

Environmental Monitoring Report

Monthly Report
March 2013

CAM: Greater Mekong Subregion Southern Coastal Corridor Project

Construction and Maintenance Supervision

Prepared by Egis International in association with Khmer Associates Consultant Engineers Co. Ltd, Key Consultants Cambodia, Khmer Consultant Engineering Corporation Ltd., SBK Research and Development, and VIDO Engineering Consultants Co. Ltd. for the Ministry of Public Works and Transport, the Royal Government of Cambodia, and the Asian Development Bank.

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Royal Government of Cambodia

Ministry of Public Works and Transport

ADB LOAN(SF) 2373-CAM GREATER MEKONG SUBREGION SOUTHERN COASTAL CORRIDOR PROJECT

Construction and Maintenance Supervision

Environmental Audit Report on
Maintenance of 2.2 km Section of NR No 3
from PK 49 + 870 to PK 52 + 060
(Kampot - Veal Rinh)

March 2013



In Association with

Khmer Associates Consultant Engineers Co. Ltd.

Key Consultants Cambodia, Khmer Consultant Engineering Corporation Ltd.

SBK Research and Development, and VIDO Engineering Consultant Co. Ltd.

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ADB Loan No. 2373 (SF)-CAM
Construction and Maintenance Supervision

Report Name: Environmental Audit Report on Maintenance of 2.2 km Section of NR
No 3 from PK 49 + 870 to PK 52 + 060 (Kampot - Veal Rinh)

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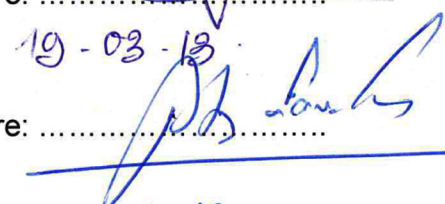
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ABBREVIATION LIST

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ADB	Asian Development Bank
APs	Affects People
BOD ₅	Biological Oxygen Demand
CDC	Council for the Development of Cambodia
CE	Construction Engineer
COD	Chemical Oxygen Demand
CO	Carbon monoxide
DBST	Double Bituminous Surface Treatment
DE	Design Engineer
DEIA	Department of Environmental Impact Assessment
DO	Dissolve Oxygen
DoE	Department of Environment
DPWT	Department of Public Work and Transport
DoP	Department of Planning
EE	Environmental Examination
EIA	Environmental Impact Assessment
IEE	Initial Environmental Examination
IEIA	Initial Environmental Impact Assessment
EMP	Environmental Management Plan
EMoP	Environmental Monitoring Planning
HIV/AIDS	Human Immunodeficiency Virus/Acquired Immunodeficiency
MoE	Ministry of Environment
MoH	Ministry of Health
MEF	Ministry of Economic and Finance
MLMUPC	Ministry of Land Management Urban Planning and Construction
MOP	Ministry of Planning
Mol	Ministry of Interior
MPWT	Ministry of Public Works and Transport
MOT	Ministry of Tourism
MRD	Ministry of Rural Development
NGOs	Non Governmental Organizations
NO ₂	Nitrogen dioxide
NR	National Road
PO	Project Owner
PCU	Project Coordination Unit
PIU	Project Implementation Unit
PMU	Project Management Unit
PR	Provincial Road
RGC	Royal Government of Cambodia
RP	Resettlement Plan
SCCP	Southern Coastal Corridor Project
SS	Suspended solids
SO ₂	Sulfur dioxide
THC	Total hydrocarbons
UXO	Unexploded ordnance
WB	World Bank
WHO	World Health Organization

ENVIRONMENTAL AUDIT REPORT

for

Maintenance of 2.2 km Section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh)

March 2013

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A. EXECUTIVE SUMMARY

Project Background

The Southern Coastal Corridor Project (SCCP) was approved by Asian Development Bank (ADB) on 18 February 2008 under Loan No 2373 and co-financed by Government of Australia (through AusAID) under grant for consulting services and civil work.

For land acquisition and resettlement, independent monitoring of the re-settlement plan implementation, a part of the project management costs, a part of contingencies, a part of civil works costs, and all taxes and duties are under responsibility of the Royal Government of Cambodia.

SCCP is under management of PMU3 (MPWT), and detailed design and construction supervision consultants are under Egis International in association with Khmer Associates Consultant Engineers Co. Ltd, Key Consultants Cambodia, Khmer Consultant Engineering Corporation Ltd, SBK Research and Development, and VIDO Engineering Consultant Co. Lt. The construction contract is Diamond Construction Ltd.

Up to now, within 2.2 km section of NR 3 (PK 49+870 to PK 52+060) some progress work has been done which is related to (i) Removed existing DBST, scarified and compacted existing base course which considered for reconstruction of sub-base; (ii) Overlay of new base course 20cm thickness by full width including margin has been placed, graded and compacted as per typical drawing (top width=11m); (iii) Prime coat has been spread and completed (width=10m); (iv) Bituminous seal coat works 19mm & 12.5mm have not yet started (full width of existing bituminous seal coat 19mm & 12.5mm is 10m) and (v) Top soil and block sodding has not yet started.

Purposed Audit

As stated in the EMP and EMoP report of the improvement of national roads projects, EMP and EMoP requires full implementation procedure. The environmental specialist of the consultant has the main roles responsible for environmental monitoring during construction period. The main roles of the environmental specialist can be indicated in the following:

Supervise the auditing of implementation mitigation measure of the contractor during the construction period which is in accordance with the EMP of the EMoP report, and submit the environmental audit report to PMU 3 (MPWT) and ADB as well. This has to be done for all the project routes and workers camps, especially, within 2.2 km section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh).

The environmental audit or monitoring report is needed to follow up the implementation of the contractor on the environmental mitigation measures which are stated within the EMP and EMoP during construction period. The guidance and instruction of the environmental auditing was prepared to enforce the contractor to follow the environmental mitigation measures as stated within EMP and EMoP report.

Inspection of Environmental Aspects

The study team conducted environmental field audit on 07-08 March, 2013 in and surrounding the 2.2 km of road section areas were inspecting, looking, and interviewing on the main environmental aspects took place:

- **Physical Resources:** Air and Noise Quality, Dust, Surface and Ground Water Quality
- **Ecological Resources:** Forest Resources, Wildlife, Fish, Habitat, and vegetation.
- **Socio-Economic:** Land use, Transportation Services, Public health and Sanitation, Safety, Traffic, and Cultural Resources.

Scope of Assessment the Impacts

The results of site assessment on the 2.2 km section of NR No3, the several impacts during road maintenance activities on the physical, ecological, and Socio-economical environment are of **small/low level of significance and of short time**. However, all the negative impacts should find proper mitigation measures to reduce and/or to limit negative impacts and enhance positive impacts.

Based on the site inspection of environmental audit team and interviews with local authorities as well as with local residents on physical, ecological and socio-economical aspects, there are only some minor impacts since within this section there are only paddy rice fields, no water sources (surface and ground water), forest, wildlife, habitats and rare endangered species, biodiversity and ecological system as well as protected areas. The summary of impacts on environment and social aspect, and mitigation measures for reducing the impacts with level of impacts are described in the table below:

Table: Scope of Assessment the Impacts

Environmental Aspects	Assessed impacts	Level of impacts
Physical Aspects		
Soil erosion and sediment	Increase erosion and sediment when raining time.	Low
Noise pollution, vibration	Increasing noise pollution and vibration in maintenance section	Low
Air and dust	Pollution from air and dust emission	Low
Surface and ground water quality	Negative changing surface and ground quality	Low
Ecological Aspects		
Small species of forest resources and wildlife and other vegetations	May be degraded or disturbed small species of forest-wildlife resources and other vegetations in this area	Low
Socio-Economic Aspects		
Local transportation movement or services	Can be affected to traffic condition and movement in this area	Low
Safety: Worker's health	May be created new diseases and accidental release during working	Low

Safety Traffic accident	May be increase traffic accidents or traffic jam in maintenance section.	Low
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According to the site investigation and inspection of the environmental specialist team on the environmental and social aspects within 2.2km section, it is concluded that there was no any environmental impact. The environmental and social conditions of the project area are good since most of the impacts occurred during the project formulation / implementation stage were minor and occurred only short time.

B. GENERAL BACKGROUND

B.1. Project overall

The Southern Coastal Corridor Project (SCCP) was approved by Asian Development Bank (ADB) on 18 February 2008 under Loan No 2373 and co-financed by Government of Australia (through AusAID) under grant for consulting services and civil work. There is also contribution from the Government of Cambodia which covers land acquisition and resettlement, independent monitoring of the re-settlement plan implementation, a part of the project management costs, a part of contingencies, a part of civil works costs, and all taxes and duties.

NR 3 from Kampot to Veal Rinh has been built/completed about 7 – 8 years ago (2004) but deficiencies developed already a few years later, showing depressions and disintegration of the surface, particularly on the above mentioned 2.2 Km section.

