

# Construction Environmental Management Plan (CEMP)

Grant Number: 0278-CAM

June 2016

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## CAM: Provincial Roads Improvement Project

Reconstruction of Portanorn, Bakdao and Srok Dikes

Prepared by Royal Mekong Construction and Development Pte., Ltd for the Ministry of Public Works and Transport, the Kingdom of Cambodia, and the Asian Development Bank.

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**KINGDOM OF CAMBODIA**



**MINISTRY OF PUBLIC WORKS AND TRANSPORT**  
**PROJECT MANAGEMENT UNIT 3**

**PROVINCIAL ROADS IMPROVEMENT PROJECT**  
**ADB GRANT No. 0278-CAM**

# **CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)**

**Reconstruction of Portanorn, Bakdao and Srok Dikes**

**June 2016**



**Royal Mekong Construction & Development Pte., Ltd.**

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## ABBREVIATIONS

ADB	Asian Development Bank
APL	Angkor Protected Landscape
APSARA	Authority for Protection and Management of Angkor and the Region of Siem Reap
CEMP	Construction Environmental Management Plan
DDIS	Detailed Design and Implementation Supervision Consultant
DoE	Department of Environment (Provincial level of MoE)
DPWT	Department of Public Works and Transport (Provincial level of MPWT)
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
FA	Forestry Authority in MAFF
GoC	Government of Cambodia
GRM	Grievance Redress Mechanism
IEE	Initial Environmental Examination
MAFF	Ministry of Agriculture Forestry and Fisheries
MCFA	Ministry of Culture and Fine Arts
MOE	Ministry of Environment
MPWT	Ministry of Public Works and Transport
ROW	right of way
SEU	Social and Environmental Unit (within MPWT)
TSBR	Tonle Sap Biosphere Reserve

## 1. PROJECT LOCATION MAP



## 2. PROJECT DETAIL

This contract package has 3 Dikes:

- 1- **PORTANORN DIKE** : Length 563m, 1 spillway length 20m and 4 water gates
- 2- **BAKDAO DIKE** : Length 2372m, 1 spillway length 20m and 4 water gates
- 3- **SROK DIKE** : Length 2575m, 4 water gates

Project Name	: Provincial Roads Improvement Project "Reconstruction of Portanorn, Bakdao and Srok Dikes"
Financing by	: Asia Development Bank (ADB Grant No.0278-CAM)
Contract Amount	: US\$ 756,115.74
Contract Duration	: 9 May 2016 – 8 May 2017
Total Duration	: 365 days
Contractor	: <b>ROYAL MEKONG CONSTRUCTION &amp; DEVELOPMENT PTE., LTD.</b>
Consultant	: Korea Consultants International ( <b>KCI</b> )
Employer	: Ministry of Public Works and Transport ( <b>MPWT</b> )
Type of Road Improvement Activities:	Widening and Raising of Embankment Dikes, Construction of Water Gates and Spillways.

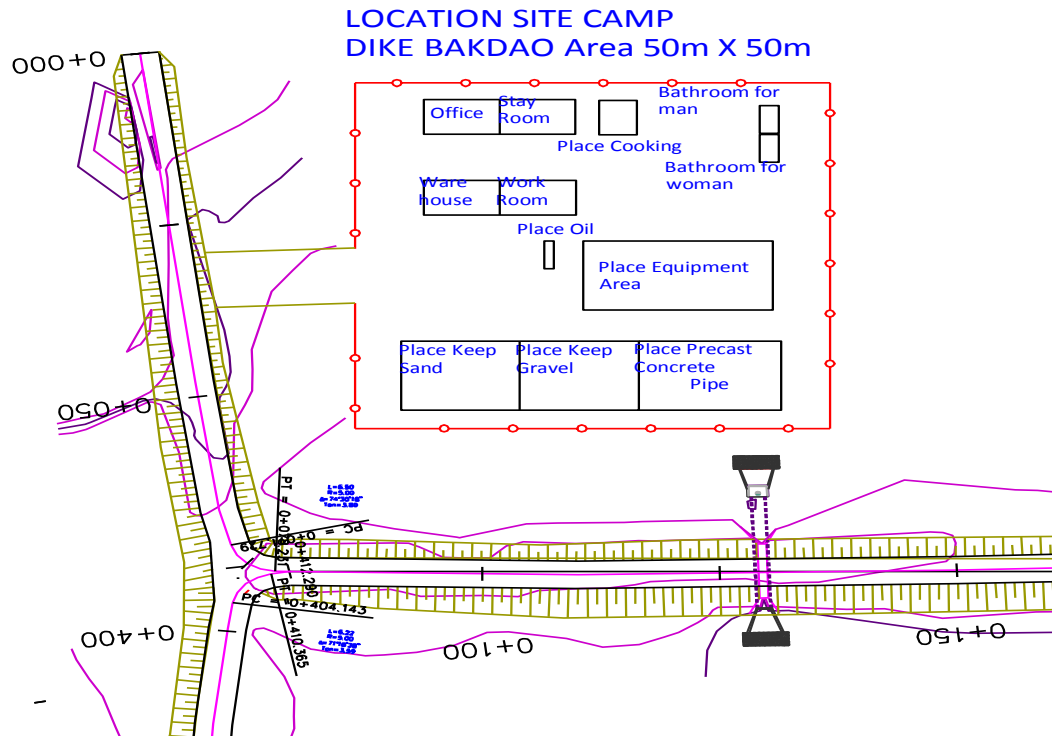
## Location of Project Facilities

The detailed list of camps, borrow-pits and quarries are shown as below table.

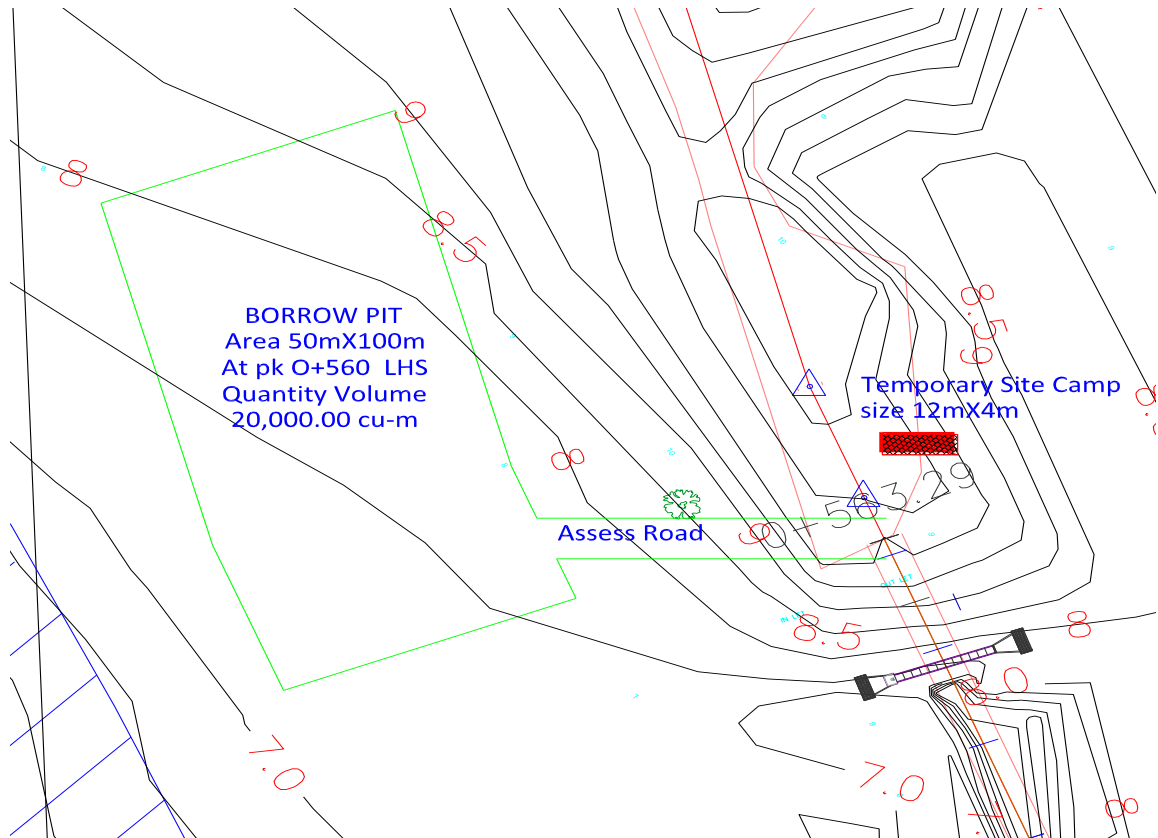
No	Description	Location (PK)	Access Road	Remarks
1	Camp	Kampong Boeung Village, Kampong Hav Commune, Kampong Leaeng District	LHS	Engineer's camp
2	Camp	BAKDAO DIKE, PK0+000	20m LHS	Contractor's camp
3	Borrow-pit	PORTANORN DIKE, PK 0+560	50m LHS	embankment
4		BAKDAO DIKE, PK 0+550	50m LHS	embankment
5		SROK DIKE, PK 0+550	50m LHS	embankment
6	Quarry	Kampong Leaeng District	-	Aggregate/ Sand
7	Disposal Area			not confirmed

The additional borrow-pits and quarries are developed when necessary.

LOCATION OF CONTRACTOR'S SITE CAMP at BAKDAO DIKE  
Area 50m X 50m at PK 0+000 LHS

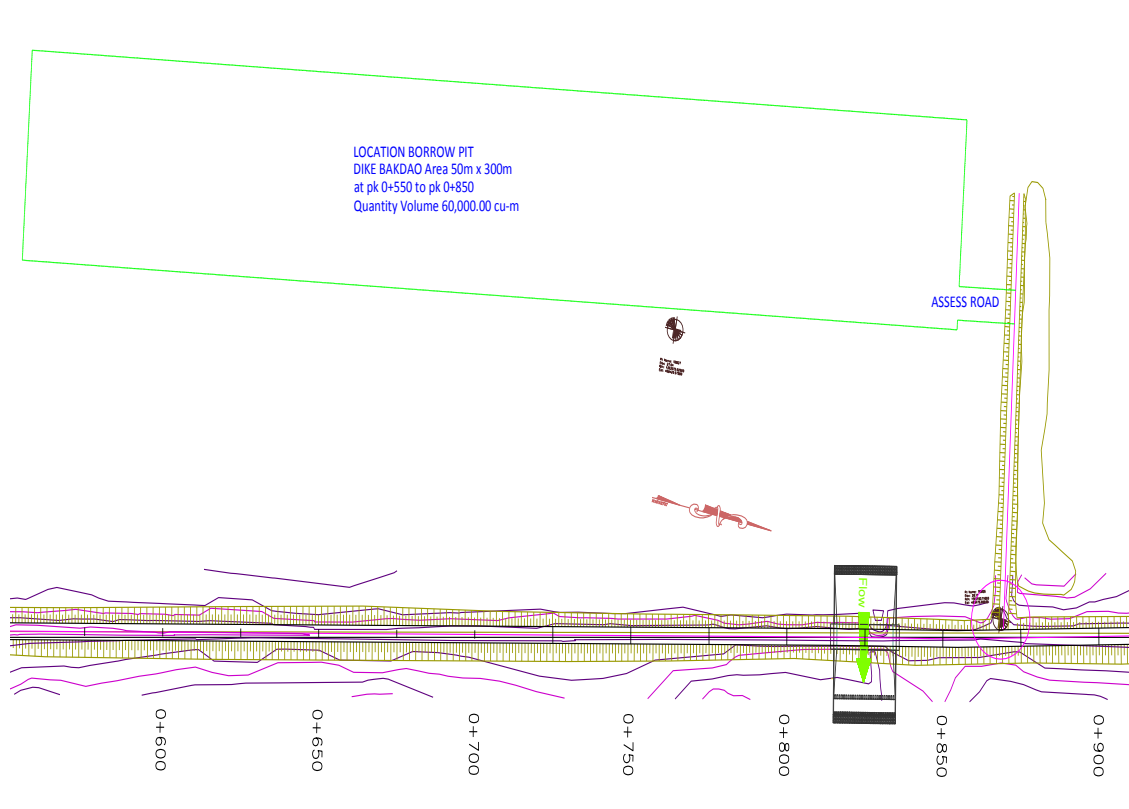


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Area 50m X 100m at PK 0+560 LHS

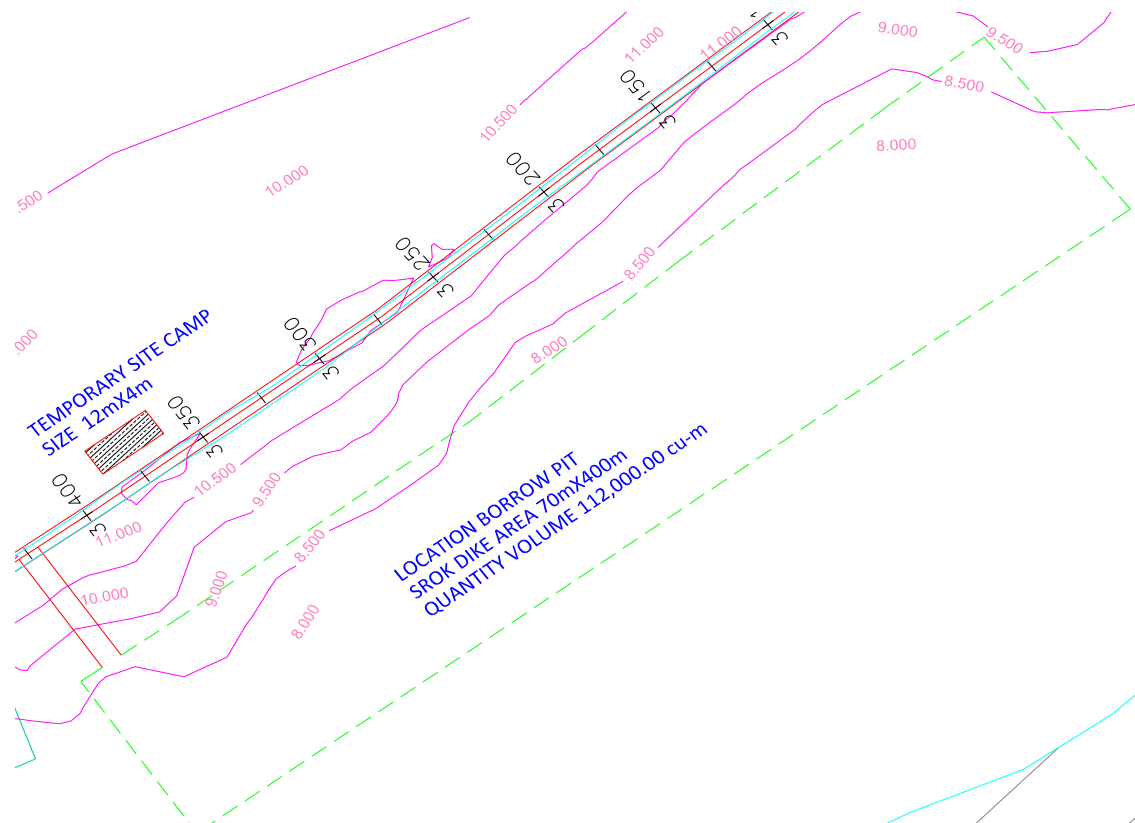




LOCATION OF BORROW PIT at BAKDAO DIKE  
Area 50m X 300m at PK 0+550 to PK 0+850 LHS



LOCATION BORROW PIT at SROK DIKE  
Area 70m X 400m at PK 3+100 to PK 3+450 LHS



## **Construction Environmental Management Plan (CEMP)**

1. This CEMP for Reconstruction of Portanorn, Bakdao and Srok Dike has been prepared to deal with mitigation and management measures to be taken during Project implementation to avoid, reduce, and mitigate for adverse environmental impacts in compliance with IEE and EMP in Volume 4 - Supplementary Information of Contract Documents.

