SOUTHERN SUDAN</b></p> <p>MINISTRY OF TRANSPORT AND ROADS</p> <p><b>Road Rehabilitation Environmental Design Checklist</b></p>
---	--

**Road Segment:**

**Date (s) Assessment Conducted:**

**Assessment Conducted by:**

(This form should be accompanied by a longitudinal sketch map of the road segment and a digital photo record of the most salient features of the route that will affect environmental sustainability)

<b>Name</b>	<b>Title</b>	<b>Organization</b>
<b>Email Address</b>	<b>Telephone Number</b>	<b>Sat Phone Number</b>

**In collaboration with:**

<b>Name</b>	<b>Title</b>	<b>Organization</b>
<b>Email Address</b>	<b>Telephone Number</b>	<b>Sat Phone Number</b>

**Road Segment Location and Basic Information:**

Details	Origin	Destination
State		
County		
Closest Town or City		
GPS Reading (Lat & Long)		
Total Distance of Segment		Kms.
Total Driving Time 4WD		Minutes
Map References Available		
Total Number of Stretches		

**Completing the Environmental Design Checklist:** The remainder of this form is a “Stretch by Stretch” response to the questions of the Environmental Design Checklist. The “Stretches” are the same ones used for the Road Engineering Assessment to which this Environmental Design Checklist is a companion. The “Stretches” are determined from the starting point to the first significant feature where there is a change in road condition (for example, at a major river bridge or a major town), at which point the next “Stretch”



begins. Some of this information will be the same as the data and information collected on the Road Engineering Assessment form but will be repeated here because of relevancy to an understanding of the environmental conditions through which the road passes.

**Stretch No. 1**

<b>Stretch No. 1 of _____</b>		<b>Feature at Start: _____</b>		<b>Feature at End: _____</b>	
Distance from origin at beginning of stretch	0+000	Lat-GPS:		Long-GPS:	
Distance from origin at end of stretch		Lat-GPS:		Long-GPS:	
Total distance of this stretch	Kms.				
Total travel time for this stretch	Minutes				
<b>Towns + Mileage Marker along the Stretch</b>					
Class of Road (check one)	Major Trunk	Trunk		Feeder	
Present Surfacing (check one)	Gravel	Dirt		Sand	
Present Road Condition (check one)	Smooth	Rough	Distorted	Loose	Muddy
Grade	Level	Rolling		Steep	
<b>Environmental Conditions/Management-Mitigation Recommendations along the Stretch</b>					
Predominant Land-use categories (rough estimate) (% per category)	Forest	Bush	Farmed	Pasture	Wetland
Indicate sources of water for construction purposes (wet compacting or for mixing concrete)	Indicate each potential source (with milepost) and availability and plan for avoiding conflict with other users				
Road passes through or closely adjacent to Protected Area (PA)	Indicate approx. mileposts and name of PA and whether there is any presence of authorities: - - Specify measures to minimize impact on the PA: - -				
Note areas of potential erosion problems	Indicate approx. mileposts and reasons why erosion is considered a problem - - Estimate need for additional erosion control measures, discuss type of measures and costs to be added to the BOQ as a result - -				



<p>Note each crossing of perennial stream or river</p>	<p>Indicate exact milepost of each bridge, its condition, whether it might be possible to minimize the impact of the crossing by road re-alignment</p> <p>-</p> <p>-</p> <p>Indicate if bridge reconstruction is likely to adversely affect water course in question and how those impacts can be mitigated</p> <p>-</p> <p>-</p>
<p>Note each crossing of a seasonal watercourse</p>	<p>Indicate exact milepost for each crossing (drift), proposed methods to minimize impact of the crossing point if necessary</p> <p>-</p> <p>-</p>
<p>Note each wetland area being crossed</p>	<p>Indicate exact mileposts and length of crossing, whether there is a perennial watercourse as part of it, describe present crossing, whether it might be possible to mitigate impacts by road re-alignment</p> <p>-</p> <p>-</p> <p>Where a causeway must be constructed, provide description (length, width, height) and indicate number, size (diameter) and configuration of the culverts</p> <p>-</p> <p>-</p>
<p>Indicate sources of murrum from probable borrow pits along the stretch</p>	<p>Estimate allowable minimum haulage to optimize the use of existing sources of murrum from borrow pits along the stretch</p> <p>-</p> <p>-</p> <p>Estimate the number of borrow pits to be opened and specify setback/siting requirements</p> <p>-</p> <p>-</p> <p>Prepare a comprehensive borrow pit management plan for the road segment with cost estimates to be included in the BOQ</p> <p>-</p> <p>-</p>
<p>Identify likely site (s) for road camp along this stretch, if any</p>	<p>Indicate exact milepost, present land-use of the site, distance to nearest town or village, area to be cleared, proximity to any watercourse, availability of water, type of camp</p> <p>-</p> <p>-</p> <p>Estimate clean-up &amp; decommissioning costs to be added to the BOQ</p> <p>-</p> <p>-</p>



<p>Which towns, villages or establishments along the road may be affected by dust</p>	<p>Indicate each of the towns, villages or establishments (schools, hospitals, clinics) with their exact mileposts (approximate length through the urbanized area)</p> <p>-</p> <p>-</p> <p>Indicate alternatives considered to mitigate the dust problem: community relocation, road diversions or bypasses around urban areas, speed bumps to slow traffic, temporary road watering during construction phase, sealed coating and estimate additional costs to be added to the BOQ for measures chosen</p> <p>-</p> <p>-</p>
<p>Note probable areas of traffic safety issues</p>	<p>Indicate each of the towns, villages, establishments (schools, hospitals, clinics) or traffic intersections with their exact mileposts (approximate length through the urbanized area)</p> <p>-</p> <p>-</p> <p>Indicate the measures chosen to mitigate the traffic safety problem: wider, smoother road shoulders w/i the urban areas, speed bumps, road signage, traffic police outposts, and estimate the additional costs to be added to the BOQ for the measures chosen</p> <p>-</p> <p>-</p>
<p>Note the potential for the spread of contagious diseases, particularly HIV/AIDS</p>	<p>Indicate whether this is likely to be an issue along this stretch as a result of urbanized areas or truck stops where long distance traffic might overnight; indicate mileposts for these areas</p> <p>-</p> <p>-</p> <p>Indicate if a HIV/AIDS Awareness and Prevention campaign is planned for this road segment and indicate the resources earmarked to fund it</p> <p>-</p> <p>-</p>

**Stretch No. 2 Through Stretch No. X** ....format repeats as many times as there are stretches along a road segment