The project route (of NR 3, Kampot to Veal Rinh) is consisting of three (3) sections. First section (from PK 00 to PK 12 + 300) is to be performance based routine maintenance, Second section (from PK 12 + 300 to PK 32 + 500) is to be repair and third section (from PK 32 + 500) is also to be performance based routine maintenance. However, 2.2 km section of NR No 3 of this project which identification from PK 49+870 to PK 52+060 located within the third section is to be repaired due to the very poor route condition. Project route is identified as paddy rice fields and within coastal areas (see the project location map below).

The project is under management of PMU 3 (MPWT), and detailed design and construction supervision consultants are under Egis International in association with Khmer Associates Consultant Engineers Co. Ltd, Key Consultants Cambodia, Khmer Consultant Engineering Corporation Ltd, SBK Research and Development, and VIDO Engineering Consultant Co. Lt. The Construction Contractor is Diamond Construction Ltd. Import & Export.

Figure 1: project Location



B.2. Project Progress

Within 2.2 km section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh) up to now (07 March 2013), the progress of works is shown as follows:

- Removed existing DBST, scarified and compacted existing base course.
- Overlay of new base course 20cm thickness by full width including margin has been placed, graded and compacted as per typical drawing (top width=11m).
- Prime coat has been spread and completed (width=10m).
- Bituminous seal coat works 19mm & 12.5mm have not yet started (full width of existing bituminous seal coat 19mm & 12.5mm is 10m).
- Top soil and block sodding works have not yet started.

B.3. Purpose of the report

As stated in the EMP and EMoP report of the improvement of national roads, EMP and EMoP require full implementation procedure. The environmental specialist of the consultant has the main roles responsible for environmental monitoring during construction period. The main roles of the environmental specialist can be indicated in the following:

- Supervise the auditing of implementation mitigation measure of the contractor during the construction and operation period which is accordance with the EMP of the EMoP report, and submit the environmental audit report to PMU 3 (MPWT) and ADB as well. This has to be done for all the project routes and worker camps, especially, within 2.2 km section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh).

The environmental auditing (monitoring) report is needed to be followed up for the implementation by the contractor on the environmental mitigation measures which are stated within the EMP and EMoP during construction and operation period. The guidance and instruction of the environmental auditing was prepared to enforce the contractor to follow the environmental mitigation measures as stated within EMP and EMoP report.

B.4. Scope of work

The main tasks of the environmental auditing (monitoring) within construction and operation period are including:

- Reviewing the relevant reports (including road rehabilitation works reports) and environmental monitoring of contractor for project routes, especially within 2.2 km section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh).
- Field auditing (monitoring) on the environmental mitigation measures performance of the contractor within 2.2 km section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh).
- Provide guidance to the staff of MPWT/PMU 3 and as well as to the environmental engineering of contract on the environmental audit (monitoring) aspect, especially in the field practice,
- Provide recommendation to contractor to properly implement all EMP and EMoP measures and take any action to mitigate and reduce any other issues which have been found during construction period.

B.5. Methodology

Mainly, there are two kind procedures/methodologies which have been applied for environmental monitoring stage such as: firstly, screening the previous environmental reports that were prepared by CSC. Secondly, site auditing (monitoring) within 2.2 km section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh) by the environmental specialist team, and environmental quality measurement by taking samples of environmental monitoring items stated in the EMP and EMoP and in-situ field data collecting techniques using specified equipments and simple measuring equipments respectively. There was also carried out the monitoring of water quality (both surface and ground water), and air and noise quality during construction period.

- Screening environmental reports of CSC: conducting the screening of the results of environmental mitigation measures which is performed by the Contractor in order to find out there is compliance with EMP and EMoP report and to ensure that they are following the regulations and laws of the Kingdom of Cambodia.
- Site monitoring: use the environmental audit (monitoring) checklist sheet and visual inspection. During the field investigation on the environmental mitigation measures which were implemented by Contractor, the environmental specialist team was using the environmental auditing (monitoring) checklist sheet (**Annex 1**). Additionally, the visual inspection methodology was also used in order to apply for other environmental monitoring items. However, decree of impact shall be well recorded and photographs taken to proof the impacts (good or bad).

C. LEGISLATION AND GUIDELINES

Overall environmental management is the obligation of the MoE, which was established in 1993. The MoE is mainly responsible for implementation of the Law on Environmental Protection and Natural Resources Management. At the provincial and city levels, there are corresponding provincial/city environment departments. These local departments have the responsibility of enforcing the environmental legislation coming under the supervision of the MoE. However, the daily operation of these departments would normally be under the direct control of the provincial authorities.

Legislations and guidelines for managing of the environmental aspect of this project in which under responsible of MoE and competency agencies are included in table below:

No	Description	Date
1	Law on Environmental Protection and Natural Resource Management	December 24, 1996
2	Sub-decree on Environmental Impact Assessment	August 11, 1999
3	Sub-decree on Water Pollution Control	April 27, 1999.
4	Sub-decree on Solid Waste Management	
5	Sub-decree on Air Pollution Control and Noise Disturbance	July 10, 2000
6	Law on Land Traffic	December 22, 2006
7	Law on Land	August 30, 2001
8	Law on Expropriation	February 26, 2010

D. RESULT OF ENVIRONMENTAL MONITORING

D.1. Environmental Monitoring of Contractor

Actually, the maintenance of NR No 3 project as well as rehabilitation of 2.2 km section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh) project was classified as environmental category C and an IEE has not been required to be conducted which is in accordance with ADB guidelines. Therefore, there were only road rehabilitation works on-going for 2.2 km section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh), which description is attached within **Annex 3** of this report.

D.2. Field Monitoring by Environmental Specialist Team

D.2.1. Visual Inspection by Environmental Team

According to the field investigation of the environmental monitoring team which was held on 07-08 March 2013 on the project routes, the degree of safety and the environmental mitigation performance was recorded in environmental auditing (monitoring) checklist sheet (**Annex 1**). The task works were followed up on the safety and environmental issues and corrective action by the contractor in project route within 2.2 km section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh) and the investigation on other environmental items that have been occurred which are indicated as follows:

Air and Noise Quality

Based on the field investigation of the team study at the project route and according to the interviews with local villagers and local authorities within the project areas, especially within Veal Rinh Commune, Prey Nob District, air quality within the project areas is not a major problem, there will be minor effects on its quality in short time due to the dust generated from unpaved roads, and construction works, and the exhausted pollution from transport sector, in particular from vehicle emissions and truck soils transport to the sites. However, this minor problem mostly occurred during construction period, especially in dry season as considered the construction schedule for the transportation.

Ground Water

Based on the interviews with local communities as well as local residents, the ground water quality within the project area is very poor quality due to the salinity. During the rainy season, they only used the surface water for irrigation purpose and gardening. The source of ground water is mainly from urban areas of Veal Rinh Commune (market). They have to buy drinking water from the market, daily used and for other purposes such as cooking.

Surface Water

Source of water within the project area is mostly used for irrigation purposes only. In particular, near the project road (NR No 3, but not in the 2.2 km section), there are existing both natural and manmade canals, river and stream, pond or well. In the rainy season, the water resources are used for agriculture including rice cultivation, Chamkar (gardening) and plantations which are scattered around the houses of local residents. In the dry season, there is very limited fresh water available.

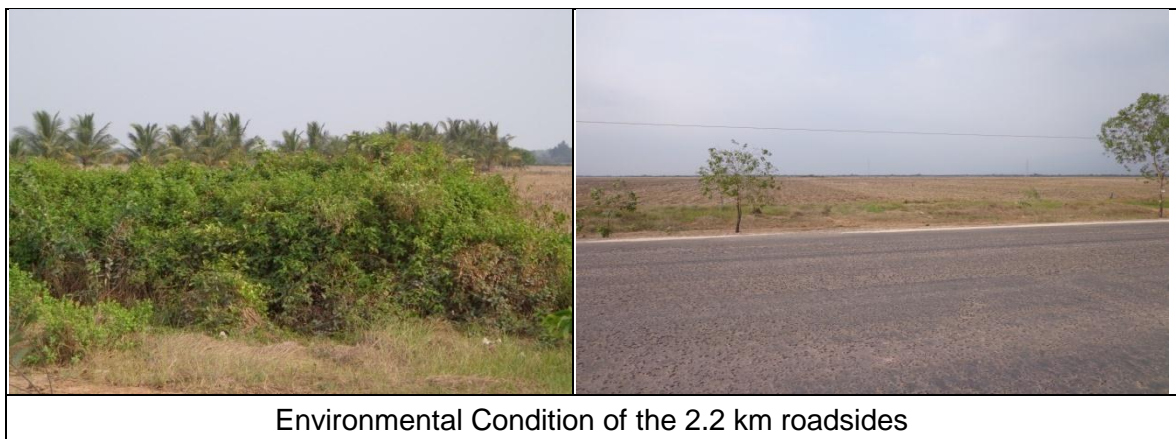
Therefore, based on the field interviews with local communities as well as the field investigation of the study team, surface water quality within project area still of good quality, it can be used for irrigation purpose on daily use within the wet season but not in dry season.