### **A. POTENTIAL IMPACTS**

#### **A-1. Potential Impacts Due to Construction Works**

##### **Protected Areas**

2. All of the construction activities, including structural work and placement, embankments, pavement formation, quarries, borrow pits, fabrication yards and workers camps must be located outside any protected areas.

##### **Borrow Areas**

3. Widening and Raising of Embankment Dikes, Construction of Water Gates and Spillways will use a variety of earth and rock materials. Soil will be obtained from borrow pits. Temporary roads may be needed to access borrow pits. The required embankment material is estimated 171,200Cu.m. The borrow pits from various sources are about 3 places, and should have approval from DDIS and permit from local government or owner's land.

After completion of civil works, borrow areas (borrow pits and borrow roads) must be reinstated to their original condition by the contractor, unless an agreement has been reached with the owner of the land and the local villagers that the excavated pits may be put to some other use, such as water reservoirs or fish ponds as has happened in previous projects. In this case the borrow areas must still be reinstated to such a condition that they do not pose a hazard to local residents.

##### **Quarries and Rock Material**

4. Two existing quarries were submitted to the DDIS Consultant located in Kampong Leaeng district. Contractor will maintain the transporting road and operate the truck with cover during transport.

##### **Rock Extraction**

5. Where rock extraction is done by explosives, blasting noise and vibration impacts may occur. The Contractor will submit blasting method statement to the Engineer in advance for his approval and should have approval from relevant government two weeks prior to the conduct of blasting activities.

##### **Fabrication Sites**

6. Construction of pipe culverts should be by the use of pre-cast concrete structures, which will be transported to site and installed. The location of fabrication sites and their operation may have impacts on surrounding areas. The fabrication site of production of RC pipes elements are at Bakdao dike.

### **Transport of Construction Materials**

7. Construction materials such as earth, sand and aggregate will be hauled by trucks to the project site. RC pipes will be pre-cast in a fabrication site and then transported to site and installed. If contractors' haulage trucks exceed weight limits there may be damage to road.

### **Fuel and Oils**

8. Vehicles will require fuel and lubrication oils which may leak into watercourses. Vehicle wash down water may cause contamination.

### **Noise and Vibration**

9. During construction, noise and vibration may be generated by construction equipment, vehicles, demolition and blasting.

### **Dust**

10. Dust from unpaved roads is a major nuisance for roadside residents, especially those in built-up areas. During construction, fabrication sites and access roads, material stockpiles, crushers and batching plants may generate dust.

### **Construction Waste Materials**

11. Demolition of existing structures may produce waste construction materials. These may comprise of waste concrete rubble, wood, nails, improper disposal of construction waste and old steel re-bars. These can be sharp and pose a threat to grazing animals and workers.

### **Erosion and Sedimentation**

12. Borrow pits, quarries, road embankments, culverts and bridge abutments and road diversions will expose bare soils where material can be eroded. Work within channels and dumping of excavated material into flowing channels can cause blockage of drainage channels.

### **Damage to Services**

13. Service lines within the right-of way (ROW) may include electrical cable, fiber optic telephone cables, telephone transmission towers and underground water pipelines. The Contractor should take necessary actions to avoid damages to these utilities.

### **Road Diversions**

14. It may be necessary to divert traffic around certain areas. Drivers must be forewarned of changed road conditions. Old signage may be misleading if not removed.

### **Forest and Roadside Trees**

15. In order to allow dikes construction, the numbers of dikes side trees will be removed. These must be disposed of adequately. These are discussed in detail under "Mitigation". All the trees along the dike within site possession, we cut and remove by using saw cut machine and excavator, and hauling to approved disposal area.

### **Discovery of Relics**

16. No ancient monuments have been located along the project dikes, but contractor must exercise care as historic artifacts may be discovered during excavation.

## **Accidents and Injuries**

17. The Contractor must have a stated policy and clear program for Occupational Health and Labor Safety. Trained first aid personnel and emergency response facilities are required.

### **A-2. Potential Impacts Due to Workers' Camps**

#### **Camp Amenities for Fixed Teams**

18. Workers living in camps will need adequate facilities for food preparation and cooking facilities, laundry, personal hygiene and waste removal. The Contractors must provide these to avoid unsanitary impacts on nearby residents.

#### **Construction Camps for Mobile Teams**

19. If construction teams move around the route as works progress, the Contractors may try to use temporary camp with containers for sleeping and temporary latrines on rented land. This is considered too disruptive to local villagers and renting houses as temporary quarters is preferred.

#### **Stagnant Water Areas**

20. Stagnant water can gather in borrow pits, discarded solid waste such as plastics, old tires and metal containers and provide temporary breeding habitats for mosquitoes. Malaria and dengue fever are prevalent. The Contractors should provide preventive control measures.

#### **Health and Safety**

21. Risks may arise during the construction stage from (i) inadequate sanitation facilities in work camps (ii) lack of preparation for accidents and injuries (iii) introduction of contagious diseases by immigrant workers (iv) out breaks of malaria in the labor force. The Contractors must take steps to avoid these.

#### **Social Issues - STIs**

22. Introduction of sexually transmitted diseases or other infections by immigrant workers is a concern. These issues should be addressed.

#### **Cleanup of the Construction Site**

23. When construction is completed, the Contractor must clean up the construction sites by removing all equipment and buildings and carrying out site remediation work, unless the site and buildings are to be left intact and handed over to the local authorities.

### **A-3. Potential Impacts Due to Operation**

#### **Road Accidents**

24. As a result of the improved road and with long straight stretches and relatively long distances between the villages, it will be possible for vehicle speeds to increase. This may increase road accidents. Traffic safety is an issue and this is being addressed by Road Safety Specialists of DDIS Consultant.

#### **Noise**

25. Noise from road traffic is a nuisance for roadside residents. As traffic grows, with more heavy vehicles, noise levels will increase. However smoother road surfaces can reduce road/wheel interaction noise.

### **Air Pollution**

26. Air pollution from vehicle operation, especially heavy diesel powered vehicles will increase. However, higher speeds give more engine efficiency which reduces air pollution.

### **Toxic Spills**

27. Currently transport operators face a poor road system with the attendant risks of a high proportion of accidents attributable to these poorly maintained roads. With the new road and better road conditions transport accidents attributable to poor road conditions will decrease but accidents attributable to speed are likely to be several times greater. Thus as traffic densities and speeds increase there is increased likelihood of accidents and toxic materials being released into the air, ground and aquatic systems. To date there do not appear to have been any major accidental spills.

### **Loss of Forest**

28. Improved access to an area can sometimes result in accelerated loss of forests due to illegal logging. Illegal logging is controlled by MoE Rangers and they reported that is not a major activity in PAWS, the main protected area near to any project roads.

### **Loss of Wildlife**

29. A concern with increased access is the possibility of an increase in illegal wildlife hunting and threats to endangered species. As stated above MoE Rangers patrol to control such illegal activities.

### **Positive Operational Impacts - Social Enhancement**

30. Not all impacts are adverse. The project will have several positive benefits which include:

- Hiring of Local Communities
- Reduce Transport Costs
- Improved Public Access
- Improved Transport of Goods for Rural Communities to market
- Tourism Benefits

These will enhance the quality of life and living standards of the local population.

## **B. MITIGATION OF IMPACTS**

### **B-1. Mitigation of Impacts Due to Location**

#### **Avoidance of Impacts outside Agreed Areas**

31. The Contractors must follow instructions as to location of construction works, materials storage, workers camps, fabrication yards, and borrow areas. The Contractor must not work in protected reserves without prior permission from the relevant authorities.

#### **Ancient Bridges and Temple**

32. There are no ancient bridges or old temples within the Project dikes.

## **Religious Edifices**

33. There are no religious edifices in the immediate vicinity of the project dikes. Contractors must employ the villagers who live near construction area. Workers should be careful that these are not disturbed when working in this area.

## **B-2. Mitigation of Impacts Due to Construction Works**

### **Intrusion into Protected Areas**

34. All of the construction activities, including structural work and placement, embankments, pavement formation, quarries, borrow pits, fabrication yards and workers' camp must be located outside any protected areas.

### **Borrow Areas**

35. The borrow areas should be identified prior to the start of construction and should be approved by engineer and the local community, but additional borrow areas will be developed when necessary. Details of location, excavation and rehabilitation are still to be decided. Many villagers stated during consultations that they wished borrow pits to be left open so that they could use for water reservoirs, duck ponds or fish ponds. As borrow areas will be subject to a private contract between the villagers and the Contractor, the decision as to rehabilitation will be made on a case by case basis. However, should the villagers specify rehabilitation the Contractor will comply with this requests. Borrow pits left open should have adequate safety warning signs, flotation devices, rope, and fencing, when necessary. Otherwise all borrow pits must be filled in after project completion, and resurfaced with topsoil and re-vegetation, as indicated in the borrow pit excavation plan, to the satisfaction of the Engineer. Temporary roads will be needed to access borrow pits. After work is completed these must be removed. This includes breaking up compaction and reinstating the original ground surface. Contractor will minimize the temporary access roads and drive the truck properly.

### **Quarries and Borrow Site Operation**

36. The following measures should be implemented at quarry and borrow sites to minimize impacts on water quality, reduce dust emission during transport, minimize erosion and siltation of nearby watercourses and avoid damage to productive land and ecologically sensitive areas:

- (i) Sourcing of quarry and borrow materials from existing sites shall be preferred over establishment of new sites, as much as possible.
- (ii) Quarries and borrow pits shall not be established in national, provincial, district and village conservation forests and other ecologically sensitive and protected areas.
- (iii) Borrow/quarry sites shall not be located in productive land.
- (iv) In case the Project will involve new quarry/borrow sites, necessary approvals from environmental authorities shall be obtained prior to operation of such sites. Such sites shall be located over 300 m away from residential, school, hospital and other sensitive receptors.
- (v) Prior to extraction, topsoil (about 15 cm) shall be stockpiled, preserved and then refilled after completion of quarry/borrow pit operation for rehabilitation purposes after excavation is over.
- (vi) Dust control during excavation and transport e.g. water spraying on access roads and covering of truck loads with tarpaulins shall be undertaken in areas where there are sensitive receptors such as residential areas, school, hospital, etc.

- (vii) Long-term material stockpiles shall be covered to prevent wind erosion.
- (viii) During quarry and borrow site operation, provide adequate drainage to avoid accumulation of stagnant water.
- (ix) The use of river bed sources shall be avoided, as much as possible, however if this is unavoidable the contractor shall minimize use of river bed for construction materials and sources of fill and quarry materials lying on small rivers and streams shall be avoided. Alluvial terraces or alluvial deposits which lie on the river beds but are not covered by water in normal hydrological conditions shall be preferred.
- (x) It is possible that villagers may request borrow pits to be left excavated so that they may be used as water reservoirs or fishponds. If this were to be agreed between the contractors and the villagers, all full safety measures must be observed to prevent drowning. Such agreements would be formalized in writing between the contractors and the villagers after full discussion with all concerned parties.

### **Rock Extraction**

37. Where rock extraction is to be by explosives blasting, normal industry standards and safety practices must be followed to minimize noise and vibration impacts. The Contractor will submit blasting method statement to the Engineer in advance for his approval and should have approval from relevant government two weeks prior to the conduct of blasting activities.

38. The contractor, or his appointed blasting subcontractor, must advise on location of drilled holes, depth of drilling, diameter of hole and charge per hole. The total number of holes and the total maximum quantity of explosive to be used must be given. If pattern blasting is to be utilized, then 10-20 millisecond delays between holes must be used to minimize vibrations. Stemming to holes must be used to minimize noise and projection of "fly rock."

39. If explosives are to be stored on site, a licensed magazine must be used. This must have strict security and restricted access. An inventory of explosives transported in, used and stored must be kept and reported monthly to the Engineer.

40. Details of the type of explosive must be given, whether it proprietary or prepared on site (e.g. ANFO). The type of initiation must be stated, whether electrical, cortex, etc. Local residents must be made aware of blasting taking place and warned in advance. If possible blasting must take place at some regular prearranged time so that residents become accustomed to it and are not alarmed. Audible (siren) and visual (red flag) signals must be used to warn passersby of an imminent blast. Blasting activities is prohibited at night.

41. Charges and whole spacing must be selected to minimize any subsequent "bouldering" blasting. All intended blasting of quarries or for demolition of structures must be notified to the UXO officer to ensure that any related areas have been cleared, in order to avoid secondary detonations. Blasting for demolition of structures must be notified to local residents at least 7 days in advance. Written notices (in Khmer) must be distributed or attached to notice boards, trees and the like in the area. Audible and visual warnings must be given in advance of the blast.

### **Fabrication Sites**

42. RC pipes will be pre-cast in a fabrication site and then transported to site and installed. The fabrication site of production of RC pipes is at Bakdao dike, to minimize waste, dusty, noise and accident. These locations will be maintained and cleared after completion.



## **Transport of Construction Materials**

43. Materials such as earth, sand and aggregate will be required for the dikes construction. Borrow pits may be located along the dikes. Sand and aggregate will be hauled by trucks to the project sites. If contractors' haulage trucks exceed weight limits there may be damage to bridges and road surfaces. Weight restrictions must be imposed on contractor's vehicles to prevent damage to structures. Allowable weight load is 25 tonnes (including truck load) for 3 axles truck and 35 tonnes for 4 axles truck. Wheel washing facilities must be provided to prevent mud being carried over onto roads. Trucks carrying construction materials shall be covered.

## **Fuel Storage and Vehicle Maintenance**

44. It is expected that vehicles will be stored at construction sites. Fuel stored on site must follow good industry practice. Fuel suppliers must provide skid mounted tanks with a metered off take and pump, mounted on a concrete hard standing. The concrete base must have a perimeter curb to catch and retain any minor leaks or spills from the main tank manifold. Some vehicle maintenance may take place at commercial garages. This will have no impact on the project area. If maintenance takes place on site measures must be implemented to control oily water runoff. All trucks, vehicles and construction equipment must be well maintained and regularly inspected, if there is fuel tank leaking during working have to immediately send to garage to repair.

## **Waste Oil**

45. Waste oil can be sold to local waste sub-contractors. This process is endorsed. The project Contractor has liberty to subcontract with any one he chooses.

This approach has several advantages:

- It allows the Contractor to avoid a cost of disposal
- It brings in some revenue to the Contractor
- It is believed that the waste oil is used as a fuel additive in the scrap metal recovery business, which currently uses wood. This disposal route may, to a limited extent, assist in reducing deforestation.
- The sub-contractor will have paid for the waste oil. It is now a valuable commodity to him. Therefore he is extremely unlikely to illegally dump the waste oil or allow any spillage on the road.

Any waste oil must be stored in drums which are clearly marked "waste material". The drums must be of sound structural integrity and not leak, or be covered on the outside with dirty oil.

Drums must be stored on a concrete hard standing with a perimeter curb to catch and retain any minor leaks or spills from the drums. The base must be covered with a lightweight rain proof shelter. Simple inclined corrugated lightweight material is sufficient. This must stop rain falling on the drums.

## **Noise Impacts**

46. Improper silencing of vehicles and equipment used on the dikes construction site may impact on communities. The Contractor must ensure that machinery is adequately silenced and operations are restricted to normal daylight hours. Blasting noise must also be controlled as described above.

## **Dust Impacts**

47. The Contractor must maintain dust abatement procedures where roads, construction

sites and access areas pass through villages and at sites where workers are employed. In rock quarries which are privately owned dust abatement will be owner's responsibility, unless the crusher, screens and storage are owned by the contractor. Abatement measures can include covering piles of raw material with tarpaulins to prevent dust being blown away, and water spraying of roads and construction areas.

### **Construction Waste Materials**

48. Demolition of existing structures may give rise to waste construction materials. These may comprise waste concrete rubble, wood, nails and old steel re-bars. These can be sharp and pose a threat to grazing animals. The approved disposal site for demolition and construction waste must be clearly identified before the start of demolition. They must be disposed of at an agreed location approved by the local authorities. This must be reported to the Engineer. Get approved disposal site for at least one month before demolition of structures.

### **Erosion and Sedimentation**

49. Borrow pits, quarries, embankments, culverts and road diversions will expose bare soils where material can be eroded. Areas must be re-vegetated as soon as possible after disturbance. Depending on the season this may require watering to ensure establishment of vegetation before the wet season arrives. Re-vegetation work may be carried out by project affected people within the Resettlement Plan as a form of income generation. The Contractor must take care to avoid unnecessary work within channels. Dumping of excavated material into flowing channels is absolutely prohibited. If possible, work which could affect water channels must take place during the dry season, before heavy rainfall flows occur.

### **Damage to Services**

50. Service disruption of utility companies must be avoided and if unavoidable, affected communities should be informed in advance.

### **Road Diversions**

51. It may be required to divert traffic around certain areas. Warning signs and flagging must displayed at the commencement of any road construction or diversion so as to forewarn drivers of changed road conditions. Old signage must be removed by the Contractor. Communities should be informed in advance of any traffic diversion.

### **Forest and Roadside Trees**

52. Trees to be cut down on dike have to inform to the Engineer. The number of trees to be cut is considerable. All the necessary permit/ clearance from relevant government agencies or owner's must be sought before this is started. Planting of trees will be conducted under climate change activities. All the trees are in site possession so no need the tree-cutting permits.

### **Discovery of Relics**

53. If during excavation relics are discovered, under the Law on Cultural Heritage, 1996, the discovery must be reported to the responsible agency.

### **Accidents and Injuries**

54. The Contractor shall have a Safety Officer trained in first aid and the Contractor must check the response time of emergency facilities such as fire and ambulance. All workers must be issued with PPE – Personal Protective Equipment – such as safety boots, helmets, goggles and gloves. Workers must be trained in their use and reminded daily at morning

“Toolbox Briefings” when the day’s tasks are assigned. Records must be kept of accidents, lost time due to fatalities, injury or medical attention. Workers should be offered incentives to report “near misses” and correct carelessness. Extra efforts must be made to prevent children injuring themselves on site after working hours. Emergency telephone numbers must be displayed prominently on site. Work must be stopped until allowed by the relevant government agency to continue.

### **Dislocation of People**

55. The dikes are being built within an established ROW but minor dislocations such as temporary bypasses around structures must be agreed by the contractor and local people.

## **B-3. Mitigation of Impacts Due to Workers Camps**

### **Camp Amenities for Fixed Teams**

56. If wells are drilled on sites the supply must be 100 L/man/day. Water must be supplied for cooking and washing but it is not intended for drinking due to contain of lime. It must be stored in overhead storage tanks for gravity distribution. If no wells are planned water for personal washing, laundry, cooking and toilets must be supplied to the camp by truck tanker. The supply must be 100 L/man /day. Purified bottled water must be supplied for drinking.

### **Drinking Water**

57. Adequate drinking water must be supplied. Between 1-4 liters per day bottled water must be supplied per worker.

### **Sanitation**

58. Prefabricated septic tanks must be used which have internal baffles and connect to underground soakaways. These are readily available in the local market. It is recommended that local subcontractors/ builders be used to install them as they have local knowledge of soil conditions, water table depth and are low cost. Septic tanks must be covered with concrete slabs to control odour and must have vent pipes. They must be accessible by manhole covers with grease seals to allow emptying when needed. Soakaways must be constructed below the ground surface to allow dissipation of liquid effluents and be subsurface. When remove the camps the septic tanks must pump out and will be backfilled by soil, septage will be handled for treatment and disposal by authorized waste contractors.

### **Food Preparation**

59. Food must be prepared by offsite local sub-contractors to provide 3 meals per day. Food waste must be collected daily and removed regularly to discourage vermin. The cooking is absolutely prohibited in the construction camps.

### **Camp Fuel Needs**

60. If the labor force is not supplied with adequate rations they may exert demands on local supplies of fuelwood, fruit and wildlife. The Contractor must provide gas, kerosene or similar for cooking and heating, and regular meals three times a day.

### **Wash Water**

61. If discharged to water courses the waste water must first pass through a grease trap to retain detergents and oil/grease. This must be cleaned regularly and the grease waste should be handled by authorized third-party contractors for treatment and disposal.

### **Solid Waste Disposal**

62. Biodegradable waste must be buried in pits and covered with soil on a daily basis. Non-biodegradable wastes such as paper, plastics, cans bottles and the like must be collected and removed from the site by a subcontractor.

### **Mobile Teams**

63. If mobile teams are used they may move around the route as the works progress. The Contractors must rent houses as temporary quarters, with full water supply, sanitation and cooking facilities for each team of workers. These locations must be determined through the approval of the Engineer.

### **Stagnant Water Areas**

64. The Contractors must check borrow pits, discarded plastic sacks, old tires and metal containers for stagnant water to avoid temporary breeding habitats for mosquitoes. This must be at least every 7 days to interrupt the breeding cycle of the mosquito which is 12 days. The Contractors must implement regular pesticide sprays and provide mosquito nets for workers during sleeping. Construction sites and camps, material storage areas, and batching plants often have stagnant water due to poor site grading and compaction and vehicular traffic in these facilities. The ground surface on these areas must be properly graded and compacted and regularly maintained.

### **Health and Safety**

65. The Contractors must implement a pre-employment health screening, employ a safety officer skilled in first aid, and carry out regular sanitary checks. They must also liaise with the local emergency services (fire, police, ambulance) to check the response time of emergency facilities. Construction camps and work areas should have adequate first aid kits and fire extinguishers that are easily accessible.

### **Social Issues - STIs**

66. Workers from outside the community must be given pre-employment HIV screening. Work camps have been sited away from local communities. An HIV/AIDS awareness program has been developed and implemented by a specialist sub-contractor.

### **Cleanup of the Construction Site**

67. When construction is completed, the Contractors must clean up the construction sites by removing all equipment and buildings and carrying out site remediation work. Discussions are taking place for some buildings to be left intact and handed over to the local authorities.

### **B-4. Mitigation Measures**

68. **Table 1** presents the environmental impacts and corresponding mitigation measures. The table also shows responsibilities for implementation of mitigation measures and monitoring. The EMP is included in the tender and contract documents for civil works. The conformity of contractor with environmental contract procedures and specifications shall be regularly monitored by the Project Management Unit 3 (PMU3) through the Social and Environmental Office (SEO) to be established within MPWT during Project implementation.

**Table 1. Environmental Mitigation Measure**

**Pre-construction**

Project Activity	Potential Environmental Impacts/Concerns	Proposed Mitigation Measures	Responsibility	
			Implementation	Monitoring
1) Location of Project roads	Safety risks due to presence of unexploded ordnance (UXO)	Any clearance that is required will be undertaken through the civil works contracts, by the engagement of qualified local UXO clearance firms.	Contractor	DDIS, PMU3/SEO
		The contractor shall only commence site works after the UXO clearance firm has certified that areas are already cleared.	Contractor	DDIS, PMU3/SEO
	Encroachment on historical/cultural areas	Excavation for sourcing fill materials for the Project shall not be undertaken within conservation zones.	Contractor	DDIS, PMU3/SEO
		Except for the road works itself, no project facilities (temporary or permanent) shall be established within conservation areas. Such facilities include, but are not limited to, construction camps, workers camps, asphalt plants, concrete mixing plants, crushing plants, vehicle and equipment maintenance areas, materials storage sites, etc.	Contractor	DDIS, PMU3/SEO, Ministry of Culture and Fine Arts (MCFA)
		The Project shall not establish or use quarry and borrow areas within conservation areas.	Contractor	DDIS, PMU3/SEO, MCFA
2) Location of quarry and borrow areas	Setting of quarry and borrow areas could cause damage to ecologically sensitive sites, productive land and nuisance to sensitive receptors (residential areas, schools, etc.)	Sourcing of quarry and borrow materials from existing sites shall be preferred over establishment of new sites, as much as possible.	Contractor	DDIS, PMU3/SEO
		Quarries and borrow pits shall not be established in national, provincial, district and village conservation forests and other ecologically sensitive and protected areas.	Contractor	DDIS, PMU3/SEO
		Existing borrow/quarry sites shall have the appropriate environmental permits from Government of Cambodia.	Contractor	DDIS, PMU3/SEO
		In case the Project will involve new quarry/borrow sites, necessary approvals from environmental authorities shall be obtained prior to operation of such sites. Such sites shall be located over 300m away from residential, school, hospital and other sensitive receptors.	Contractor	DDIS, PMU3/SEO
Pre-Mobilization	Anticipated/ possible disruption of utility services	coordination with utility providers, relocation of power/water lines, inform/consult affected households	Contractor	DDIS, PMU3/SEO
Pre-Mobilization	Anticipated complains from stakeholders during construction	Establishment of a Grievance Redress Mechanism	Contractor	DDIS, PMU3/SEO

**Construction Stage**

Project Activity	Potential Environmental Impacts/Concerns	Proposed Mitigation Measures	Responsibility	
			Implementation	Monitoring
3) Earthworks, excavation activities, transport of materials, operation of construction equipment, vehicles and	Air pollution due to elevated levels of dust and gaseous emissions	Construction equipment will be maintained to a good standard. Immediate repairs of any malfunctioning construction vehicles and equipment shall be undertaken.	Contractor	DDIS, PMU3/SEO
		Equipment and vehicles not in use shall be switched off.	Contractor	DDIS, PMU3/SEO
		Machinery and vehicles causing excessive pollution(e.g., visible smoke) will be banned from construction sites.	Contractor	DDIS, PMU3/SEO

Project Activity	Potential Environmental Impacts/Concerns	Proposed Mitigation Measures	Responsibility	
			Implementation	Monitoring
other facilities (asphalt plants, crushing plants, concrete mixing plants), stockpiling and waste disposal		All construction equipment and vehicles shall have valid certifications indicating compliance to vehicle emission standards.	Contractor	DDIS, PMU3/SEO
		On rainless day undertake watering, at least twice per day, on dusty and exposed areas at construction yards, materials stockpile, construction sites, access roads, quarry areas, borrow sites and other project areas where residential sites and other sensitive receptors are located nearby.	Contractor	DDIS, PMU3/SEO
		Tightly cover trucks transporting construction materials (sand, soil, cement, gravel, etc.) to avoid spills and dust emission.	Contractor	DDIS, PMU3/SEO
		Impose speed limits on construction vehicles to minimize dust emission along areas where sensitive receptors are located (houses, schools, hospitals, temples, etc.).	Contractor	DDIS, PMU3/SEO
		Position any stationary emission sources (e.g., portable diesel generators, compressors, etc.) as far as is practical from sensitive receptors.	Contractor	DDIS, PMU3/SEO
		Burning of wastes generated at the construction sites, work camps and other project-related activities shall be strictly prohibited.	Contractor	DDIS, PMU3/SEO
		Provide temporary covers (e.g., tarpaulins, grass, etc.) on long term material sand spoils stockpiles.	Contractor	DDIS, PMU3/SEO
		Clean road surfaces of debris/spills from construction equipment and vehicles	Contractor	DDIS, PMU3/SEO
		Install temporary fencing or barriers around particularly dusty activities in vicinity of sensitive receivers.	Contractor	DDIS, PMU3/SEO
		Locations for stockpiling spoils, fill and other materials with high dust content shall be at least 300m from the nearest residential areas and other sensitive receivers.	Contractor	DDIS, PMU3/SEO
4) Earthworks, transport of materials, operation of construction equipment and vehicles	Elevated noise and vibration levels that could cause nuisance and damage to properties	No noisy construction-related activities (e.g., transport of materials a residential areas and other sensitive receptors, piling, use of jackhammer, etc.) will be carried out from 2100hrs to 0600hrs along residential areas, hospitals and other sensitive receptors	Contractor	DDIS, PMU3/SEO
		Noisy construction activities will be avoided during religious or cultural events in close proximity to the roadside such as Friday prayers attended by Muslim Cham, when ethnic Khmer are attending temple festivals or holding weddings, etc.	Contractor	DDIS, PMU3/SEO
		All construction equipment and vehicles shall be well maintained, regularly inspected for noise emissions, and shall be fitted with effective muffler and other appropriate noise suppression equipment consistent with applicable national and local regulations.	Contractor	DDIS, PMU3/SEO
		Use only vehicles and equipment that are registered and have necessary permits.	Contractor	DDIS, PMU3/SEO
		Truck drivers and equipment operators shall avoid, as much as possible, the use of horns in densely populated areas and where there other sensitive receptors are found such as schools, temples, hospital, etc. are located.	Contractor	DDIS, PMU3/SEO
		Impose speed limits on construction vehicles to minimize noise emission along areas where sensitive receptors are located (houses, schools, temples, hospitals, etc.).	Contractor	DDIS, PMU3/SEO
		Provide temporary noise barriers (3-5meterhighbarrier canreduce5-10 dB(A), as necessary, if site works will generate high noise levels that could disturb nearby households, hospital, school and other sensitive receptors	Contractor	DDIS, PMU3/SEO