Forest, wildlife, habitat and rare endangered species

The landform of the project road corridor is mostly agriculture including paddy rice fields and fruit trees scattered within villages, settlements and aquaculture as well. Within 2.2 km section of NR No 3, there are no designated forest, wildlife and rare endangered species or habitats. Most trees are grown for fruits, other production purposes and plantations, mainly in settlement areas: the predominant species are eucalyptus along the project route which were planted in previous road construction process and the other fruit trees which are planted by local communities as well as local villagers are such as mangoes, bananas and coconuts, and village gardens, etc.

However, wildlife, habitat and rare endangered species are very poor. Based on the local communities as well as local residents and according to the observations of the study team, there are no any wildlife, habitat and rare endangered species.

Picture 3.1: Forest



Biodiversity and ecological system

Within the 2.2 km section of NR No 3 from PK 49 + 870 to PK 52 + 060, there are shrub lands, paddy rice fields, floodplains such as watercourse and depression in areas around flooded grassland within the project corridor. The ecological conditions qualified for fish to live in the catchments area belongs to this project routes (at both sides of road), but they are not good enough for fish migration in dry season. In the area, some fishes are found (see table below).

Table 3.1: Local Fish Name

No	Local name	Scientific name
1	Trey AndengRoeung	Clariasbatrachus
2	Trey AndengTun	Clariasmeladerma
3	Trey Chhlonh	Marcognathussiamensis
4	Trey Ampil Tum	Systemusorphoides
5	Trey Chhpin	Hypsibarbusmalcolmi
6	Trey Kanhchos	Mystussingaringan
7	Trey Kantrob	Pristolepisfasciata
8	Trey Kranh	Anabas testudineus
9	Trey Sor	
10	Trey Ross	Snake-head fish
11	Trey Chang Var	
12	Trey KamPleanh	

Source: Local Community, March 2013

Physical or Cultural heritage

Based on the field observation of the study team and local authorities as well as local residents, there are no physical or cultural heritage places within the 2.2 km section of NR No 3 from PK 49 +870 to PK 52 + 060 (Kampot to Veal Rinh)

D.2.2. Interview with Local Community and Resident

Within 2.2 km section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh), there are only 44 small houses on both sides of roadway. The interviews have been conducted on 07-08 March 2013 by environmental team with local residents who are living along the roadsides (see the table below: list name of respondents) in order to:

- Obtain information on the project, it's location, and activities
- Provide information on potential impacts and mitigation measures
- Receive feedback, comments from stakeholders, and
- Address potential issues and concerns.

Table 3.2: List name of respondents

No	Name	Organization	Position	Phone
1	Mr. Vith Kong	Veal Rinh commune	Commune Chief	016 782 378
2	Mr. KhovTha Nit	Veal Meas village, Veal Rinh commune	Village Chief	015 364 698
3	Ms. Sok Mean	BeungVeng village, Veal Rinh commune	Villager	
4	Ms. Kam Sokhom	BeungVeng village, Veal Rinh commune	Villager	
5	Mr. Ly Khon	BeungVeng village, Veal Rinh commune	Villager	016 574 972
6	Mr. Ly Nim	Road Maintenance Project	Site Manager	078 532 732
7	Mr. Meas Channa	BeungVeng village, Veal Rinh commune	Village Chief	016 65 81 98

Source: Local Community, March 2013

The result of interviewing and feed-back is indicated in the following:

- This section of NR No3 near to Veal Rinh commune was almost completely damaged, so the maintenance of this road is welcome to be a very good project, because this road way is economically important for the coastal provinces (economic pole) and for the whole country.
- This road section was damaged by rainwater and increasing big trucks, with over-loading.
- There are only 44 small houses on both sides of roadway.
- This section is paddy field (wet rice field), so the impact on fruit trees and resettlement is no problem.
- This road maintenance project follows the existing road alignment and will not expand the road width, so there is no impact to forest/vegetation and social resources in the commune.
- There are small impacts during maintenance stage that are caused by noise, dust, and vibration, but short time impacts only.
- Contractor should provide regularly watering in maintaining the section for reducing dust during maintenance period.
- For the heavy rains which occur in this area during raining season, the maintenance project should consider the run-off.
- If the maintenance project will be completed within short time, the negative impact will be small and a short time one only.
- The impact of this road maintenance (repair) activities on natural and social environment, and health in this section is very small, the village and commune authorities are happy and will collaborate with this project.

Picture 3.2: Interviews people



Met and Interviewed People

D.2.3. Impacts and Mitigation Measures

The result of site assessment on the 2.2km section of NR No3, the several impacts during road maintenance activities on the physical, ecological, and Socio-economical environment are small/low level of significance. However all the negative impacts should find proper mitigation measures to reduce and/or to limit negative impacts and enhance positive impacts.

The environmental impacts and proposed mitigation measures caused by those maintenance / repair activities on 2.2km section of NR No3 in BeungVeng and Veal Meas village, Veal Rinh commune, Prey Nob district, Preah Sihanouk Province are summarized in table below:

Based on the site inspection of environmental audit team and interviews with local authorities as well as with local residents, the summary of impacts on environment and social aspect and mitigation measures for reducing the impact can be described in the **Tables 3.3 and 3.4 below:**

Table 3.3: Scope of Assessment the Impacts

Environmental Aspects	Assessed impacts	Level of impacts
Physical Aspects		
Soil erosion and sediment	Increase erosion and sediment when raining time.	Low
Noise pollution, vibration	Increasing noise pollution and vibration in maintenance section	Low
Air and dust	Pollution from air and dust emission	Low
Surface and ground water quality	Negative changing surface and ground quality	Low
Ecological Aspects		
Small species of forest resources and wildlife and other vegetations	May be degraded or disturbed small species of forest-wildlife resources and other vegetations in this area	Low
Socio-Economic Aspects		
Local transportation movement or services	Can be affected to traffic condition and movement in this area	Low
Safety: Worker's health	May be created new diseases and accidental release during working	Low
Safety Traffic accident	May be increase traffic accidents or traffic jam in maintenance section.	Low

Table 3.4: Potential Impacts and Proposed Mitigation Measures

Environmental Aspects	Potential Impacts	Proposed Mitigation Measures
Physical Aspects		
Topography and soil (erosion and sediment)	<ul style="list-style-type: none"> - Changed topography of along the road-side, - Increase soil erosion and loss of fertility of top soil cause by filling, digging/excavating will small and short impacted to water quality during maintenance stage. 	<ul style="list-style-type: none"> - Properly reduce cutting vegetation on the road shoulder. - The maintenance will be operated during dry season.
Air and noise pollution, vibration, and dust from earthwork	<ul style="list-style-type: none"> - Air emission and noise pollution, due increase air, noise, dust from construction machines and road maintained activities during maintenance stage. 	<ul style="list-style-type: none"> - Use the new and high technical of construction machines to emit small air and noise and regularly maintain. - Limit driving speed as much as possible in the maintenance area

	<ul style="list-style-type: none"> - Increased dust from traffic volume and road maintained activities during maintenance stage. 	<ul style="list-style-type: none"> to reduce noise, vibration and dust. - Watering on the maintained section for reducing dust throughout maintaining period.
<ul style="list-style-type: none"> - Surface water quality. - Ground water quality 	<ul style="list-style-type: none"> - Can be small impacted to water quality from changing water flow and increased sediment and soil erosion at maintenance site during maintenance period. - Degradation surface and ground water quality from hazardous and non-hazardous waste of construction machines and workers: oil, lubricant, and plastic bags, etc 	<ul style="list-style-type: none"> - The maintenance should be operated in dry season, so impact on surface water quality is completely mitigate. - The camps should be located far from water sources. - Separate hazardous and non-hazardous wastes and store in appropriate container and comply with waste disposal rules in local authority. - Proper management, oil and lubricant will store in the container or give to licensed sub-constructor to transport and dispose.
Ecological Aspects		
Forest resources and other vegetations on the road shoulder and RoW	<ul style="list-style-type: none"> - Can be Loss and degraded small species of forest resources, wildlife and vegetations are on the roadway during maintenance activities and moving heavy equipments. 	<ul style="list-style-type: none"> - Try to reduce cutting or clearing forest resources along roadway. - Ensure that the movement equipments will be no damaged to forest resources and vegetations. - Hunting, logging, and wildlife trade will be strictly prohibited in this area and regularly control and supervise. - The movement heavy construction equipment shall be transported on the car trailers
Socio-Economic Aspects		
Local transportation Traffic movement	<ul style="list-style-type: none"> - Can be disturbed local traffic and released traffic accident in the maintenance sites during maintenance period. - May be disturbed to local traffic cause of increased dusk and noise pollution in Maintenance section. - Will be disturbed or damaged on existing roads by movement of heavy construction equipments. 	<ul style="list-style-type: none"> - Traffic flows controlled by suitable signage and trained personnel. - Provide warning signs and other safety signs at maintenance site. - Provide proper signage, barriers and flag persons for traffic control. Local traffic police involvement is required. - Limit driving speed for contracted and public vehicles. - Frequently watering on incomplete road. - Construction equipment with tracks shall be not drive on the existing or rehabilitated road surfaces and shall be transported on the car trailers
Safety: Public health (worker's health)	<ul style="list-style-type: none"> - May be created new diseases and infected from workers to workers come from many places. malaria, diarrhea, and HIV/AIDS, 	<ul style="list-style-type: none"> - Promote health awareness include HIV/AIDS), waste management, safety and spill accidents. - Provide proper sanitation and