Project Activity	Potential Environmental Impacts/Concerns	Proposed Mitigation Measures	Responsibility	
			Implementation	Monitoring
5) Various construction activities, operation of construction and workers camps	Improper handling and disposal of wastes could cause odor and vermin problems, pollution and flow obstruction of nearby watercourses and could negatively impact the landscape.	Avoid noisy construction activities in vicinity of sensitive receivers during nighttime or other sensitive periods (e.g. during school hours in vicinity of schools)	Contractor	DDIS, PMU3/SEO
		Truck drivers and equipment operators shall avoid the use of horns	Contractor	DDIS, PMU3/SEO
		Segregate and regularly collect wastes at worker camps and offices.	Contractor	DDIS, PMU3/SEO
		Construction/workers' camps shall be provided with garbage bins with lids.	Contractor	DDIS, PMU3/SEO
		Prohibit disposal of solid wastes into canals, rivers, other watercourses, agricultural field and public areas.	Contractor	DDIS, PMU3/SEO
		There will be no site-specific landfills established by the contractors. All solid waste will be regularly collected and removed from the work camps and disposed to areas approved by local authorities.	Contractor	DDIS, PMU3/SEO
		Prohibit burning of construction and domestic wastes.	Contractor	DDIS, PMU3/SEO
		Recyclables shall be recovered and sold to recyclers.	Contractor	DDIS, PMU3/SEO
		Residual and hazardous wastes shall be disposed of in disposal sites approved by local authorities.	Contractor	DDIS, PMU3/SEO
		Ensure that wastes are not haphazardly dumped within the project site and adjacent areas	Contractor	DDIS, PMU3/SEO
6) Establishment and operation of construction and workers camps	Operation of these facilities will generate solid and liquid wastes and If improperly handled, these could cause health problems and pollution.	Drainage shall be provided to facilitate the rapid removal of surface water from all areas and prevent flooding and accumulation of stagnant water.	Contractor	DDIS, PMU3/SEO
		Provide adequate housing for all workers at the construction camps and establish clean canteen/eating and cooking areas.	Contractor	DDIS, PMU3/SEO
		Portable lavatories (or at least pit latrines in remote areas) shall be installed and open defecation shall be prohibited and prevented by cleaning lavatories daily and by keeping lavatory facilities clean at all times.	Contractor	DDIS, PMU3/SEO
		Provide separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers.	Contractor	DDIS, PMU3/SEO
		Wastewater effluents from contractors' workshops and equipment washing- yards will be passed through gravel/sand beds and all oil/grease contaminants will be removed before wastewater is discharged. Oil and grease residues shall be stored in tightly covered drums. Such wastes shall be disposed consistent with national and local regulations.	Contractor	DDIS, PMU3/SEO
		Construction/workers camps shall be cleaned up after use to the satisfaction of MPWT/SEO/DDIS and local community. All waste materials shall be removed and disposed to disposal sites approved by local authorities.	Contractor	DDIS, PMU3/SEO
		Land used for campsites shall be restored to the original condition as far as practicable and the area shall be planted with appropriate trees/shrubs as soon as practicable after it is vacated and cleaned.	Contractor	DDIS, PMU3/SEO

Project Activity	Potential Environmental Impacts/Concerns	Proposed Mitigation Measures	Responsibility	
			Implementation	Monitoring
7) Quarry And borrow site operation	Operation of quarry and borrow sites could cause adverse impacts to surface water quality, elevated dust emission during excavation and transport, erosion and siltation of nearby water courses, damage to productive land and ecologically sensitive areas and pose health and safety risks.	Prior to extraction, topsoil (about 15 cm) shall be stockpiled, preserved and then refilled after completion of quarry/borrow pit operation for rehabilitation purposes after excavation is over.	Contractor	DDIS, PMU3/SEO
		Dust control during transport (e.g., water spraying on access roads and provision of truck cover) and excavation shall be undertaken in areas where there are sensitive receptors such as residential areas, school, hospital, etc.		
		Long-term material stockpiles shall be covered to prevent wind erosion.		
		During quarry and borrow site operation, provide adequate drainage to avoid accumulation of stagnant water.		
		The use of river bed sources shall be avoided, as much as possible, however if this is unavoidable the contractor shall minimize use of river bed for construction materials and sources of fill and quarry materials lying on small rivers and streams shall be avoided. Alluvial terraces or alluvial deposits which lie on the river beds but not covered by water in normal hydrological conditions shall be preferred.	Contractor	DDIS, PMU3/SEO
		Confine winning river bed materials to less than 20% of river width in any location and keep away from river banks.	Contractor	DDIS, PMU3/SEO
		Protect and reinstate river banks if unexpected erosion occurs.	Contractor	DDIS, PMU3/SEO
		Quarry and borrow sites must be selected amongst those offering the highest ratio between extractive capacity (both in terms of quality) and loss of natural state.	Contractor	DDIS, PMU3/SEO
		Quarry and borrow sites lying close to the alignment, with a high level of accessibility and with a low hill gradient, are preferred.	Contractor	DDIS, PMU3/SEO
		Upon completion of extraction activities, re-contour borrow/quarry pit wall or fill-up when there are available and suitable materials such as excavation spoils, replace top soil, and re-vegetate with native species such as grasses and fast-growing shrubs and trees.	Contractor	DDIS, PMU3/SEO
		Upon completion of extraction activities, borrow pits shall be dewatered and fences shall be installed, as appropriate, to minimize health and safety risks.	Contractor	DDIS, PMU3/SEO
		In quarries in mountainous or hilly areas, or wherever slopes are important, terraces shall be cut after extraction, drainage system and vegetation cover shall be provided for rehabilitation to enhance slope stability	Contractor	DDIS, PMU3/SEO
		Implement compensatory planting (at least one is to one ratio) if trees will have to be removed at quarry and borrow sites.	Contractor	DDIS, PMU3/SEO
		Borrow pits will be left in a tidy state with stable side slopes and proper drainage in order to minimize soil erosion, siltation of nearby bodies of water and to avoid creation of water bodies favorable for mosquito breeding.	Contractor	DDIS, PMU3/SEO
		To avoid drowning when pits become water-filled, measures such as fencing, providing flotation devices such as a buoy tied to a rope, etc. shall be implemented.	Contractor	DDIS, PMU3/SEO



Project Activity	Potential Environmental Impacts/Concerns	Proposed Mitigation Measures	Responsibility	
			Implementation	Monitoring
		It is possible that villagers may request borrow pits to be left excavated so that they may be used as water reservoirs or fishponds. If this were to be agreed between the contractors and the villagers, all the full safety measures detailed above must be observed. Such agreements would be formalized in writing between the contractors and the villagers after full discussion with all concerned parties.	Contractor	DDIS, PMU3/SEO
8)Use of hazardous substances such as fuel, oil, bitumen, etc.	Pollution and safety risks due to use of hazardous materials and disposal of hazardous wastes	Store fuel and hazardous substances and wastes in paved areas with roof and embankment. If spills or leaks do occur, undertake immediate clean up.	Contractor	DDIS, PMU3/SEO
		Train relevant construction personnel in handling of fuels and other hazardous substances as well as spill control procedures.	Contractor	DDIS, PMU3/SEO
		Ensure availability of spill cleanup materials (e.g., absorbent pads, etc.) specifically designed for petroleum products and other hazardous substances where such materials are being stored.	Contractor	DDIS, PMU3/SEO
		Segregate hazardous wastes (oily wastes, used batteries, fuel drums) and ensure that storage, transport and disposal shall not cause pollution and shall be undertaken consistent with national and local regulations.	Contractor	DDIS, PMU3/SEO
		Store waste oil, lubricant and other hazardous materials and wastes in tightly sealed containers to avoid contamination of soil and water resources.	Contractor	DDIS, PMU3/SEO
		Ensure all storage containers of hazardous substances and wastes are in good condition with proper labeling.	Contractor	DDIS, PMU3/SEO
		Regularly check containers for leakage and undertake necessary repair or replacement.	Contractor	DDIS, PMU3/SEO
		Store hazardous materials above flood level.	Contractor	DDIS, PMU3/SEO
		Storage areas for fuel, oil, lubricant, bitumen and other hazardous substance will be located at least 100 m away from any watercourses.	Contractor	DDIS, PMU3/SEO
		Storage areas will be bounded and provided with interceptor traps so that accidental spills do not contaminate the environment.	Contractor	DDIS, PMU3/SEO
		Storage, transport and disposal of hazardous wastes, including spill wastes, shall be consistent with national and local regulations.	Contractor	DDIS, PMU3/SEO
		Wherever possible, refueling will be carried out at a fuel storage area.	Contractor	DDIS, PMU3/SEO
		Re-fuelling shall not be permitted within or adjacent to watercourses.	Contractor	DDIS, PMU3/SEO
		Where significant amount of oily wastewater or spill/leakage of oil and grease may occur (e.g., equipment maintenance areas), drainage leading to an oil-water separator shall be provided for treatment of wastewater. The oil- water separator shall be regularly skimmed of oil and maintained to ensure efficiency.	Contractor	DDIS, PMU3/SEO
		Vehicle maintenance and refueling will be confined to areas in construction sites designed to contain spilled lubricants and fuel.	Contractor	DDIS, PMU3/SEO
		Bitumen shall not be allowed to enter either running or dry streambeds and nor will be disposed of in ditches or small waste disposal sites prepared by the contractor.	Contractor	DDIS, PMU3/SEO

Project Activity	Potential Environmental Impacts/Concerns	Proposed Mitigation Measures	Responsibility	
			Implementation	Monitoring
		Bitumen storage and mixing areas as well as storage areas for other petroleum products used in the preparation of the bitumen mixture shall be protected against spills and all contaminated soil must be properly handled according to national and local regulations. As a minimum, these areas must be provided with concrete flooring and surrounded by an embankment to readily contain and clean-up spills.	Contractor	DDIS, PMU3/SEO
		Adequate precaution will be taken to prevent oil/lubricant/ hydrocarbon contamination of channel beds. Spillage if any will be immediately cleared with utmost caution to leave no traces.	Contractor	DDIS, PMU3/SEO
		All areas intended for storage of hazardous materials will be quarantined and provided with adequate facilities (e.g., firefighting equipment, sorbent pads, etc.) to combat emergency situations complying with all the applicable statutory stipulation.	Contractor	DDIS, PMU3/SEO
		If there is fuel tank leaking during working have to immediately send to garage to repair.	Contractor	DDIS, PMU3/SEO
		The Bitumen tanks have to keep properly at dry place and far from watercourses.	Contractor	DDIS, PMU3/SEO
9)Blasting	Safety risks to workers and the public	Blasting will be carried out only with permission of the concerned authority, using a pre-established schedule.	Contractor	DDIS, PMU3/SEO
		All the statutory laws, regulation, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives will be strictly followed.	Contractor	DDIS, PMU3/SEO
		The timing will be made available to the local people within 500 m of the blasting site in all directions, depending on the total charge used.	Contractor	DDIS, PMU3/SEO
		Blasting will be held only during day time and shall be carried out not using high powered explosives. Under no circumstance will blasting be undertaken at night.	Contractor	DDIS, PMU3/SEO
		Where possible blasting mats will be used to reduce noise levels when blasting is carried out to reduce flying rock.	Contractor	DDIS, PMU3/SEO
		No blasting will take place without condition survey of the buildings within 500 m and permission and monitoring by the DDIS	Contractor	DDIS, PMU3/SEO
		People living near blasting sites will be informed of blasting times prior to the blasting.	Contractor	DDIS, PMU3/SEO
		Warning sirens will be sounded before blasting.	Contractor	DDIS, PMU3/SEO
		Pre-splitting shall be undertaken.	Contractor	DDIS, PMU3/SEO
		Where the vibration from blasting is exceeding the maximum permissible level, or damage occurs to local property information from the blasting shall be used to modify blasting patterns and calculate a reduced charge for future blasts	Contractor	DDIS, PMU3/SEO
		Blasting shall be under careful and strict management/supervision of properly trained and licensed personnel. Workers at blasting sites will be trained prior to blast operations and provided with safety equipment and earplugs.	Contractor	DDIS, PMU3/SEO
		Observe proper warning and precautionary measures to ensure safety of residents, pedestrians, motorists and structures during blasting.	Contractor	DDIS, PMU3/SEO
		All expenses/costs to address injuries, damage to properties, accidents, etc. due to blasting shall be shouldered by the contractor.	Contractor	DDIS, PMU3/SEO

Project Activity	Potential Environmental Impacts/Concerns	Proposed Mitigation Measures	Responsibility	
			Implementation	Monitoring
10) Earthworks/ excavation	Improper spoils disposal could cause deterioration of water quality, damage to productive land and flow obstruction of water courses.	Provide grass cover and other suitable slope stabilization measures on road embankment slopes and on long term stockpile of spoils.	Contractor	DDIS, PMU3/SEO
		Spoil disposal shall not cause sedimentation and obstruction of flow of watercourses, damage to agricultural land and densely vegetated areas.	Contractor	DDIS, PMU3/SEO
		The spoils disposal site shall be located at least 50 m from surface water courses and shall be protected from erosion by avoiding formation of steep slopes, provisions of adequate drainage and grassing	Contractor	DDIS, PMU3/SEO
		Spoils shall only be disposed to areas approved by local authority.	Contractor	DDIS, PMU3/SEO
		Water courses (rivers, canals, etc.) shall be kept free of excavation spoil and construction debris, floating and submerged.	Contractor	DDIS, PMU3/SEO
		Spoil and construction materials stockpile area shall be located away from water bodies and under no circumstances will these materials be dumped into watercourses.	Contractor	DDIS, PMU3/SEO
		Dredged and excavated materials shall be reused or provided to local residents as soon as possible, if they require such materials, for land reclamation. The remaining spoils can be disposed into low elevation sites for road construction.	Contractor	DDIS, PMU3/SEO
11) Transport of materials and spoils, operation	Damage to community utilities such as water supply pipes, irrigation	The contractor shall not allow overloading of trucks used for all project-related activities.	Contractor	DDIS, PMU3/SEO
		The contractor shall immediately repair any damage caused by the Project to community facilities such as water supply, power supply, irrigation canals, drainage and the like. Adequate compensation shall be paid to affected parties, as necessary.	Contractor	DDIS, PMU3/SEO
		Access roads damaged during transport of construction materials and other project-related activities shall be reinstated upon completion of construction works.	Contractor	DDIS, PMU3/SEO
		Services disruption of utility companies must be avoid and if unavoidable, affected communities should informed in advance.	Contractor	DDIS, PMU3/SEO
12) Spillway and Water gate works, Stockpiling of construction materials and spoils, use of hazardous materials and earthworks	Deterioration of surface water quality, flooding and flow obstruction of watercourses	Spoils, construction wastes and construction materials stockpile area shall be located away from water bodies and under no circumstances will these materials be dumped into watercourses.	Contractor	DDIS, PMU3/SEO
		Do not fill up canals and creeks at the construction site. In case filling of local drainage system is necessary, consultation with local authorities shall be undertaken and their permission obtained beforehand. An alternative drainage shall be established before the existing canal is filled-up.	Contractor	DDIS, PMU3/SEO
		Prohibit placement of construction materials, waste storage areas or equipment in or near drainage channels and water courses.	Contractor	DDIS, PMU3/SEO
		Discharge of oily wastewater, fuel, hazardous substances and wastes, and untreated sewage to watercourses/canals and on the ground/soil shall be prohibited.	Contractor	DDIS, PMU3/SEO
		Provide adequate drainage at the construction sites and other project areas to avoid flooding of surrounding areas and minimize flow obstruction of existing watercourses.	Contractor	DDIS, PMU3/SEO
		Regularly inspect and maintain all drainage channels to keep these free of obstructions.	Contractor	DDIS, PMU3/SEO
		Construct retaining structures such as gabion baskets, rip-rap, etc. for slope protection.	Contractor	DDIS, PMU3/SEO

Project Activity	Potential Environmental Impacts/Concerns	Proposed Mitigation Measures	Responsibility	
			Implementation	Monitoring
13) Dikes, Spillway and Water gate works	Traffic disruption and obstruction of access to roadside properties	In cooperation with the local traffic authorities, properly organize transport of materials for the project to avoid congestion.	Contractor	DDIS, PMU3/SEO
		Set up clear traffic signal boards and traffic advisory signs at the roads going in and out the Dikes, Spillway and Water gate construction sites to minimize traffic build-up.	Contractor	DDIS, PMU3/SEO
		Regularly monitor traffic conditions along access and Project dikes to ensure that project vehicles are not causing congestion.	Contractor	DDIS, PMU3/SEO
		Provide sufficient lighting at night within and in the vicinity of construction sites.	Contractor	DDIS, PMU3/SEO
		Implement suitable safety measures to minimize risk of adverse interactions between construction works and traffic flows through provision of temporary signals or flag controls, adequate lighting, fencing, signage and road diversions, as necessary.	Contractor	DDIS, PMU3/SEO
		Provide safe temporary accesses to properties and establishments affected by disruption to their permanent accesses.	Contractor	DDIS, PMU3/SEO
		Reinstate good quality permanent accesses following completion of construction.	Contractor	DDIS, PMU3/SEO
		Provide safe vehicle and pedestrian access around construction areas. Pay particular attention to areas near schools.	Contractor	DDIS, PMU3/SEO
		Provide adequate signage, barriers and flag persons for traffic control.	Contractor	DDIS, PMU3/SEO
		If necessary, traffic will be diverted for safe and smooth movement of vehicles to ensure smooth traffic flow and minimize accidents, traffic hold ups and congestion.	Contractor	DDIS, PMU3/SEO
		The diversion signs would be bold and clearly visible particularly at night.	Contractor	DDIS, PMU3/SEO
		Temporary bypasses will be constructed and maintained (including dust control) during the construction period particularly at Spillway and Water gate crossings. Location of temporary bypasses shall be agreed with local authorities and such sites shall re-instated upon completion of works.	Contractor	DDIS, PMU3/SEO
14) Earthworks, stockpiling and dike works	Soil erosion	On hill slopes and other potentially erodible places along the dike slope, appropriate native vegetation that retards erosion will be planted.	Contractor	DDIS, PMU3/SEO
		As much as possible, construction activities in hilly areas are to be undertaken during dry season only.	Contractor	DDIS, PMU3/SEO
		Road embankments and slopes shall be monitored during construction for signs of erosion, vegetative cover shall be provided on slopes by planting native grass and creepers on erosion prone sections.	Contractor	DDIS, PMU3/SEO
		Long-term material stockpiles will be covered with native species of grass or other suitable materials to prevent wind erosion.	Contractor	DDIS, PMU3/SEO
15) Operation of construction equipment and vehicles, site works, spoils disposal and presence of	Impacts to flora and fauna	Spoils and all types of wastes shall not be dumped into forested areas, agricultural land, densely vegetated areas, and water courses.	Contractor	DDIS, PMU3/SEO
		Workers shall be prohibited from collecting firewood and construction materials from surrounding forests, and from hunting wild animals.	Contractor	DDIS, PMU3/SEO
		Ensure that construction works are carried out without unnecessary clearing of roadside vegetation.	Contractor	DDIS, PMU3/SEO
		The contractor shall prohibit cutting of trees for firewood and for use in for construction-related activities	Contractor	DDIS, PMU3/SEO

Project Activity	Potential Environmental Impacts/Concerns	Proposed Mitigation Measures	Responsibility	
			Implementation	Monitoring
		Construction vehicles will operate within the corridor of impact, i.e., approximately within ROW, to avoid damaging soil and vegetation. It will be most important to avoid soil compaction around trees. Generally the rule will be to avoid driving heavy equipment or trucks anywhere into the 'drip-line' of a tree (defined as imaginary line around a tree where rainwater falls freely to ground unimpeded by the tree's foliage)	Contractor	DDIS, PMU3/SEO
		The contractor will not use or permit the use of wood as a fuel for the execution of any part of the Works and to the extent practicable shall ensure that fuels other than wood are used for cooking, and water heating in all his camps and living accommodations.	Contractor	DDIS, PMU3/SEO
		Contractor shall not buy or use wood from the illegal sources (that come from the illegal logging)	Contractor	DDIS, PMU3/SEO
		Construction camps, asphalt mixing plants, material storage sites and other project facilities shall not be located in the forest areas and other densely vegetated sites.	Contractor	DDIS, PMU3/SEO
		Contractor will take all precautions necessary to ensure that damage to vegetation is avoided due to fires resulting from execution of the works. The Contractor will immediately suppress the fire, if it occurs, and shall undertake replanting to replace damaged vegetation.	Contractor	DDIS, PMU3/SEO
		As much as possible, bridge works will be scheduled in dry season to minimize adverse impacts to fishery, river water quality and other aquatic resources.	Contractor	DDIS, PMU3/SEO
16) Construction works, operation of workers camps	Health and safety risks to workers and the public	Conduct orientation for construction workers regarding emergency response procedures and equipment in case of accidents (e.g., burns from hot bitumen, spills of hazardous substances, etc.), fire, etc.; health and safety measures, such as on the use of hot bitumen products for paving of Project roads, etc.; prevention of HIV/AIDS, malaria, diarrhea, and other related diseases.	Contractor	DDIS, PMU3/SEO
		Provide drainage at construction sites and workers camps to prevent water logging/ accumulation of stagnant water and formation of breeding sites for mosquitoes.	Contractor	DDIS, PMU3/SEO
		Provide firefighting equipment and appropriate emergency response equipment (based on on-going construction activities) at the work areas and at construction and workers camps.	Contractor	DDIS, PMU3/SEO
		Provide first aid facilities that are readily accessible by workers.	Contractor	DDIS, PMU3/SEO
		At the workers camps, provide adequate housing for all workers at the construction camps, provide reliable supply of potable water, install separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers and establish clean eating areas and kitchen.	Contractor	DDIS, PMU3/SEO
		Provide workers with appropriate safety equipment/devices (such as dust mask, hard hats, safety shoes, goggles, ear plugs, etc.) and strictly require them to use these as necessary.	Contractor	DDIS, PMU3/SEO
		Install sign boards, lighting system at the construction sites, borrow pits, or places which may cause accidents for people and workers	Contractor	DDIS, PMU3/SEO
		Strictly impose speed limits on construction vehicles along residential areas and where other sensitive receptors such as schools, hospitals, and other populated areas are located.	Contractor	DDIS, PMU3/SEO

Project Activity	Potential Environmental Impacts/Concerns	Proposed Mitigation Measures	Responsibility	
			Implementation	Monitoring
		Educate drivers on safe driving practices to minimize accidents and to prevent spill of hazardous substances and other construction materials during transport.	Contractor	DDIS, PMU3/SEO
		Barriers (e.g., temporary fence) shall be installed at construction areas to deter pedestrian access to these areas except at designated crossing points.	Contractor	DDIS, PMU3/SEO
		Sufficient lighting at night as well as warning signs shall be provided in the periphery of the construction site.	Contractor	DDIS, PMU3/SEO
		The general public/local residents shall not be allowed in high – risk areas, e.g., excavation sites and areas where heavy equipment is in operation.	Contractor	DDIS, PMU3/SEO
		Ensure proper collection and disposal of solid wastes within the construction camps consistent with local regulations.	Contractor	DDIS, PMU3/SEO
		Provide fencing on all areas of excavation greater than 2 m deep.	Contractor	DDIS, PMU3/SEO
		Ensure reversing signals are installed on all construction vehicles.	Contractor	DDIS, PMU3/SEO
		Measures to prevent malaria shall be implemented (e.g., provision of insecticide treated mosquito nets to workers, spraying of insecticides, installation of proper drainage to avoid formation of stagnant water, etc.).	Contractor	DDIS, PMU3/SEO
		Discharge of untreated sewage shall be prohibited.	Contractor	DDIS, PMU3/SEO
17) Operation of Construction /workers camps	Social conflicts	Regularly inform in advance the local officials and local residents on the location and schedule of construction activities which may cause impacts on the environment and life of people (e.g., dike sections to be constructed; roads used for transport, locations of worker camps etc.).	Contractor	DDIS, PMU3/SEO
		Locate construction camps away from communities (at least 300 m away) in order to avoid social conflict in using resources and basic amenities such as water supply.	Contractor	DDIS, PMU3/SEO
		Maximize number of local people employed in construction works.	Contractor	DDIS, PMU3/SEO
		Maximize goods and services sourced from local commercial enterprises.	Contractor	DDIS, PMU3/SEO

## **C. ENVIRONMENTAL MONITORING AND IMPLEMENTATION ARRANGEMENT**

### **C-1. Staffing for Monitoring**

69. The contractors should have an environmental specialist on their staff who will advise on implementing the EMP. MPWT has retained supervision consultants. They will maintain a Resident Engineer (RE) on site and a team of inspectors. The inspector's responsibilities will include environmental issues and they must check activities and progress against environmental checklists. The inspectors must report to the RE who in turn submits reports to the Consultants. Environmental results must be reported to the social and environment division (SEU) which has been established in the Department of Planning, MPWT. The results must also be incorporated in the progress reports submitted to ADB. A summary of the monitoring results for six months will be included in the Semi-annual Environmental Monitoring Report that MPWT/PMU3 will submit to ADB.

### **C-2 EMP Implementation Monitoring Checklist**

70. An EMP implementation monitoring checklist will be prepared and used by the contractor, DDIS and SEU during inspections. The checklist contains all the mitigation measures listed in the EMP that are applicable to the contract work package. The checklist may be revised or updated as necessary during the progress of civil works. A sample checklist is included in the appendix.

### **C-3. Timing of Monitoring**

71. The timing of the monitoring is important. The following list is for guidance and is indicative only.

- Liquid emissions from sites must be checked weekly or after heavy rain if overflowing is reported. Measurements in streams and water courses must be made when necessary.
- Dust emissions on site must be checked weekly by visual inspection and monthly by examining records of water spraying. Ambient air quality must be checked over a 24 hour continuous period at sensitive receptors in the event of complaints.
- Noise levels must be checked every three months at site perimeters, or in the event of a complaint, at night as well as during the daytime.
- Correct removal and disposal of food waste and waste engine oil and grease must be checked weekly by visual inspection of the camps and checking of records from the waste disposal contractors.
- Noise and vibration must be checked at sensitive receptors when blasting first occurs or in the event of complaint. Before blasting commences warning notices must be posted to local residents.
- Reinstatement of borrow pits and quarries must be checked after closure of the facility.
- Implementation of EMP will be checked weekly by the contractor and at least once a month by DDIS and SEU using an EMP implementation monitoring checklist.

72. In addition to regular monitoring, unannounced spot checks must be made by SEU on contractors operations. All of the above procedures should be carried by the site inspectors, in conjunction with SEU, and where appropriate MOE/ DOE. The results should be formally recorded every week and compiled into a monthly report. This should be submitted to the Engineer, the Chief Resident Engineer and discussed with SEU and the contractors as necessary but at a minimum on a monthly basis.

**Table 2. Measurement of Environmental Parameters**

Environmental Issue	Parameter	Standard	Timing	Equipment	Institutional Responsibilities
Water Quality	BOD	< 50mg/L	every 3 months or after heavy rain	Water Sampler	DDIS, SEU
	SS	< 50mg/L			
	Temperature	<45°C			
	pH	6-9			
	Oil & Grease	< 5mg/L			
	Dissolved Oxygen	> 4mg/L			
Air Quality	TSP	< 0.33 mg/m <sup>3</sup>	24 hours	H.V.S + Lab	MoE
Noise Quality	Leq	75dB(A)	(daytime 07-19)	Noise Meter	SEU
	Leq	65dB(A)	(nighttime, 19-07)		
Vibration	PPV	< 1mm/sec	During blasting	Vibration meter	MoE
Solid Waste	Food Waste	Properly Removed	Daily	Visual Inspection	Contractor
Liquid Waste	Waste Oil, Grease	Properly Controlled After Removed by Subcontractor	Weekly	Visual Inspection	Contractor
Septic Tank	Smell, Sewage	No Smell, No Overflowing	During Operation	Visual Inspection	DDIS
Borrow Pits	Condition of Borrow Pits	Filled after Project Completion, Topsoil resurfaced	After Closure	Visual Inspection	DDIS
Borrow Pits	Depth of Borrow pits	No Drowning Hazard	After Closure	Visual Inspection	DDIS
Borrow Road	Location for Borrow Road	Meet the Engineer Demand	After Closure	Visual Inspection	DDIS
Quarries	Condition of Quarries	Quarries reinstated	After Closure	Visual Inspection	DDIS
Tree if Cut	Tree	Tree Replanted	After Removal	Visual Inspection	FA
EMP implementation	All mitigation measures in the EMP/CEMP	Mitigation measures are implemented	Weekly for contractors, at least once a month for DDIS, SEU	Visual inspection or other appropriate methods	Contractor, DDIS, SEU



#### C-4. Monitoring activities

73. **Table 3** presents the environmental monitoring activities to be undertaken during various project phases. The monitoring reports shall describe progress with the implementation of the EMP and compliance issues and corrective actions, if any.

**Table 3. Environmental Monitoring Measures**

Aspects/Parameters to be Monitored and Applicable Standards	Location	Means of Monitoring	Schedule / Frequency	Responsible to Undertake Monitoring
<b>Pre-construction</b>				
1. UXO clearing	All project dikes	Confirm necessary UXO removal is completed and certified by authorized UXO clearing firm	Prior to start of site works	DDIS, MPWT/ PMU3
2. Setting of quarry and borrow areas consistent with EMP	All project dikes	Check contractor's construction materials plans, site visit	Prior to establishment of quarry and borrow areas	DDIS, MPWT/ PMU3
3. Setting of various project facilities (workers/construction camps, crushing plants, etc.) consistent with EMP	All project dikes	Check contractor's facilities location plans, site visit	Prior to establishment of contractor's facilities	DDIS, MPWT/ PMU3
4. Relocation of community facilities (e.g., water supply pipelines, irrigation canal, etc.)	All project dikes	Site visit, confirm with local officials	Prior to start of site works	DDIS, MPWT/ PMU3
5. Ambient surface water quality (fecal coliform, dissolved oxygen, pH, oil and grease, suspended solids, biological oxygen demand–5 days or BOD5) to be compared to standards specified in Subdecree on Water Pollution Control, 1999 (No. 27 ANK.BK)	All project dike on rivers or streams close to proposed sites for construction/workers camps	Field sampling (will be sampled at rivers)	Once, prior to establishment of workers /construction camps	DDIS
<b>Construction</b>				
6. Implementation of construction phase environmental mitigation measures Note: Implementation of EMP measures monitoring should be done at least weekly by the contractors, and monthly by DDIS/SEU	All project dikes	Site visit, interviews with local residents, coordination with concerned agencies (e.g. MCAFA, local traffic authorities, etc.)	Quarterly (on a regular basis) Random checks and to validate complaints	DDIS, MPWT/PMU3/ SEO, DPWTs As appropriate–MCFA
7. Noise in dB(A) compared to standards specified in Sub decree on the Control of Air Pollution and Noise Disturbance, 2000 (No. 42 ANK.BK)	All project dikes and other areas where project-related activities are undertaken	Noise measurement	In response to complaints	DDIS

8. Total suspended particulate/dust compared to standard specified in Sub decree on the Control of Air Pollution and Noise Disturbance, 2000 (No. 42 ANK.BK)	All project dikes and other areas where project-related activities are undertaken	Field sampling	In response to complaints	DDIS
9. Ambient surface water quality (fecal coliform, dissolved oxygen, pH, oil and grease, BOD5)  10. Other parameters to be sampled, as appropriate, to validate complaints and pollution event(s) due to project activities	Upstream, midstream and downstream of rivers and stream close to construction/w orkers camps  Other locations to validate complaints or where pollution occurred due to the project (e.g., fuel spill)	Field sampling	Quarterly and in response to complaints/validate pollution events	DDIS

74. **Table 4** presents the environmental monitoring activities to be undertaken during construction phase. The monitoring reports shall describe progress with the implementation of the EMP and compliance issues and corrective actions, if any.