	<ul style="list-style-type: none"> - Can be increased hazardous and non-hazardous wastes from construction camps lead to threat on worker's health in case uncontrolled sanitation, water supply, air and noise from construction machines during maintenance stage. - Will be impacted to worker's health of air and noise emission and vibration from construction machines, who will work closely, drive and order heavy equipments during maintenance period. 	<ul style="list-style-type: none"> waste disposal at camp and maintenance site. - Provide health care and worker's health checking - Segregate hazardous and non-hazardous wastes and store in appropriate containers. - Disclose information on infection, prevention and curing malaria. Provide malaria vaccination to workers. - Implementation maintenance program for all construction machines and training to workers for safety use machines - The worker camp will be provided latrine and will put at least 300m from water sources and existing residences. - Drinking water will meet National potable water quality standards. - Development of a comprehensive camp management plan including rules for on-site behavior and prohibition of the sexual worker trade.
Safety: Accidental release and unplanned/emergency traffic accident	<ul style="list-style-type: none"> - May be released any accidents, may be impacted human of life or bodies of workers, during maintenance working hours. - Can be released traffic accidents in the maintenance places, will be impacted to human life/bodies of maintenance workers and local passengers. 	<ul style="list-style-type: none"> - Provide training skills on using construction equipments. - Frequency control and properly repair construction equipments. - Strongly control and enforce traffic signs in the maintenance section. If necessary use traffic polices. - Emergency Response Plan is prepared in working site and use closed supported citie/town such as: equipments, materials, transportation, and professional staffs.

E. CONCLUSIONS AND RECOMMENDATIONS

E.1. Conclusions

According to the site investigation and inspection of the environmental specialist team on the environmental and social aspects of the repair works which are performed by contractor on 2.2 km section of NR No3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh), it is concluded that there was no adverse environmental impact. The environmental and social conditions of the project area are good since most of the impacts occurred during the project formulation / implementation stage were minor and occurred for only short time.

E.2. Recommendations

As required in the EMP and EMoP which is stated for the environmental mitigation measures, the environmental specialist team is strongly recommending in the following points:

1. *Contractor must make corrections and conduct the mitigation measures which are related to the safety tools / equipments and sign boards at the project sites,*
2. *Contractor must install the safety and informatory sign boards, and safety tools / equipment at all project sites as well as work sites in appropriate time and place in order to protect the workers' health during working activities, and provide education to the workers and staff before commencement of works,*
3. *Contractor must implement the corrective activities on the ground for compliance with EMP, EMoP and the laws and guidelines of the Royal Government of Cambodia.*
4. *Contractor must do environmental quality measurement to proof decree of the impact on the environmental resources which stated / listed in the EMP and EMoP.*

F. CORRECTIVE ACTION PLAN

Based on the site inspection of the environmental study team, interviews with local authorities and local residents who are living within project alignment, and interviews with site manager, there is indicated that:

- The project construction has been started already for long time and the result of those works are about 75% to 80% of works completion. It means that works remaining are still sealing aggregates and wearing course laying only.
- The construction works have been done properly by the Contractor by following the EMP and EMoP which is attached herewith (see Annex 4).
- Within alignment of 2.2km section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh), there was no impact on natural environment and socio-economic issues since there is no any protected areas and protected forest, wildlife habitat and endangered species, cultural heritage and any sensitive areas which could raise concerns.
- There was no any environmental impact. The environmental and social conditions of the project area are good since most of the impacts occurred during the project formulation / implementation stage were minor and occurred only short time. Therefore, the corrective action plan is not required in accordance with above aspects (visual inspection, interviews and site condition surveys).

ANNEX 1

ANNEXES

Annex 1: Environmental Audit (Monitoring) Checklist

Environmental Audit (Monitoring) Sheet

Project Name: Southern Coastal Corridor Project (SCCP)

Project site: 2.2 km Section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Renh)

Environmental monitoring sheet: Monitoring date: 07-08 March 2013

NO	Description	Location	Appropriate Facilities/ Protection Method	Decree of Environmental Condition					
				1	2	3	4	5	
	Physical Aspects								
6	Surface water quality	Project sites	Checking with quality			✓			
			Laden sedimentation			✓			
			Floating solid waste			✓			
			Floating liquid waste			✓			
		Worker camp	Checking with quality						
			Liquid waste						
			Solid waste/garbage						
			Human waste						
7	Air quality	Project sites	Checking with quality			✓			
			Dust			✓			
			Spray water			✓			
		Access road	Dust						
			Cover materials						
			Spray water						
8	Noise disturbance	Project sites	Any complain				✓		
			Checking with quality			✓			
			Noise level			✓			
		Worker camp	Any complain						
			Noise level						
9	Ground water	Project sites	Any change in color			✓			
			Checking with quality			✓			
		Worker camp	Any complain						
			Any change odor						
	Erosion and Sediment	Construction sites	Soil type				✓		
			Side slope			✓			
			compaction			✓			
			Re-vegetation						
		Borrow/quarries area	Embankment						
			Retention pond			✓			
10	Drainage system	Project sites	Arrangement				✓		
			Functioning						
		Worker camp	Arrangement						
			Functioning						
		Storage areas	Arrangement						

Environmental Audit (Monitoring) Sheet

			functioning					
	Social Aspects							
	Traffic system	Access road	Congestion				✓	
			Accident				✓	
		Level crossing	Safety sign			✓		
			Pavement condition			✓		
			Accident				✓	
	Safety	Project site	Safety sign		✓			
			Tool/equipment		✓			
			Education/awareness			✓		
		Quarry/workshop	Safety sign					
			Tool/equipment					
			Education/awareness					
		Worker camp	Safety camp					
			Education/awareness					
			Tool/equipment					
	Material and Chemical storage sites	Storage materials	Safety sign					
			Far from watercourse > 20m					
			Far from drainage canal					
			Concrete flooring					
			Concrete curve or wall				✓	
			Leakage			✓		
		Construction sites	Spilling					
			Symbol sign					
	Waste generation	Project sites	Liquid waste			✓		
			Solid waste/garbage				✓	
			Human waste				✓	
			Hazardous waste				✓	
		Worker camp	Liquid waste					
			Solid waste/garbage					
			Human waste					
		Storage areas	Liquid waste				✓	
			Solid waste/garbage			✓		
			Human waste				✓	
			Hazardous waste				✓	
	Community perception	Project sites	Conflict with local people				✓	
			Any complain from people				✓	
		Camp/quarry	Conflict with local people					
			Any complain from people					

Note: 5- very good, 4- good; 3-normal change; 2- poor; 1- very poor

ANNEX 2

Annex 2: Consultation and Environmental Condition Pictures



Environmental Condition Along 2.2 km Section of NR No 3
from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh)



Road Condition for 2.2 km Section of NR No 3, PK 49 + 870 to PK 52 + 060
(Kampot-Veal Rinh)



People Met and Houses Along 2.2 km Section of NR No 3
from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh)

ANNEX 3

Annex 3: Road Rehabilitation Work Report for 2.2 km Section of NR No 3 from PK 49 + 870 to PK 52 + 060 (Kampot to Veal Rinh)



**Royal Government of
Cambodia**

**Ministry of Public Works
and Transport**

ADB LOAN(SF) 2373-CAM

**GREATER MEKONG SUBREGION SOUTHERN COASTAL
CORRIDOR PROJECT**

Construction and Maintenance Supervision

**Road rehabilitation work for NR 3 for Km
49+870 – Km 52+060, “2 Km Section”**

August 2012

Version A



 **egis International**

In Association with

Khmer Associates Consultant Engineers Co. Ltd.

Key Consultants Cambodia, Khmer Consultant Engineering Corporation Ltd.

SBK Research and Development, and VIDO Engineering Consultant Co. Ltd.

Contents

- **INTRODUCTION**
- **PERFORMANCE OF INVESTIGATION**
- **THE LABORATORY'S SAMPLING/TESTING RECORDS**
- **DEFECTS**
- **CAUSES**
- **REPAIR OPTIONS**
- **COSTS**

ROAD REHABILITATION NR 3 PK 49+870 TO PK 52+060

“2 Km SECTION”

- INTRODUCTION

NR 3 from Kampot to Veal Rinh has been built/completed about 7 – 8 years ago (2004) but deficiencies developed already a few years later, showing depressions and disintegration of the surface, particularly on the a.m “2 Km section”

The road passes in the concerned area rather muddy underground which then led to the assumption that the defects were caused by weak subsoil conditions damaging the pavement structure too.