**Table 4. Summarized Potential Negative Impacts, Mitigation Measures and Responsibilities**

Activities	Potential Negative Impacts	Mitigation Measures	Implementing Organization	Supervising organization
1) Raising Road Affecting Hydrology or Drainage.	Increase erosion, possible road failure due to impoundment of flood waters.	<ul style="list-style-type: none"> <li>All bridges stream flow area increased, extra cross drainage provided. Included in detailed design.</li> </ul>	Consultant	MPWT
2) Need for fill material	Loss of livelihood, Loss of Agricultural Land for Borrow Pits.	<ul style="list-style-type: none"> <li>Develop alternative uses for borrow pit areas with agreement of farmers and villagers. Some villagers request borrow pits to be left as water ponds for use by village.</li> </ul>	Contractor	SEO, MPWT
3) Cutting of roadside trees	Loss of roadside trees, loss of shade and utility.	<ul style="list-style-type: none"> <li>Compensation to be paid under Resettlement Plan. No replanting is required by contractor.</li> </ul>	IMRC	MPWT
4) Cut faces and borrow pits	Erosion and instability of cut faces and borrow pits	<ul style="list-style-type: none"> <li>Design cut slope to minimize instability.</li> <li>Use structural stabilization measures such as retaining walls and gabions, if necessary.</li> <li>Use adequate design, siting, and sizes of drainage structures.</li> </ul> <p>All included in detailed design.</p>	Consultant	MPWT
5) Outflow from drainage structures	Erosion of lands below the roadbed receiving concentrated outflow carried by drainage structures– in contravention of Draft Sub-Decree on Water Quality.	<ul style="list-style-type: none"> <li>Position drainage structures to avoid a cascade effect and to ensure that runoff is conveyed into natural drainage lines at controlled velocities.</li> <li>Line receiving areas with stones or concrete to protect soils at outflow areas</li> <li>Incorporate sufficient number of drainage outlets such that flow from any individual outlet is not excessive.</li> </ul> <p>Included in detailed design.</p>	Consultant	MPWT
6) Road widening onto agricultural land	Destruction of agricultural land through road widening and realignment	<ul style="list-style-type: none"> <li>Minimize realignment through agricultural land.</li> <li>Ensure appropriate compensation for loss of agricultural lands.</li> </ul>	Consultant	MAFF, SEO
7) Road shoulder widening	Encroachment on previously unidentified cultural sites– in contravention of Law on Protection of Cultural and National Heritage (1996)	<ul style="list-style-type: none"> <li>Consult with villagers during detailed design to avoid encroachment on graveyard, and other unidentified sites of cultural importance.</li> </ul>	Consultant	MPWT, MoCF

Activities	Potential Negative Impacts	Mitigation Measures	Implementing Organization	Supervising organization
8) Mobilization of equipment and workforce	Accident risk from mobilizing construction equipment	<ul style="list-style-type: none"> <li>Minimize the mobilization of heavy equipment to nighttime.</li> <li>Over-width and over-length vehicles should display adequate warnings such as flashing lights, signs, and flags on extending parts of equipment.</li> </ul>	Contractor, Police	SEO
9) Mobilizing workforce	The introduction of an outside workforce can have a negative impact on the health and social well-being of local people	<ul style="list-style-type: none"> <li>Conduct special briefing or on-site training on environmental requirement of the project to workers.</li> <li>Strictly supervise workers not to interference with local affairs or quarrel with local people.</li> <li>In case of complaints from local people on the issues caused by workers, the complaints should be solved as soon as possible, by collaboration of contractor and village representatives.</li> </ul>	Contractor	SEO
10) Behaviour of workers	Impacts on local wildlife by workforce– in contravention of Joint Prakas of the Ministry of Environment and the Ministry of Agriculture on Prohibition of Hunting and Catching of Wildlife Animals (1996)	<ul style="list-style-type: none"> <li>Carry out awareness-raising campaigns on wildlife value for workers.</li> <li>Any worker conduct hunting, or buying wildlife from local people, will be dismissed from job.</li> <li>Supply workers with sufficient food from outside the project.</li> </ul>	Contractor	SEO, MoE, MAFF
11) Protecting workers safety	Accident risk from mobilizing	<p>The following safety precautions should be provided to workers.</p> <ul style="list-style-type: none"> <li>Warning and/or Precaution Signs on safety.</li> <li>Provide full PPE; Helmets, boots, warning jackets etc.</li> <li>Instruction on health and safety.</li> <li>Establishment of all relevant safety measures required by law and good engineering practices.</li> </ul>	Contractor	SEO, MPWT
12) Health Aspects	Outbreak of disease	<ul style="list-style-type: none"> <li>The contractor shall have all his workers undergo a medical screening prior to their arrival on site, to check for HIV/AIDS, sexually transmitted diseases, and to provide an awareness program. Any workers screening positive for such diseases shall not be allow on the site.</li> <li>Site construction camps far away from local communities and rivers.</li> <li>Keep camps from becoming blight on the local environment.</li> <li>Provide enough water supplies for workers, and ensure sufficient sanitation for the camp: the proper location for solid waste disposal.</li> </ul>	Contractor	SEO, MoH

Activities	Potential Negative Impacts	Mitigation Measures	Implementing Organization	Supervising organization
		<ul style="list-style-type: none"> <li>Make medical treatment available for workers. Provide workers mosquito nets and malaria-prevention medication, if needed, spray around camp area with chemicals against mosquitoes.</li> </ul>		
13) Providing fuel for workers	Depletion of natural resources through demand for building materials, fuel and food for workers– in contravention of Royal Decree on the Creation and Designation of Protected Areas (1993)	<ul style="list-style-type: none"> <li>Do not harvest wood resources within protected area.</li> <li>Where local materials must be used, make agreements with local communities about the areas or the volume that can be harvested without significant impact.</li> <li>Support community development by paying an adequate price for any local resources used.</li> <li>All supplies for building camps should be brought from outside area.</li> </ul>	Contractor	SEO, MoE, FA
14) Construction work area	Loss of water quality– in contravention of Sub-Decree on Water Quality	<ul style="list-style-type: none"> <li>Revegetation of construction area. This relates to grass seeding of slopes of new embankments for soil stabilisation and control of sediment run off.</li> </ul>	Contractor	MPWT
15) Work in stream channels	Loss of water quality– in contravention of Sub-Decree on Water Quality	<ul style="list-style-type: none"> <li>Limit work in channels to low flows. Diversionary works to be completed in dry season.</li> </ul>	Contractor	MPWT
16) Fuel, lubricants and asphalt	Loss of soil and water quality – in contravention of MOE Praka No. 992 on the Regulation of Industrial Solid and Liquid Waste Management (1994)	<ul style="list-style-type: none"> <li>Fuel storage in properly designed facilities, careful refueling systems</li> <li>All fuel tanks to be on solid concrete base surrounded by kerb for spill containment.</li> <li>All oil drums to be stored vertically to prevent spills.</li> <li>Waste oil drums to be stored on waterproof base and covered over from rain.</li> </ul>	Contractor	MPWT, DoE
17) Solid waste disposal	Loss of soil and water quality– in contravention of Sub-Decree on Waste Management	<ul style="list-style-type: none"> <li>All Solid waste to be removed off site and disposed of correctly. No burning of rubbish allowed onsite.</li> </ul>	Contractor	MPWT, DoE
18) Dust impacts	Loss of quality of life values– in contravention of Draft Sub-Decree on Air Pollution Prevention	<ul style="list-style-type: none"> <li>Road watering, cover stock piles</li> </ul>	Contractor	MPWT
19) Noise impacts	Loss of quality of life values– in contravention of Draft Sub-Decree on Noise Prevention	<ul style="list-style-type: none"> <li>Vehicle noise control, Timing of work, Give advance notice of time of blasting</li> <li>No working between 1900 and 0700 without permission of RE.</li> </ul>	Contractor	MPWT

Activities	Potential Negative Impacts	Mitigation Measures	Implementing Organization	Supervising organization
20) Vibration impacts	Loss of quality of life values– in contravention of Draft Sub-Decree on Noise Prevention	<ul style="list-style-type: none"> <li>Schedule work to minimize nuisance</li> </ul>	Contractor	MPWT
21) Damage to services	Loss of services	<ul style="list-style-type: none"> <li>Contractor liaise with utility company on location of services</li> </ul>	Contractor	MPWT
22) Altered road conditions	Driver hazards	<ul style="list-style-type: none"> <li>Reduce waiting time delays; erect signage and employ traffic controllers.</li> </ul>	Contractor	MPWT/Police
23) Inadequate sanitation	Increased disease– in contravention of Law on Environmental Protection and Natural Resource Management (1996)	<ul style="list-style-type: none"> <li>Provide sanitation through septic tanks; potable water, by wells and tankers. Well to be sunk on permanent campsites. Septic tanks to be installed on permanent campsites. Temporary camps to be in rented accommodation with existing sanitation, and extra water provided by tanker if needed.</li> </ul>	Contractor	MPWT
24) Being ready for accidents and injuries	Slow response to injury, no treatment for illness	<ul style="list-style-type: none"> <li>Worker Health and Safety Plan, First Aid officer on site identifying nearest medical facilities.</li> </ul>	Contractor	Contractor, Consultant, MPWT
25) Transmission of sexually communicable diseases	Spread of diseases to communities	<ul style="list-style-type: none"> <li>Pre-employment worker screening, Public education program.</li> </ul>	Separate study and program implemented	MPWT/ Contractor
26) Stagnant water areas	Breeding habitats for mosquito vector	<ul style="list-style-type: none"> <li>Siting camps distant to communities. Removal of stagnant water areas.</li> </ul>	Contractor	Consultant
27) Dislocation of people within RoW	Loss of livelihood and assets	<ul style="list-style-type: none"> <li>Resettlement and compensation plan</li> </ul>	SEO	MPWT/ IRC
28) Discovery of artifacts and relics	Permanent loss of cultural items– in contravention of Law on Protection of Cultural and National Heritage (1996)	<ul style="list-style-type: none"> <li>Contractor awareness; chance finds must be reported to RE who informs MoCF</li> </ul>	Contractor	MoCF
29) Earthworks, steep roads and operating of quarries and borrow pits	Erosion and instability of cut faces and borrow pits	<ul style="list-style-type: none"> <li>No new side roads should be permitted in areas with steep slopes.</li> <li>Minimize major earthworks during the rainy season, to the extent feasible.</li> <li>Pile topsoil from digging of borrow pits carefully to one side, where it can be later used for reclamation.</li> </ul>	Contractor	SEO

Activities	Potential Negative Impacts	Mitigation Measures	Implementing Organization	Supervising organization
		<ul style="list-style-type: none"> <li>During construction, employ erosion prevention measures such as the use of hay bales.</li> <li>At the end of the construction phase, recontour borrow pit walls, replace topsoil, and revegetate.</li> <li>At the end of the construction phase, revegetate cut slopes where feasible.</li> </ul>		
30) Dredging of Lake Khsetl	Land contamination and mud on road ; disturbance to fish habitat	<ul style="list-style-type: none"> <li>Dredged material to be stored along side of Lake Khset.</li> <li>No dumping of dredged material in roads, gullies or watercourses.</li> <li>Any lorries carrying dredged material to be covered with tarpaulins when on road.</li> <li>Measures to protect fish</li> </ul>	Contractor	SEO
31) Construction of dams in river and near riverside	Loss of riverside vegetation	<ul style="list-style-type: none"> <li>Avoid clearing riverside vegetation during dam construction except where absolutely necessary.</li> <li>Avoid spill of oil and lubricants into river</li> </ul>	Contractor	SEO
32) Construction near cultural sites on Kampong Leaeng	Encroachment on previously unidentified cultural heritage sites– in contravention of Law on Protection of Cultural and National Heritage (1996)	<ul style="list-style-type: none"> <li>Alert local authority upon discovery of any objects of possible archaeological significance that may be uncovered during construction.</li> <li>Construction activity affecting the area of the find should stop until qualified site assessment has been made and contractors have been given permission to proceed..</li> </ul>	Contractor	SEO, MoCF
33) Construction Causing Air Pollution	Dust / Air pollution– in contravention of Draft Sub-Decree on Air Pollution Prevention	<ul style="list-style-type: none"> <li>Use water bowsers to water the road when dust occurs, particularly in the dry season.</li> <li>Maintain all construction vehicles to minimize vehicle emission.</li> </ul>	Contractor	SEO, DoE
34) Setting up and operating an asphalt plants, bitumen operation area.	Water pollution by oil, grease, and fuel around gas stations and parking areas– in contravention of Draft Sub-Decree on Hazardous Substances	<ul style="list-style-type: none"> <li>Locate storage areas for diesel and bitumen at least 500 meters from watercourses.</li> <li>Employ safe practices in filling bitumen distributor tanks and in heating bitumen. Do not allow smoking or fire of any kind in the vicinity of bitumen and kerosene blending tanks. Provide a carbon dioxide fire extinguisher at the bitumen tank site for fire-fighting.</li> <li>Collect and recycle all lubricants and take precautions to prevent accidental spills.</li> <li>Prohibit road asphaltting activities during rainfall.</li> <li>Develop and implement plans for safe storage of all toxic and potentially toxic materials into construction planning and design.</li> </ul>	Contractor	Consultants, SEO

Activities	Potential Negative Impacts	Mitigation Measures	Implementing Organization	Supervising organization
35) Construction activities near prime agricultural lands	Destruction of agricultural land through spoil and construction waste disposal– in contravention of Draft Sub-Decree on Waste Management	<ul style="list-style-type: none"> <li>Do not dispose cut spoil and construction waste on agricultural land.</li> <li>No encroachment on agricultural land during construction activities.</li> </ul>	Contractor	SEO, MAFF
36) Blasting (if carried out)		<ul style="list-style-type: none"> <li>All the statutory laws, regulation, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives will be strictly followed. Blasting will be carried out as per Cambodian statutory requirements with notification to the authorities.</li> <li>People living near blasting sites will be informed of blasting times prior to the blasting and warning sirens will be sounded before blasting.</li> <li>Blast blankets will be laid over the blast area to reduce flying rock and pre-splitting shall be undertaken..</li> <li>Where the vibration from blasting is exceeding the maximum permissible level, or damage occurs to local property information from the blasting shall be used to modify blasting patterns and calculate a reduced charge for future blasts</li> <li>Blasting will not be undertaken at night.</li> <li>Blasting shall be under careful and strict management of properly trained and licensed personnel. Workers at blasting sites will be trained prior to blast operations and provided with safety equipment and earplugs.</li> <li>Observe proper warning and precautionary measures to ensure safety of residents, pedestrians, motorists and structures during blasting.</li> </ul>		



## **D. GRIEVANCE REDRESS MECHANISM**

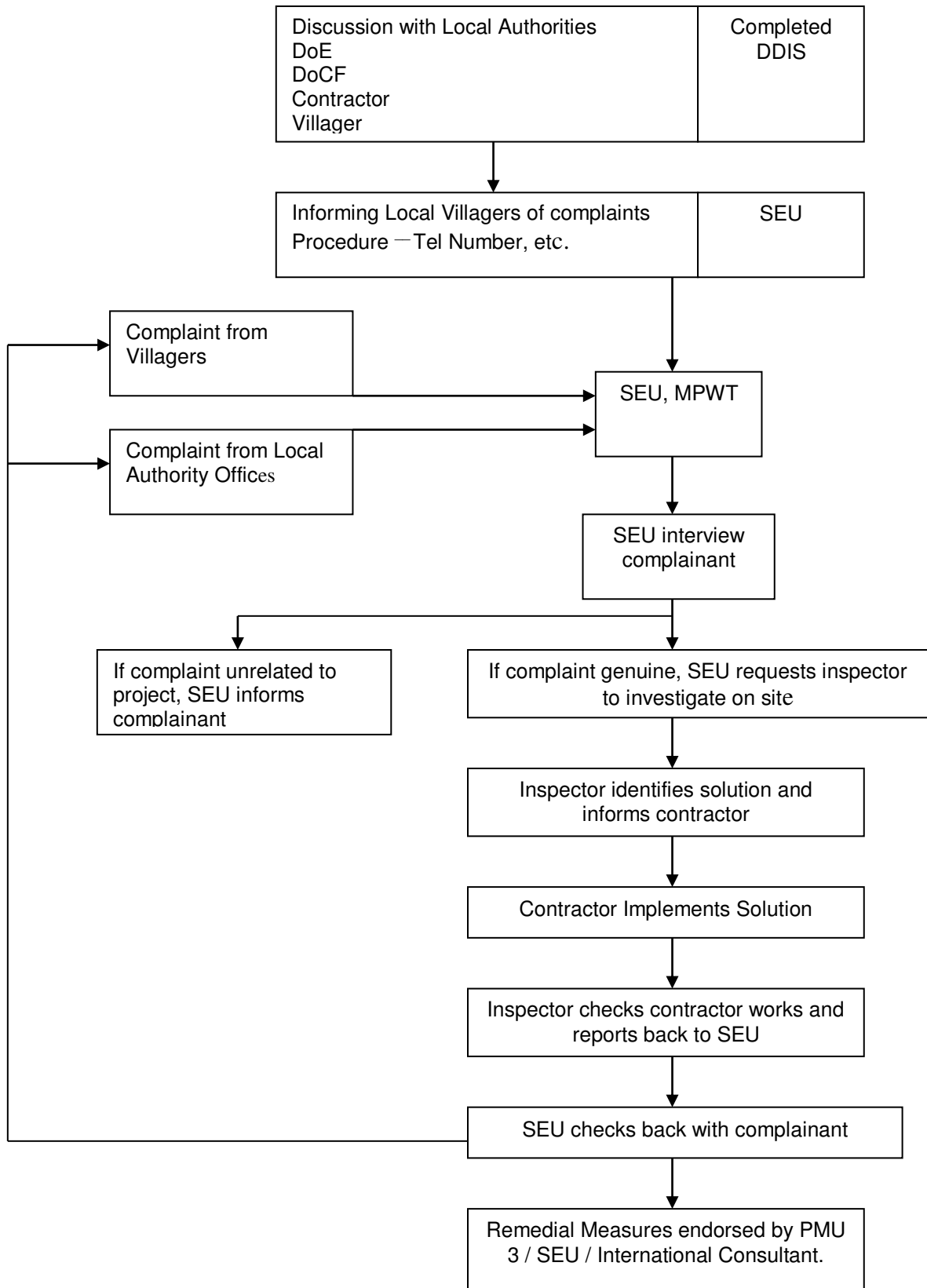
75. PMU and the contractor will develop a system or a grievance redress mechanism (GRM) that will allow for receiving/recording and immediate response to construction-related complaints. Such complaints will also be reported by PMU and/or contractor to CSC within 24 hours and vice versa for immediate resolution. The GRM will be established and publicized before construction starts.
76. The GRM will be managed by PMU (with oversight by the CSC). PMU and the Contractor will inform the communities along the alignment and other stakeholders affected by the Project about the GRM in place to handle complaints and concerns about the Project. The Contractor will also install notice boards at the construction sites to publicize the name and telephone numbers of the representatives of the Contractor, PMU and CSC who are designated to receive and document complaints.
77. Any individual, household or organization (business unit, production unit, governmental or private office socio-political association, etc.) can lodge a claim against the project owner or its contractors if her/his or their properties/ life/ business/health or public environment is damaged by project activities.
78. The existence of the Project GRM shall not impede the complainant's access to the Government's judicial or administrative remedies.
79. Resolution of issues under the GRM shall consist of the following steps:
  1. **Prepare a Complaint** – may be made verbally, in written form or through local officials/media. The complainant can directly express claims to the representative of the contractor / project owner, PMU or CSC in case of verbal complaint or send a grievance letter to offices of project owner/contractor, PMU or CSC and with a copy to local government units in case of grievance in written form. If the complainant does not know how to send a grievance letter, the assistance of third-parties, such as media or local government officials, can be tapped to send this letter to the contractor/ project owner, PMU or CSC.
  2. **Receive and Register a Complaint** - Once a complaint has been received, it should be registered by the PMU with local officials and all concerned parties notified properly. Within 15 calendar days a reply in written form from the project owner / contractor should be sent back to the complainant with a copy to the local officials.
  3. **Screen for Eligibility and Assess the Complaint** - Once a complaint has been received, PMU, in close coordination with CSC, should determine if the complaint is attributable to the project and if it is within the scope of the GRM. It then identifies who will conduct the assessment of the damages
  4. **Assess the Damages Caused by the Project Activities** - In case the complaint is related to the project activities, representatives of the PMU and the chosen assessment unit should visit the complainant and the site where damage is reported. The assessment should be implemented with participation of the complainant and witnesses, such as local officials and the results of the assessment should be agreed upon and signed by the complainant, representatives of project owner/contractor, PMU, assessment unit and local officials. If one side is not satisfied with the assessment results, they can propose another method or another assessment unit to re-assess the impacts until the assessment satisfies both sides.

5. **Select grievance resolution approaches** – Resolution of the grievance may be approached several ways. Some common approaches are as follows:
    - a. The complainant proposes a solution, based on their self - evaluation of their damages;
    - b. The project owner/contractor proposes a solution, based on the legal regulation and their assessment of the damages;
    - c. The complainant and project owner/contractor negotiate; and
    - d. The two sides defer to a third party (local mediating committee), government agencies with the participation of environmental management units. In case resolution is not achieved by these bodies, both sides may request a court to decide.
  6. **Compensate Damages Caused by the Project Activities and Communicate Back to All Parties Involved** - After arriving at an agreement, the project owner or its contractor will immediately compensate the complainant. The compensation may be in money and/or in kind (for example land, construction materials, house, apartment, etc.) depending on the agreement between the two sides or by decision of courts. Compensation also includes restoration of the damaged environment caused by the project activities, if the complainant requires.
80. A documentation of the process should be prepared and signed by the complainant, representatives of the project owner/contractor and local PC and distributed. The process should be monitored by community officials/organizations.

### **Response to Complaints**

81. Environmental monitoring must be carried out by the construction supervision inspectors. Response to complaints will be based on the following schedule:
- Complaint made to contractor
  - Response by contractor or construction supervision consultants' inspectors.
  - Weekly compiling of checklists by inspectors. Copies of checklists to be given to contractors as official notification of action being required, confirmation of receipt obtained by contractor signing copy, and joint inspection carried out if necessary.
  - Monthly progress reports by inspectors by consolidating weekly reports.
  - Corrective Action Reports (CARs) from contractors, as soon as action taken.
  - Monthly progress meetings with contractors at which CARs from previous month examined and checked.
  - Three monthly progress reports to ADB detailing problems and Corrective Actions taken.
  - Checks with complainants that they are satisfied.
82. The Contractor must maintain contact on a working level with the local authorities:
- Provincial DoE
  - Provincial DoCF
  - Provincial DoAFF
83. In addition liaison with community heads, local village representatives, individual landowners and utility companies must be maintained. The creation of a Grievance Redress Mechanism (GRM) to address the concerns, complaints and grievances of the stakeholder resulting from project activities. The contact numbers of client will be engraved on the 7 numbers of project information board to contact when anyone have the concerns, complaints and grievances. Client will reply within five days.

**Figure 1 Investigations Procedure**



The below table show the institutional responsibilities for implementation of the CEMP.

**Figure 2 Responsibilities for CEMP Implementation**

Agency	Responsibilities
Ministry of Public Works and Transport (MPWT)	<ul style="list-style-type: none"> <li>• Executing agency, shall ensure that sufficient funds are available to properly implement the EMP</li> <li>• Ensure that all Project components, regardless of financing source, complies with the provisions of the EMP and ADB Safeguard Policy Statement 2009 (SPS)</li> <li>• Ensure that Project implementation complies with Government environmental policies and regulations</li> <li>• Ensure that tender and contract documents include the EMP</li> <li>• Establish a Social and Environmental Unit during Project implementation</li> <li>• Submit semi-annual monitoring reports on EMP implementation to ADB</li> </ul>
PMU3 / SEU	<ul style="list-style-type: none"> <li>• Responsible for overall project implementation, management and coordination;</li> <li>• Include the EMP in the tender and contract documents;</li> <li>• Ensure that EMP provisions are strictly implemented during various project phases (pre-construction, construction and operation) to mitigate environmental impacts to acceptable levels</li> <li>• Undertake monitoring of the implementation of the EMP (mitigation and monitoring measures) with assistance from DDIS.</li> <li>• Ensure that Project implementation complies with ADB's Safeguard Policy Statement (SPS) principles and requirements</li> <li>• Commit and retain dedicated staff for the SEU to oversee EMP implementation</li> <li>• Prior to start of site works, establish an environmental grievance redress mechanism, as described in the IEE, to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the Project's environmental performance</li> <li>• With assistance from DDIS, prepare semi-annual environmental monitoring reports for submission to ADB</li> <li>• Based on the results of EMP monitoring, identify environmental corrective actions and prepare a corrective action plan, as necessary, for submission to ADB</li> </ul>
DDIS	<ul style="list-style-type: none"> <li>• Incorporate into the project design the environmental protection and mitigation measures identified in the EMP for the design/pre-construction stage;</li> <li>• Assist PMU3/SEU to ensure that all environmental requirements and mitigation measures from the IEE and EMP are incorporated in the bidding documents and contracts</li> <li>• Prior to start of site works, assist PMU3 in establishing a grievance redress mechanism as described in the IEE,</li> <li>• Implement all mitigation and monitoring measures for various project phases specified as DDIS's tasks in the EMP</li> <li>• Undertake environmental management capacity building activities for SEU as required in the EMP</li> <li>• Undertake regular monitoring of the contractor's environmental performance as scheduled in the EMP</li> <li>• Conduct field measurements for surface water quality, dust and noise as required in the EMP</li> </ul>

Contractor	<ul style="list-style-type: none"> <li>• Provide sufficient funding and human resources for implementation of the EMP</li> <li>• Ensure proper and timely implementation of required pre-construction and construction mitigation measures in the EMP</li> <li>• Implement additional environmental mitigation measures, as necessary</li> </ul>
DPWT	<ul style="list-style-type: none"> <li>• Responsible for operation and maintenance of Project road</li> <li>• Implement EMP mitigation and monitoring measures during operation</li> </ul>
Ministry of Environment (MOE), APSARA, MCFA	<ul style="list-style-type: none"> <li>• Issue necessary approvals to the Project prior to implementation</li> <li>• Undertake monitoring of the Project based on their mandate</li> </ul>

## CHECKLIST

**G0278-CAM-Provincial Roads Improvement Project**  
**EMP Implementation Monitoring Checklist**

**Contract Package :**  
**Inspection Date :**

**Inspector's Name :**  
**Position :**

Item	EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations	Deadline
		Yes	No	Partial			
	<b>Community Facilities (power lines, irrigation canals, etc.)</b>						
1.	Interruption of utility services are minimized by laying out new lines prior to transfer						
2.	Replacement structure are constructed prior to demolition of existing structure						
3.	Temporary facilities to maintain adequate services are in place						
4.	Coordination with local company or local offices						
5.	Affected people are informed in advance						
6.	Local roads used by the project are upgraded prior to use						
7.	Local and access roads used by the project are repaired and maintained regularly and fully restored at the end of the project						
8.	Contractor immediately repairs and/or compensates for any damage to properties						
	<b>Air Quality (Dust and Gaseous Emissions)</b>						
9.	Vehicles and equipment are well maintained and in good condition						
	Borrow areas, casting yard and other project facilities are duly licensed and have all the necessary environmental approvals						

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		Yes	No	Partial			
10.	All construction vehicles and equipment are tested for compliance with relevant emission standard and properly licensed; smoke belching vehicles and equipment are not used for the project						
11.	Parked vehicles on the site works have their engines turned off. Unnecessary engine idling of vehicles and equipment is prohibited						
12.	Water spraying of roadways, work areas and other construction-related facilities handling raw sand, aggregates, and similar materials near sensitive receptors						
13.	Dust barriers are installed as necessary						
14.	Storage areas of construction materials such as sand, gravel, cement, etc., have provisions that prevent them from being blown away towards sensitive receptors						
15.	Trucks transporting construction materials (i.e. sand, soil, cement, gravel, etc.) are tightly covered						
16.	Roadways are regularly cleaned of tracked in mud, cement, etc. from construction works						
17.	Stockpiling of spoils near sensitive receptors is prohibited						
18.	Construction vehicles have speed limits (typically 25 km/hour or less) along areas where sensitive receptors are located						
19.	Areas where there is a regular movement of vehicles have an acceptable hard surface and are clear of loose surface material						
20.	Cement and other fine-grained materials delivered in bulk are stored in closed containers						
21.	Conveyor belts are fitted with wind-boards, and conveyor transfer points and hopper discharge areas are enclosed						
22.	Weigh hoppers are vented with a suitable filter						