Accordingly were the 2 Km repaired in 2010, reinforcing the road structure by placing a geotextile, but new defects showed again shortly after on the repaired section that could not be explained by only the increasing number of heavy trucks on the road but could be caused also by deficient work, material, etc.

In the course of a meeting about the matter, held on 23.7. in MPWT, the Deputy Director General requested EGIS to

- Inspect the site,
- Investigate defects and causes,
- Propose adequate repair,
- Estimate costs for proposed repair options

- PERFORMANCE OF INVESTIGATION

The EGIS team went on site to inspect on foot the 2 concerned Km's in both directions with special attention to the 10 damaged subsections of ± 30 lin m each.

On grounds of what could be seen and considering the partly different assessments of the defects by the team engineers and to cover all risks it was decided to undertake a “mixed” investigation program, meant to study both:

- The soundness of the entire road structure and its foundation as a unit,
 - Applying plate bearing tests
- The stability of the pavement structure layer by layer
 - Subgrade
 - Subbase
 - Base
 - DBST

For

- The thickness of the layer
- The type of materials
- Workmanship of implementation
- Cleanness of aggregates
- Bondage of bitumen, etc.
- Applying DCP tests, sampling/testing properties and measuring dimensions.

Meanwhile EGIS Head office hired the Laboratory "Soil testing and Georesearch Inc to undertake:

- The sampling/testing
- Evaluation..... as described above

and check whether respectively to what extent findings match with the requirements stipulated in the original Specs/design meant to support the determination of defects, causes and remedies

The EGIS team marked on site

- 9 locations for PB tests
- 5 locations for Coring
- 4 locations for DCP tests
- 2 locations for digging pits and sampling/measuring dimensions of pavement layers

which were handed over to the Laboratory's field team, starting testing and sampling the following day (27.07.12) (see Annex 1)

The importance and urgency of the matter is recognized by the Head of the Laboratory who visited the site on 29.7, to inform himself about probabilities of defect causes and feasible repair.

He also identified onsite more or less immediately as a certain cause for the disintegration of the DBST a highly plastic material that embedded spotwise the chippings instead bitumen.

Sampling and testing in the field (PB, Coring, DCP, sampling) was completed on 4.8.12

The laboratory's testing/evaluation is now underway.

To be prepared for the eventuality of underground failure as built drawings are available to survey if and to what extent the 2 Km section has settled since reconstruction.

- THE LABORATORY'S SAMPLING & TESTING RECORDS

The laboratory's

- sampling
- testing
- evaluation

following hereafter is recorded on standard form sheets and commented by the Head of STG

Of special interest are also the info's, he got from persons, earlier involved in the original – and/or the “2 Km repair project”

Also of interest are tests, the Lab. made, pushing the drill under high load into the underground, to get hints about the underground conditions where cores were taken.

- DEFECTS (SEE ALSO PHOTO DOCUMENTATION)

On the 4000 sqm damaged area within the entire “2 Km section” typical damages are met as follow:

- Depressions (mostly shallow)
- Mesh cracking
- Shoving
- Potholes (isolated and series)
- Deformations of DBST and Base
- Large sections of disintegrated pavement (DBST)

- CAUSES

Although a few of the Plate bearing tests indicate occasional spots of weak underground (deficient testing due to difficulties to install the bottom slab of the jack on the uneven road surface, though using sand as platform, is theoretically also possible) one can, considering all other tests, conclude that:

The actually bad condition of the “2 Km section” is caused in the first place by a failure of the DBST or Base course or its combined function, but not by underground failure.

Generally it is certainly a number of causes that led to the deterioration.

- Piles of chippings of the DBST have been found, without traces of bitumen
- Other chippings embedded in a high plastic material, located in-between DBST and base, origin unknown
- Base course material with much fine portion or crushed material, rather milled by the passing traffic

All 3 observations are indicating that there was no stable clean base platform on to which a DBST was glued.

DBST, perhaps even bedded on soft plastic material, will break under a heavy truck wheel and allow penetration of water leading to the normal disintegration of the combined layers, resulting in shoving and all kinds of deformations and potholes.

One can assume that the damage happened so or likewise to the DBST – Base unit of the 2.2 Km

In all it is a mixture of poor workmanship and deficient material that led to the described defects.

- REPAIR OPTIONS

Considerations prior to proposals:

What makes the 2 Km so special over the other 52 Km from Kampot to Veal Rinh.

If there is nothing, applies option 1:

“Repair as per Re-condition survey, repair spots only”

To avoid the risk¹ that also the rest of the 2 Km section will fail, apply, depending on the actual condition of the base, option 2 or 3

“20 respectively 32 cm Base course and DBST over the entire 2.2 Km section”

In case of doubts² versus the section’s underground, applies option 4

20 cm stabilized (5% Cement) base course and DBST over entire 2.2 Km section

More theoretical option 5

25 cm RC slab over entire 2.2 Km section

General Notes:

¹ In view of the fact that the 2 Km section was repaired by one Contractor, who failed to provide proper workmanship and adequate materials, it is recommended to apply option 2 or 3, but in any case repair of “entire section”

² EGIS and STG have some doubts about the underground, upto 18 m mud is natural risk, but are sure that the actual damages have other causes.

- COST ESTIMATE FOR 5 APPLICABLE REPAIR OPTIONS

Options	Total amount (USD)	Amount for 2.2 Km (USD)	Remarks
Option 1	1,984,135.58	50,663.25	As per re-condition survey, repair spots only
Option 2	2,277,200.33	343,728.00	20 cm base course and DBST, entire 2.2km sections
Option 3	2,372,066.09	438,593.76	32 cm base course and DBST, entire 2.2km sections
Option 4	2,236,987.92	303,515.59	20 cm stabilized (5% cements) base course and DBST, entire 2.2km sections
Option 5	2,901,472.33	968,000.00	25cm RC slab, entire 2.2km sections

Road Rehabilitation NR 3

Km 49+870 – 52+060

ANNEXES

List of SAMPLING and TESTING

undertaken : from 27 July 2012 to 02 August 2012
 On : NR 3, Km 49+870 to Km 52+060
 To : determine damages, causes
 and corresponding repair

as follows:

Chainage	LHS	RHS	Type of test	Remarks
52+060	4.5		Plate Bearing Test	PB1
51+802		3.5	Plate Bearing Test	PB2
51+540	4.5		Plate Bearing Test	PB3
51+325		3	Plate Bearing Test	PB4
51+060	1.5		Plate Bearing Test	PB5
50+825		2	Plate Bearing Test	PB6
50+575	3.5		Plate Bearing Test	PB7
50+286		3	Plate Bearing Test	PB8
49+870	3.5		Plate Bearing Test	PB9
52+060	4.5		SPT Test	C1
51+540	4.5		SPT Test	C2
51+160		3.5	SPT Test	C3
50+575	3.5		SPT Test	C4
49+870	3.5		SPT Test	C5
52+060	5		DCP Test	Test No.1
51+540	4		DCP Test	Test No.2
51+160	3		DCP Test	Test No.3
49+870	3.2		DCP Test	Test No.4
51+440	3		Sampling Material for Base course and Sub-base	Pit 1 (Depth 0.32m for Base course and 0.30m for Sub-base)
49+870	3.2		Sampling Material for Base course and Sub-base	Pit 2 (Depth 0.2m for Base course and 0.20m for Sub-base)

PHOTO DOCUMENTATION

“ 2 Km Section”

TYPICAL DEFECTS on the "2 Km SECTION"



Disintegration of DBST



DBST & Base damage



Series of potholes leading to complete deterioration



SAMPLING and TESTING on the “2 Km SECTION”



Plate bearing tests



Coring



Cylinder sampling



Dynamic Cone Pen. Test



Sampling disintegrated DBST



Pit digging to sample/measure pavement layers

ANNEX 4

**Kingdom of Cambodia
Ministry of Public Works and Transport**

**ADB LOAN 2373(SF) – CAM
GREATER MEKONG SUBREGION SOUTHERN COASTAL CORRIDOR
PROJECT**

**Detailed Design and Implementation Services
Construction Supervision Services**



**SCCP-CW3 : NR3 – ROAD MAINTENANCE
ENVIRONMENTAL MANAGEMENT PLAN
ENVIRONMENTAL MONITORING PLAN**



In Association With

Khmer Associates Consulting Engineers Co. Ltd.

Key Consultants Cambodia

Khmer Consultant Engineering Corporation Ltd.

SBK Research and Development, and VIDO Engineering Consultant Co. Ltd

Date March 2013

Reference

Version A

Recipients

Attention		Copy	
Name	Organisation	Name	Organisation
Mr. Pheng Sovicheano	MPWT/PMU-3	Through MPWT / PMU-3	ADB
		Through MPWT / PMU-3	AusAID

History of modifications

Final control	
Date	
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Signature	

Version	Date	Prepared by	External control	Modifications
A	18 March 2013	Yim Chamnan	Andre Drockur	

Other information

Author	Yim Chamnan
Date	March 2013
Reference	
Document Title	SCCP-CW3 : NR3 – Road Maintenance ENVIRONMENTAL MANAGEMENT PLAN ENVIRONMENTAL MONITORING PLAN

ABBREVIATIONS

ADB	–	Asian Development Bank
DDIS	–	detailed design and implementation services
EA	–	executing agency
EMP	–	environmental management plan
EMoP	–	environmental monitoring plan
GDPW	–	General Department of Public Works
GMS	–	Greater Mekong Subregion
IEE	–	initial environment examination
MPWT	–	Ministry of Public Works and Transport
NR	–	national road
PDPWT	–	Provincial Department of Public Works and Transport
PMU-3	–	Project Management Unit No.3
ROW	–	right-of-way
SCC	–	Southern Coastal Corridor

**GREATER MEKONG SUBREGION SOUTHERN COASTAL CORRIDOR PROJECT
ADB Loan No. 2373(SF)-CAM**

**SCCP-CW3 : NR3 – ROAD MAINTENANCE
ENVIRONMENTAL MANAGEMENT PLAN - ENVIRONMENTAL MONITORING PLAN**

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3. Environmental Monitoring Plan Checklist
4. Ambient Air Quality Standard
5. Maximum Allowable Standard of Pollution Substance for Immovable Sources in Ambient Air
6. Maximum Standard of Noise Emission Level Allowable for Vehicles on Public Roads
7. Maximum Standard of Noise Level Allowable in the Pubic and Residential Areas (dB(A))

5. Due to financing constraints the project scope would need to be downsized to meet project funds available. The required change in project scope is being processed by RGC and the financiers. It is proposed to remove from the original scope the NR33 bridge component and to redesign the maintenance component by removing periodic and routine maintenance on NR31 and NR33 section and introducing a routine maintenance component on NR3 between Kampot and Veal Rinh. While within the southern coastal corridor, the proposed NR3 routine maintenance is regarded as a new component as it is located in an area which was not anticipated at Appraisal.

C. Environment

6. The project corridor in southern Cambodia contains no designated forest, wildlife, or rare and endangered species or habitats. Vehicle related air and noise pollution is not a serious problem along the corridor. However, during dry seasons, laterite dust from passing vehicles creates serious dust clouds affecting the quality of life for all living along the roadway. And up to 75 m on either side.

D. SCCP-CW3: Maintenance of NR3 - Environmental Impact - Mitigation Measures

7. The present report deals with the environmental impacts resulting from the Maintenance works at NR 3 from Kampot to Veal Rinh, with special regard to the 2.2 km section from PK 49+870 to PK 52+060.

8. No adverse environmental impacts are expected during construction and operation of the roadway. The attached EMP lists the measures to be implemented during road maintenance stage to mitigate the potential environmental impacts, all of temporary nature. The EMoP provides the monitoring activities related to each proposed mitigation measure. To ensure implementation of the EMP by the civil works contractor, clauses have been included in section 1-10 of the technical and special specifications to detail the Contractor's contractual and legal obligations.

Table A1 - ENVIRONMENTAL MANAGEMENT PLAN (EMP)

Environmental Impact/Issue	Magnitude of Impact			Duration of Impact			Risk	Mitigation Measures	Location	Time Frame	Responsibility	
Impact	L	M	H	S	M	L	L/M/H				Implement	Supervise
1. CONSTRUCTION PERIOD												
Failure of the contractor to adhere to Construction period mitigative measures defined in the EMP							H	As part of the contractor's work plan, they will need to confirm that they have in hand the EMP/EMoP, or at least the impact and mitigation section for use as a guide to their work	N/A	Within the 1st week of contractor mobilization	Contractor	PMU3/SEU, PSC, Provincial MPWT at Kampot
Excessive noise from construction equipment and machineries affecting settlement areas							M	Given that this subproject is in a low Population density agricultural corridor, construction works involving equipment and trucks and any other noisy activities will be minimally restricted, except within 300m of settlement noise level shall not exceed 55dBA, work will be limited to the hours of 0600 to 1800. Contractor will be required to maintain the exhaust systems of the entire work fleet in order to avoid excessively noisy machinery operations.	Anywhere that construction is taking place	Throughout construction period	Contractor	PMU3/SEU, PSC and MPWT-Kampot
Noise, bad odour and dust due to the placement and operation of borrow pits							M	Any borrow pits operated or used by the Contractor must be legally operating borrow pits (according to Cambodian Environmental Law). The contractor must provide written proof that this is so and if not, either correct the non-compliance, or find a different legal supplier.	At borrow pits	Throughout construction period	Contractor	PMU3/SEU, PSC and MPWT-Kampot

Environmental Impact/Issue	Magnitude of Impact			Duration of Impact			Risk	Mitigation Measures	Location	Time Frame	Responsibility	
	L	M	H	S	M	L					Implement	Supervise
Air pollution from vehicle exhaust and gaseous emissions of trucks and construction equipment, and dust generated by hauling and transport of construction materials							H	Operation of construction equipment shall be subjected to regular check up and maintenance to reduce noise and gaseous emissions. TSP limits must not exceed 0.33 mg/m ³ . Construction site watering will be undertaken, haul road will be regularly cleaned by the contractor to prevent ancillary dust and vehicle speeds will be limited to 30 km/hr to prevent excessive dust levels.	Construction access and haul roads used by the contractor	1x every 3 months throughout construction period	Contractor	PMU3/SEU, PSC and Provincial MPWT - Kampot
Traffic disruption, blockage of side road, property access, and use of side roads as storage of construction materials, (e.g. laterite, sand and gravel)							M	The road side use as storage of construction materials, e.g. laterite, sand and gravel will not be allowed. Transport route and haul roads through which the trucks will need to pass must be established and approved by the sub-district officials During the day's peak traffic period, as determined by the traffic counts, the contractor will have on site traffic control systems that will prevent delays. Any complaints must be recorded and reported to MPWT Kampot within 3 days of filing.	Anywhere that construction is taking place	Throughout construction period	Contractor	PMU3/SEU, PSC and Provincial MPWT - Kampot
Degradation of access and haul road							M	Contractor will be responsible for maintaining and repairing all roads used as access to worksites, or to materials production and storage areas, this will include cleaning, dust control and repair of surface degraded by heavy truck uses.	Construction access and haul roads used by the contractor	Throughout construction period	Contractor	PMU3/SEU, PSC and Provincial MPWT - Kampot

Environmental Impact/Issue	Magnitude of Impact			Duration of Impact			Risk	Mitigation Measures	Location	Time Frame	Responsibility	
	L	M	H	S	M	L					Implement	Supervise
Blockade of waterways and irrigation channels							M	Contractor must follow closely the specifications for re-placement of each drainage structure, making sure to clear away all blockages before finishing the work.	At all worksites where drainage structures replacement	Throughout construction period	Contractor	PMU3/SEU, PSC and Provincial MPWT - Kampot
Pollution of waterways and irrigation channels related to discharge of construction-related wastes							H	Construction-related waste will not be diverted into natural waters but into paddy areas for use as irrigation water. Wastes such as used oil, lubricants, petroleum products, and all waters used to wash vehicles including garbage and sewage will be collected to the disposal site.	Along all construction area and construction camps	Throughout construction period	Contractor	PMU3/SEU, PSC and Provincial MPWT - Kampot
Failure to rapidly re-vegetate areas denuded during construction, (if applicable) using the replanting plan provided							M	Contractor must be reminded that replanting must be done according to a replanting plan or based on Forestry Department advice (if applicable). Mandatory monitoring will occur and payment will be based on final plant survival numbers.	Along all road sides according to the planting plan	Throughout construction period	Contractor	Contractor, PMU3/SEU, PSC and Provincial MPWT - Kampot
Inappropriate sighting, use and rehabilitation of borrow areas							M	As a first step, the contractor will use only legally licensed borrow operators. Secondly there will be no side borrow permitted, unless agreed to with roadside residents. The contractor will be responsible for rehabilitating any borrow sites opened and operated by them.	All borrow sites and any access roads	Throughout construction period	Contractor	PMU3/SEU, PSC and Provincial MPWT - Kampot
Contractor's interim and Final Monitoring Report not submitted							M	MPWT and MPWT-Kampot or a designate will actively obtain the monitoring report from the contractor(s) working on the road and, based on that, prepare the implementation timetable for mitigation and monitoring during operating stage of the project	Contractor's office	At end of construction period	Contractor	PMU3/SEU, PSC and Provincial MPWT - Kampot