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		Yes	No	Partial			
23.	Wheel washers are used to clean delivery/ haul trucks of mud and dirt as they exit the work area						
24.	Construction vehicle trips and travel distances for material deliveries are minimized (e.g., by using local materials and labor sources).						
25.	Construction access roads are temporarily paved or sealed						
	<b>Noise and Vibration</b>						
26.	Prior notification to the community on construction schedule						
27.	Vehicle and equipment are fitted with emission control and silencers to meet national noise standard						
28.	Vehicles and equipment are well-maintained and checked by the contractor every 6 months						
29.	Only vehicles and equipment that are registered and have necessary permits are used						
30.	Noisy equipment are completely enclosed whenever possible						
31.	Stationary equipment that produce high noise level are positioned as far as is practical from sensitive receptors.						
32.	Noisy construction activities within 200m of a settlement are only during daytime						
33.	Suitable noise control barriers are used in the vicinity of house, school, temples, medical facilities and other sensitive receptors						
34.	Noisy construction activities are avoided in the vicinity of sensitive receivers; noisy construction activities are avoided near school during examination period and coordinated with school administration						

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		Yes	No	Partial			
35.	Suitable noise level reduction measures are installed by the contractor if construction activities are disruptive						
36.	Speed limits on construction vehicles are imposed						
37.	Construction traffic routes are defined in cooperation with local communities and traffic police						
38.	Asphalt concrete batching plants and crushing plant are located at least 500 m away from inhabited areas and other sensitive receptors						
39.	Fully loaded trucks are rerouted away from roadways that go through heavily built areas						
40.	Heavy equipment are operated away from vibration-sensitive areas						
41.	Simultaneous activities like demolition, ground impacting and earthmoving are avoided						
42.	Use of vibrating rollers near vibration- sensitive structures are avoided						
	<b>Erosion and Sedimentation</b>						
43.	Suitable soil erosion control measures are implemented prior to excavation of the bridge pier foundation and construction activities at waterways						
44.	Silted water carried with the spoils during excavation and construction of bridge foundation are properly treated						
45.	Spoils (excavated soil, rocks, removed asphalt, etc.) stockpiles are located at least 50 m from watercourses						
46.	A bund is placed around the spoils stockpile area						
47.	Spoil disposal does not cause sedimentation and obstruction of water flow, damage to agricultural land and densely vegetated areas						

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Item	EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations	Deadline
		Yes	No	Partial			
48.	Grading is avoided or minimized during the rainy season particularly in areas of steep topography and/or adjacent to water courses						
49.	Phased grading schedule is implemented to limit the area subject to erosion at any given time						
50.	Appropriate erosion control and stabilizing measures (such as geotextiles, mats, fiber rolls, soil binders that are not toxic to the environment, or vegetation measures/temporary landscaping) are used in disturbed areas and on graded slopes						
51.	Construction works (for bridges, culverts, drainage, etc.) on or near watercourses do not cause obstruction of channel flow						
52.	Slopes along water channels are stabilized						
53.	Dumping of soil, rocks, construction materials and debris onto watercourses is prohibited						
54.	When construction works cause obstruction of watercourses, the obstruction is immediately cleared to restore channel flow						
	<b>Spoils Disposal</b>						
55.	Spoils (excavated soil and rocks, cut vegetation, removed pavement such as asphalt, etc.) are immediately transported to disposal sites approved by local authorities						
56.	Temporary spoils stockpiles near paddy fields have bund or silt fence around them						
57.	Temporary spoils stockpile that are planned to be used longer than six months are sodded.						
58.	Height of spoils stockpile is limited to minimize windblown dust						

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Item	EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations	Deadline
		Yes	No	Partial			
	<b>Hazardous Materials and Wastes Management</b>						
59.	Maintenance shops, fuel and oil depot have impermeable flooring with sump						
60.	Refueling and servicing of equipment are carried out only in adequately equipped areas						
61.	Accurate and up-to-date written inventories and labels for all stored hazardous materials						
62.	Only minimal chemicals, hazardous substances and fuel are stored on site works, within an enclosed and covered secure area that has an impervious floor and impervious bund around it						
63.	Storage area for chemicals, hazardous substances and fuel are located away from watercourses, flood-prone areas, work camps, and danger areas						
64.	Oil-stained refuse such as oily rags, spent oil filters and used oil are collected and disposed of through recyclers/authorized waste handlers and disposed in authorized waste facilities						
65.	Spill clean-up materials specifically designed for petroleum products and other hazardous substances are provided						
66.	Cleanup of spills or leaks of petroleum products and/or hazardous substances is done immediately						
67.	Relevant construction personnel are trained in handling of fuels/hazardous substances and spill control procedures						
68.	Check for leakage in containers is done at least weekly and immediate repair or replacement is undertaken when necessary						

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Item	EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations	Deadline
		Yes	No	Partial			
69.	Equipment maintenance and fuel storage areas are provided with drainage to an oil-water separator that is regularly skimmed of oil and maintained						
70.	Discharge of oil-contaminated water into the environment is prohibited						
71.	Waste oil, used lubricant and other hazardous wastes are stored in tightly sealed containers with proper labeling						
72.	Removal and treatment or proper disposal of oil contaminated soils is included in work sites restoration						
	<b>Water and Soil Resources Protection</b>						
73.	Temporary canals /irrigation channels are provided to prevent disruption of water supply to farmlands						
74.	Suitable settling/retention ponds are constructed prior to operation of asphaltic concrete batching plants and casting yards						
75.	Settling/retention ponds are properly operated and maintained to ensure effluent quality meets applicable effluent standards						
76.	Bentonite slurry and sludge, mud and other materials and wastes from drilling are collected and processed to avoid pollution of surface water						
77.	Bentonite slurry and sludge, mud and other materials and wastes from drilling are not discharged into watercourses						
78.	Drilling solutions (e.g., bentonite slurry) for bridge construction, abutment construction, piling, etc. are processed in a closed system						
79.	Proper disposal of bentonite-containing spoils as fill material in appropriate sites						
80.	Spilled bentonite mud in agricultural land is cleaned immediately before it cakes and hardens						

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Item	EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations	Deadline
		Yes	No	Partial			
81.	Water from bridge foundation dewatering is not discharged directly into a water body						
82.	Total suspended solids content of discharges into water bodies comply with applicable standards						
83.	Sanitation facilities with sufficient capacity are provided to handle and treat sewage generated by workers						
84.	Equipment service and maintenance yards are provided with impermeable flooring and collection sump						
85.	All equipment maintenance shops are provided with water-tight receptacles for waste oil, oily rags, spent oil filters, solvents and oily containers						
86.	Disposal of all waste oil, oily rags, spent oil filters, solvents and oily containers are through authorized waste handlers and recyclers						
87.	Paving operations are restricted during wet weather						
88.	Sediment control devices are used downstream of paving activities						
89.	Mobile fueling/maintenance units for construction equipment are used whenever feasible						
90.	Berms, ditches, and/or impervious liners, etc. are used in material storage, vehicle/equipment maintenance and fueling areas						
91.	Material storage, maintenance and fueling areas and septic systems are at least 30 m from storm drains and surface waters						
92.	Facilities for solid and domestic liquid waste management are used and maintained						

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Item	EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations	Deadline
		Yes	No	Partial			
	<b>Solid Waste</b>						
93.	Covered garbage bins and temporary storage facilities for construction wastes, domestic solid wastes and segregated wastes are provided within the project site						
94.	Waste segregation (hazardous, non-hazardous, reusable) is practiced						
95.	Regular collection and disposal of wastes is undertaken by contractor or authorized third party to sites approved by local authorities						
96.	Wastes are not dumped into watercourses, agricultural land and surrounding areas						
	<b>Borrow Pits</b>						
97.	Borrow areas are not located in productive land, forested areas and near water courses such as rivers, streams, etc.						
98.	Topsoil is properly removed, stockpiled and preserved for later use during site restoration and provision of vegetation cover to minimize erosion						
99.	Stable side slopes are provided during excavation of the borrow pits						
100.	Quarry sites lying on small rivers and streams are avoided						
101.	Quarry sections located on the river bed are avoided or reduced if unavoidable						
102.	Borrow pits are left in a tidy state with stable side slopes, proper drainage and safety features						
103.	Quarry sites and borrow pits are restored and rehabilitated after use						

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		Yes	No	Partial			
	<b>Traffic Management and Local Access</b>						
104.	Advisory/warning sign boards are installed where the alignment crosses existing roads and where construction related-facilities are located						
105.	Flag persons are employed to regulate traffic especially in potentially hazardous areas						
106.	Traffic advisory signs (to minimize traffic build-up) are posted in coordination with local authorities						
107.	Sufficient lighting are provided at night within and in the vicinity of construction sites						
108.	Traffic conditions are regularly monitored along access roads to ensure that project vehicles are not causing congestion						
109.	Schedules are observed for different types of construction traffic trips (e.g., transport of pre-cast sections, haulage of spoils, delivery of construction materials, etc.)						
110.	Delivery of construction materials and equipment and transport of spoils are during non-peak hours						
	Interactions between construction works, traffic flows and pedestrians are minimized by the following safety measures:						
111.	<ul style="list-style-type: none"> <li>▪ Temporary signals or flag controls</li> <li>▪ Fencing, barricades, traffic cones</li> <li>▪ Signage</li> <li>▪ Adequate lighting</li> </ul>						
112.							
113.							
114.							
115.	Escort vehicles and warning signs/lights are used to increase public awareness of potential hazards						



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		Yes	No	Partial			
116.	Construction activities and schedules are coordinated in advance with local agencies, businesses, community representatives, schools to avoid conflict						
117.	Existing access routes are maintained (whenever feasible)						
118.	Provision of alternative access and/or parking when impacts to principal access routes and parking areas cannot be avoided						
119.	Adequate informational and directional signage to improve alternative access function						
120.	At least one safe through lane is maintained at all times in construction areas						
	<b>Accidental Discovery of Artefacts</b>						
121.	Immediate work stoppage on road section where artifacts/ archaeological finds are unearthed; contractor informs the DDIS and PMU3						
122.	PMU3 notifies the relevant ministry/office to obtain advice regarding the next steps						
123.	Work is resumed only after the relevant ministry/office has provided official notification						
	<b>Occupational Health and Safety</b>						
124.	Orientation is provided for construction workers regarding health and safety measures, emergency response and prevention of HIV/AIDS and other diseases						
125.	Workers at the bridge site are provided with life vests/buoyancy devices at all times						

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Item	EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations	Deadline
		Yes	No	Partial			
126.	Stable footpaths/access with sturdy guardrails to the bridge work sites are provided						
127.	A waterway safety plan, approved by the agencies in charge is implemented						
128.	Contractor complies with the waterway traffic safety during construction						
129.	First aid facilities that are readily accessible to workers are provided						
130.	Fire-fighting equipment is provided at construction camps and work areas, as appropriate						
131.	Adequate drainage in workers' camps						
132.	Adequate and clean housing and sanitation facilities for all workers at the workers'/ construction camps						
133.	Separate sleeping quarters for male and female workers						
134.	Reliable supply of water for drinking, cooking and washing purposes at the workers' camps						
135.	Separate hygienic sanitation facilities/toilets and bathing areas with sufficient water supply for male and female workers						
136.	All wastewater from workers' and construction camps and project-related activities/ facilities are treated consistent with national regulations						
137.	Proper collection and disposal of solid wastes within the workers'/construction camps						
138.	Sturdy fencing on all excavation areas greater than 2 m deep						
139.	Workers are provided with complete personal protective equipment (PPE) such as safety boots, protective clothes, breathing mask, ear protection, helmets, gloves, etc. and use appropriate PPE at work						

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Item	EMP Requirement (Mitigating Measures)	Compliance Status			Remarks/Reasons for Partial or Non-Compliance	Recommendations	Deadline
		Yes	No	Partial			
140.	Reversing signals are installed on all construction vehicles						
141.	Fall prevention and protection measures are implemented whenever a worker is exposed to the hazard of falling more than two meters, falling into operating machinery or through an opening						
	<b>Public Safety</b>						
142.	Signage are installed at the periphery of the construction site to warn and direct traffic and pedestrians						
143.	Security personnel are deployed in hazardous areas to restrict public access						
144.	Speed limits are imposed on construction vehicles along residential and other sensitive areas (typically 25 km per hour)						
145.	Drivers are taught safe driving practices to minimize accidents and prevent spill of hazardous and other construction materials during transport						
146.	Safe access are provided to properties and establishments affected by construction works						
147.	Safe passageways for pedestrians crossing the construction site are provided; schoolchildren are escorted when necessary						
148.	Excavated areas are immediately backfilled, covered (e.g., with metal plates) and/or repaved						
149.	All construction vehicles and equipment are secured during non-working periods to prevent unauthorized access or use						
150.	Appropriate safety barriers and warning signs are installed in areas that pose safety risks such as open excavations, cut slopes, erosion-prone slopes, manufactured slopes, drainages, etc.						

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		Yes	No	Partial			
	<b>Flora and Fauna</b>						
151.	Vegetation removal is coordinated with forest authority						
152.	Tree-cutting permit is secured, as necessary						
153.	Contractor has a tree planting plan that includes:						
154.	▪ Inventory of the number of species of trees proposed for removal						
155.	▪ Identifying and documenting quantity, variety, and location of replacement trees						
156.	▪ Replanting at the outer portions of the ROW and in locations agreed with local authorities						
157.	▪ Monitoring and maintenance program to ensure effectiveness of the plan						
158.	▪ Adopting remedial measures where appropriate (e.g., replacing dead or damaged replanted trees)						
159.	Clearing of trees is limited to areas that are only necessary based on the project design and as approved by the forestry department						
160.	Cutting of trees for firewood and for use in project is prohibited						
161.	New alien plant species are not used for replanting/revegetation without an existing regulatory framework						
162.	Invasive species are not introduced into new environments						
163.	Workers are prohibited from hunting wild animals and collecting forest products						
164.	Bridge works are scheduled in dry season to minimize adverse impacts to aquatic resources						
165.	Contractors do not buy or use wood from illegal sources (illegal logging)						

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		Yes	No	Partial			
166.	No construction camps, asphalt mixing plants, material storage sites and other construction facilities are located in protected areas						
167.	Construction camps, asphalt mixing plants, material storage sites and other construction facilities are located at least 1 km from the boundaries of national parks and class 1A and 1B watershed designated areas						
168.	Precautions are adopted to ensure that damage to vegetation is avoided should fires resulting from execution of the works occur						
169.	Road improvement works are restricted to the existing ROW boundaries						
170.	Grading methods and facilities i.e., rounding, benching, terracing and retaining walls are used to reduce earthwork and related topographic alteration/vegetation removal						
171.	Suitable wildlife crossing structures are installed at locations agreed with the park management boards and National Environmental Board						
172.	Measures to protect fish habitats and aquaculture facilities are in place during construction						
	<b>Blasting (if carried out)</b>						
173.	All the statutory laws, regulation, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives are strictly followed. Blasting is carried out as per Cambodian statutory requirements with						
174.	People living near blasting sites are informed of blasting times prior to the blasting and warning sirens are sounded before blasting.						
175.	Blasting is not undertaken at night.						
176.	Blasting was under careful and strict management of properly trained and licensed personnel. Workers at blasting sites are trained prior to blast operations and provided with safety equipment and earplugs.						

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		Yes	No	Partial			
177.	Proper warning and precautionary measures are observed to ensure safety of residents, pedestrians, motorists and structures during blasting.						
178.	Additional mitigating measures and corrective actions should be implemented to address any unforeseen negative environmental impacts during construction						