Environmental Impact/Issue	Magnitude of Impact			Duration of Impact			Risk	Mitigation Measures	Location	Time Frame	Responsibility	
Impact	L	M	H	S	M	L	L/M/H				Implement	Supervise
2. OPERATIONAL PERIOD												
Failure of Operator/Proponent to actively seek Contractor's Monitoring Report and To Prepare an Operational Period Mitigation Schedule							M	MPWT and MPWT-Kampot or a designate will actively obtain the monitoring report from the contractor(s) working on the road and, based on that, prepare the implementation timetable for mitigation and monitoring during operating stage of the project	To cover all areas defined in the EMP, specifically including the work to complete replanting	At or just before road commissioning	MPWT-Kampot and Contractor	MPWT
3. MONITORING												
Environmental Monitoring	Not Applicable							Monitoring will be conducted according the details as defined in Table A-2 of this document, supported by an implementation timetable prepared during the design phase, by the PSC, the SEU of MPWT and the MPWT-Kampot; Monitoring will be done during the construction years and near the end of the first operating year, covering primarily the plantings and the drainage management works plus the adequacy of flood protection.	As defined in Table A-2	Throughout the project phases as defined in Table A-2; the Environmental Monitoring Plan (EMoP)	MPWT-Kampot	MPWT

Note: Magnitude and Duration- refer to severity and length of the impacts if not mitigated.
 Risk - refers to the risk that the effect listed or action required will not be undertaken

Table A2 - Environmental Monitoring Plan (EMoP)

PERIOD	Mitigation Measures (Items to Monitor)	Monitoring Required	Schedule / Frequency	Start / Completion	Reporting	Responsibility
CONSTRUCTION PERIOD						
	As part of the contractor's work plan, they will need to confirm that they have in hand the EMP/EMoP, or at least the impact mitigation section for use as a guide to their work	Confirm with PMU that translated documents are in hand	Once during construction period	Prior to construction/ Before start of work	Written confirmation by contractor to Supervision Engineer	Contractor, Contract Supervision Consultant and PMU3 and MPWT Kampot
	Construction work involving equipment and trucks and other noisy activities, will be limited to the hours of 0600 to 1800; the same will be applied to roads through settlement areas used by hauling trucks to a construction site. Contractors will either have to plan ahead or haul during the daytime. Outside the settlement areas, construction will be permitted at any time.	Periodic random monitoring by Supervision Engineer for at least 1 hr (0530-0630) and (1700-1900) four times per month at work sites and material haul roads which pass through settlement areas	Every month, using checklist prepared from EMP	Every month/ By the end of that month	Table reporting No/type of construction vehicle operating after designated times to MPWT- Kampot	Contractor, Contract Supervision Consultant, PMU3 and MPWT-Kampot
	Any borrow pit operated or used by the contractor must be legally operating (according to Cambodian law). Written proof of legal status will be required and if not, compliance or use of a different legal supplier will be required.	Obtain and keep on file the copies of necessary licenses in contractors site office	When operation is scheduled to be used.	Before start of use/Before start of use of the site by contractor	Site map, and associated permit provided by Ministry of Mining and Energy submitted to Supervision Engineer	Contractor, Contract Supervision Consultant provincial MOE-Kampot and MPWT

PERIOD	Mitigation Measures (Items to Monitor)	Monitoring Required	Schedule / Frequency	Start / Completion	Reporting	Responsibility
	<p>Operation of construction equipment shall be subjected to regular check up and maintenance to reduce noise and gaseous emissions.</p> <p>TSP limits must not exceed 0.33 mg/m³. Construction site watering will be undertaken, haul road will be regularly cleaned by the contractor to prevent ancillary dust and vehicle speeds will be limited to 30 km/hr to prevent excessive dust levels.</p> <p>Transport route and haul roads of construction materials must be established and approved by the sub-district officials through which the trucks will need to pass.</p> <p>During the day's peak traffic period, as determined by the traffic counts, the contractor will have on site traffic control systems that will prevent delays. Any complaints must be recorded and reported to MPWT Kampot within 3 days or filing.</p>	Contract Supervision inspection Reports	When operation is scheduled to be used	Before start of use of the site by contractor/Monthly / within one week of month end	Section in monthly construction inspection report; based on EMP tasks	Contractor, Contract Supervision Consultant provincial MOE-Kampot and MPWT
	The use of side roads as storage of construction materials, e.g. laterite, sand and gravel along the road side will not be allowed.		Daily throughout the construction period along all construction area and transport route and haul roads.	Start of construction period and end of construction	Section in monthly construction inspection report; based on EMP tasks	Contractor, Contract Supervision Consultant PMU3/SEU and MPWT-Kampot
	Contractor will be responsible for maintaining and repair of all roads used as access to worksites, or to materials production and storage areas; this will include cleaning, dust control and repair of surface degraded by heavy truck uses.	Contract Supervision inspection reports	As part of regular construction inspection	Monthly/ within one week of month end	Section in monthly construction inspection report; based on EMP tasks	Contractor, Contract Supervision Consultant PMU3/SEU and MPWT-Kampot

PERIOD	Mitigation Measures (Items to Monitor)	Monitoring Required	Schedule / Frequency	Start / Completion	Reporting	Responsibility
	Contractor must follow closely the specifications and placement of each drainage structure (if any), making sure to clear away all blockages before finishing the work.	Contract Supervision inspection reports	As part of regular construction inspection	Monthly/ within one week of month end	Section in monthly construction inspection report	Contractor, Contract Supervision Consultant PMU3/SEU and MPWT-Kampot
	Contractor will adhere to standard good housekeeping practices as defined in the bidding documents and special environmental clauses. Special consideration will be given to management of construction-related waste not diverted into natural waters but into paddy areas for use as irrigation water, Wastes such as used oil, lubricants, petroleum products, and all waters used to wash vehicles including garbage and sewage will be collected to the disposal site in compliance with RCG regulations and standards.	Contract Supervision inspections report, using EMP as a guide	Two times during work	Every 6 months- Before 6th month has started / Within two weeks of end of each 6-month period	Compliance checklist of all housekeeping activities as defined in EMP submitted to Supervision Engineer	Contractor, Supervising Engineer, PMU3/SEU and MPWT-Kampot
	Contractor to undertake the replanting program (if applicable) as prescribed and immediately after work in one section of the road is complete; using a qualified landscape gardener specialist.	Contract Supervision inspection reports	Throughout the construction period	As soon as the first plantings are completed/through the end of the construction period	Contractor to provide a sketch of location and species planted, dates planted- and provide exact survival numbers at end of construction period.	Contractor, Supervising Engineer and MPWT-Kampot
	As a first step, the contractor will use only legally licensed borrow operators. Secondly there will be no side borrow permitted, unless agreed to with roadside residents. The contractor will be responsible for rehabilitating any borrow sites opened and operated.	Contract Supervision inspections report	Throughout the construction period	Prior to construction/ Before start of work	Site map, and Signed agreement with resident/land owner	Contractor, Supervising Engineer and MPWT-Kampot

PERIOD	Mitigation Measures (Items to Monitor)	Monitoring Required	Schedule / Frequency	Start / Completion	Reporting	Responsibility
	Contractor will prepare a final monitoring report, in the form of a small matrix table, defining the mitigative actions taken, when and where these were taken, the benefits achieved and the future actions needed during the operating period.	MPWT-Kampot to collect this table/document	Once	Start of construction period/ End of construction	Monitoring completion report by contractor submitted to Supervision Engineer and MPWT Kampot with copy to MOE-Kampot	Contractor, Supervising Engineer and MPWT-Kampot
OPERATING PERIOD						
	MPWT-Kampot or a designate will obtain the monitoring report from the contractor and, based on that, prepare the implementation timetable for mitigation and monitoring during operating stage of the project	PSC, PMU and MPWT-Kampot to collect contractor's final monitoring data and use it to prepare an operating period implementation timetable—dealing mostly with maintenance of mitigative actions such as plantings (if applicable), then proceed to monitor its implementation	Once	Start of Operating period	Mitigation and monitoring timetable and compliance monitoring checklist prepared by the MPWT-Kampot	PSC and PMU 3/SEU

Table A3 – Environmental Monitoring Plan – Monitoring Checklist

General information	DD/MM/YY		
	Report prepared by		
	Name of road and location of construction site		
	Name of contractor/ subcontractor		
Permits, agreements	Request for obtaining a permit for quarry/borrow pit opening during construction	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Request for obtaining an agreement for disposal of construction waste	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
Management of construction sites	Proper location of construction site/camp	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Aggregate/asphalt batching plants properly licensed and approved by Ministry of the Environment (MOE).	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Availability of proper storage for fuel, oil and construction materials	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Proper maintenance of construction machinery and equipment (prevent leakage of fuel, oil, lubricants, etc.)	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Availability of temporary storage areas for excavated and demolished materials and construction wastes within the existing right-of-way	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Timely removal of excavated and demolished materials and construction waste from the temporary storage areas to planned and agreed places	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Use covered trucks for transportation of construction materials and waste	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Clean the surrounding area from dust by water sprinkling in construction zone (when necessary)	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Clean/ wash tires of vehicles before they get to dwellings and/or drive on highways (when necessary)	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Implementation of works at the established time (e.g. work during daytime 06.00 to 18.00)	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Installation of road signs in construction sites, camps and along access roads	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A

	Ensure proper sanitary/ hygienic conditions for workers at the construction site	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
Management of construction sites	Restoration of the area of construction sites and camps when the construction works are over	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A
	Replanting/planting of finished work areas (i.e. embankment slopes, borrow pits, etc.)	<input type="checkbox"/> Yes	<input type="checkbox"/> No	<input type="checkbox"/> N/A

Annex to Anukret No. 42/ANK/BK of July 10, 2000

Ambient Air Quality Standard

No.	Parameter	1 Hour Average mg/m ³	8 Hours Average mg/m ³	24 Hours Average mg/m ³	1 Year Average mg/m ³
1	Carbon Monoxide (CO)	40	20		
2	Nitrogen dioxide (NO ₂)	0,3		0,10	
3	Sulfur dioxide (SO ₂)	0,5		0,30	0,10
4	O Zone (O ₃)	0,2			
5	Lead (Pb)			0,005	
6	Total Suspended Particulate (TSP)			0,33	0,10

This standard applies to ambient of air quality and to monitoring of air pollution status.
Method for analysis of ambient air quality is specified in the guideline of the Ministry of Environment.
TSP = Total Suspended Particulate.

Annex to Anukret No. 42/ANK/BK of July 10, 2000

**Maximum Allowable Standard of Pollution
 Substance for Immovable Sources in Ambient Air**

No.	Parameter	Maximum Level of Discharge
1	Particulate in smoke of:	
	- Incinerator	400 mg/m ³
	- Heating Metal	400 mg/m ³
	- Bad Stone, lime, cement manufacturing	400 mg/m ³
	- Asphalt concrete plant	500 mg/m ³
2	Dust	
	- Containing silica (SiO ₂)	100 mg/m ³
	- Containing Asbestos	27 µg/m ³
	Chemical in organic substance	
3	Aluminum Al	(dust) 300mg/m ³ ; (Al) 50mg/m ³
4	Ammonia NH ₃	100 mg/m ³
5	Antimony Sb	25 mg/m ³
6	Arsenic As	20 mg/m ³
7	Beryllium Be	10 µg/m ³
8	Chloride Cl	20 mg/m ³
9	Hydrogen chloride HCl	200 mg/m ³
10	Hydrogen Fluoride HF	10 mg/m ³
11	Hydrogen Sulfide H ₂ S	2 mg/m ³
12	Cadmium Cd	1 mg/m ³
13	Copper Cu	(dust) 300 mg/m ³ (Cu) 20 mg/m ³
14	Lead Pb	(dust) 100 mg/m ³ , (Pb) 30 mg/m ³
15	Zinc Zn	30 mg/m ³
16	Mercury Hg	0,1 mg/m ³
17	Carbon Monoxide CO	1000 mg/m ³
18	Sulfur dioxide SO ₂	500 mg/m ³
19	Nitrogen Oxide (all kinds) NO _x	1000 mg/m ³
20	Nitrogen oxide NO _x (emitted HNO ₃ product)	2000 mg/m ³
21	Sulfuric Acid H ₂ SO ₄	35 mg/m ³
22	Nitric Acid HNO ₃	70 mg/m ³
23	Sulfur Trioxide SO ₃	35 mg/m ³
24	Phosphoric Acid H ₃ PO ₄	3 mg/m ³
	Chemical organic substance	
25	Acetylene tetra bromide CHBr ₂	14 mg/m ³
26	Acrolein CH ₂ =CHCHO	1,2 mg/m ³
27	Aniline C ₆ H ₅ NH ₂	19 mg/m ³
28	Benzidine NH ₂ C ₆ H ₄ C ₆ H ₄ NH ₂	None
29	Benzene C ₆ H ₆	80 mg/m ³
30	Chloro benzyl C ₆ H ₅ CH ₂ Cl	5 mg/m ³
31	Butyl Amine CH ₃ (CH ₂) ₂ CH ₂ NH ₂	15 mg/m ³
32	Cresol (O-,m-,p-) CH ₃ C ₆ H ₄ OH	22 mg/m ³
33	Chloro benzene C ₆ H ₅ Cl	350 mg/m ³
34	Chloroform CHCl ₃	240 mg/m ³
35	Chloropicrin CCl ₃ NO ₂	0,7 mg/m ³

No.	Parameter	Maximum Level of Discharge
36	O-dichlorinbenzene <chem>C6H4Cl2</chem>	300 mg/m ³
37	1,1-dichloro ethane <chem>CHCl2CH3</chem>	400 mg/m ³
38	Di methyl sulfate <chem>(CH3)2SO4</chem>	0,5 mg/m ³
39	Di methyl hydrazine <chem>(NH3)2NNH2</chem>	1 mg/m ³
40	Di nitro benzene (o-,m-,p-) <chem>C6H4(NO2)2</chem>	1 mg/m ³
41	Ethylene di amine <chem>NH2CH2-CH2NH2</chem>	30 mg/m ³
42	Ethylene Chlorohydrine <chem>CH2ClCH2OH</chem>	16 mg/m ³
43	Ethylene oxide <chem>CH2OCH2</chem>	20 mg/m ³
44	Formaldehyde <chem>HCHO</chem>	6 mg/m ³
45	Methyl Acrylate <chem>CH2=CHCOOCH3</chem>	35 mg/m ³
46	Methanol <chem>CH3OH</chem>	260 mg/m ³
47	Methyl bromide <chem>CH3Br</chem>	80 mg/m ³
48	Monomethyl Aniline <chem>C6H5NHCH3</chem>	9 mg/m ³
49	Nitro Benzene <chem>C6H5NO2</chem>	5 mg/m ³
50	Nitroglycerine <chem>C3H5(NO2)3</chem>	5 mg/m ³
51	Nitrotoluene <chem>NO2C6H4CH3</chem>	30 mg/m ³
52	Phenol <chem>C6H5OH</chem>	19 mg/m ³
53	Phenylhydrazine <chem>C6H5NHNH2</chem>	22 mg/m ³
54	Pyridine <chem>C5H5N</chem>	30 mg/m ³
55	Pyrene <chem>C16H10</chem>	15 mg/m ³
56	Quinone <chem>C6H4O2</chem>	0,4 mg/m ³
57	Styrene <chem>C6H5CHCH2</chem>	420 mg/m ³
58	1,1,2,2-tetrachloroethane <chem>CL2HCCHCl2</chem>	35 mg/m ³
59	Tetrachloromethane <chem>CCl4</chem>	65 mg/m ³
60	Toluene <chem>C6H5CH3</chem>	750 mg/m ³
61	Tetranitromethane <chem>C(NO2)4</chem>	8 mg/m ³
62	Toluidine <chem>CH3C6H4NH2</chem>	22 mg/m ³
63	Toluene-2,4-D-isocyanate <chem>CH3C6H3(NCO)2</chem>	0,7 mg/m ³
64	Trichloro ethylene <chem>ClCH=CCl2</chem>	110 mg/m ³
65	Xylidine <chem>(CH3)2 C6H3NH2</chem>	50 mg/m ³
66	Vinylchloride <chem>CH2=CHCl</chem>	150 mg/m ³

This standard applies to control of pollution substance for immobile source to atmosphere

Annex_5 to Anukret No. 42/ANK/BK of July 10, 2000

Maximum Standard of Noise Emission Level Allowable for Vehicles on Public Roads

No.	Category of Vehicles	Maximum Noise Level permitted (dB (A))
1	- Motorcycles, cylinder capacity (cc) of engine <125cm ³	85
2	- Motorcycles, cylinder capacity (cc) of engine ≥125cm ³	90
3	- Motorize Tricycles	90
4	- Cars, taxi, bus with capacity of < 12 passengers	80
5	- Bus with capacity of ≥ 12 passengers;	85
6	- Truck with loading capacity of <3,5 tons	85
7	- Truck with loading capacity of ≥ 3,5 tons	88
8	- Truck with engine capacity of ≥ 150 kw	89
9	- Other machinery (tractors/trucks) that are not listed above	91

This standard applies to control of noise emission standard for all kind of vehicle when operating on the public road.

Annex-6 to Anukret No. 42/ANK/BK of July 10, 2000

**Maximum Standard of Noise Level Allowable
 in the Public and Residential Areas (dB(A))**

No.	Areas	Period of Times		
		From 6AM through 18PM	From 18PM through 22PM	Form 22PM through 6AM
1	Quiet Areas - Hospitals - Libraries - School - Kindergarten	45	40	35
2	Residential Areas - Hotels - Administrative office - Villa, flat	60	50	45
3	Commercial and Service Areas and Area of multiple business	70	65	50
4	Small industrial factories mingling in residential area	75	70	50

This standard applies to control of noise level of any source or activity that emitted noise into the public and residential areas.