Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

NR5-South Section : Contract Package 1

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
Air Quality	Construction site	Visual inspection of mechanical condition and exhaust gas	No major adverse impacts	No standards	Every day before working	At construction camp site	
	Construction site	Visual observation of dust			Every day	site works	
	Storage facilities for dust generation		No major adverse impacts			Every day, especially in dry season	
	AQS-1 (January 14th, 2022) KP: 39+200 Odongk District Hospital, Kompong Speu Province.	**PM_{10}**	AQS1 = 0.031mg/m^3	0.05 mg/m^3 (WHO, average 24h)	2 times in dry season 2 times in wet season	We use mobile device to check for daily and weekly monitoring. The result was showing that the value of NO2, SO2, PM2.5 and PM10 were bellowed the Cambodian Standard as well as IFC Standard. Therefore, it means that air quality within those section was not polluted with particle matter due to the human activities were reduced, even though, the contractor has to pay more attention above matter by providing more watering in regularly, especially during the day time.	Contractor will provide more watering regularly, especially during the day time. Surface Treatment (Prime coat and/or Calcium Chloride) The drivers of construction vehicles will comply with speed limits to minimize road dust and keeping driving speed of construction machines less than 60km/h The contractor will prepare and strictly implement plan around construction sites.
		$PM_{2.5}$	AQS1 = 0.019mg/m^3	0.025 mg/m^3 (WHO, average 24h)			
		SO_2	AQS1 = 0.021mg/m^3	0.30 mg/m^3 (WHO average 24h)			
		NO_2	AQS1 = 0.013mg/m^3	0.10 mg/m^3 (WHO average 24h)			
Water Quality	WS-1 KP:32+000 at LHS, Pond, 200m from ROW (water sampling point will be replaced due to far from the road WS-2 KP: 32+300 at RHS, in Tonle Sap river, in front of Prek Prang Pagoda	Visual observation/inspection	No major adverse impacts	No standards	Every day	Contractor and inspector	
		pH	**The water quality was not conducted from January-March, 2022**	6.5-8.5 (MoE)	1 time in dry season 1 time in wet season		
		TSS		25-100 mg/l (MoE)			
		BOD		1-10 mg/l (MoE)			
		COD		1-8 mg/l (MoE)			
		Total Coliform		<5,000 (Japanese Standard)			

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

NR5-South Section : Contract Package 1

Item	Location	Parameter/Means of Monitoring		Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
	WS-3 KP: 36+900 at RHS, downstream, border of Kandal and Kompong Chhnang WS-4 KP: 40+900 at RHS, downstream near factory							
Noise	ANV-1 KP:39+200 Odongk District, Kompong Speu Province (Odongk district hospital)	Noise Level (MoE Laboratory)		**The Noise and Vibration Survey were not conducted from January-March, 2022**	- 60 dB(A) (06:00-18:00) - 50dB(A) (18;00-22:00) - 45dB(A) (22:00-06:00) (MoE, residential area)	1 time in dry season 1 time in wet season		
Vibration		Vibration Level (MoE Laboratory)			- 65 dB (7:00-20:00) - 60 dB (20:00-7:00) (MoE)			
Waste Generation	Waste storage at construction site	Slurry and other construction waste	Discharged amount	2000kg/month	No standards	Every day	Septic tank	
			Recycled amount	2000kg /month				
			The way of recycle	Backfill/Sold to scavenger				
			Treated amount					
			Local of final disposal	Disposal area				
		General waste	Discharged amount	158kg/month				
			Recycled amount	0kg/month				
			The way of recycle	Sold to scavenger				
			Treated amount					
			Local of final disposal	Disposal area			Land-fill of provincial authority	
Subsidence	Subsidence prone locations along the project road	Visual inspection and interview to the local people		No impact at construction site	No standards	1 time/week to 1 time/month	Minor affects to prone locations along the project road.	

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

NR5-South Section : Contract Package 1

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
					(depending on situation)		
Hydrology	River, stream, and reservoir where construction works are executed	Visual inspection on volume and speed of water flow	No impacts at construction site		Every day	In the main rivers and canals are crossing NR-5, sometime, was raining.	
Ecosystem	EC-1 KP 35 and KP 37+200 Odongk bypass as requested by JICA and Client	Interview the local people and Visual observation of animals, reptiles, and amphibious	**The Ecosystem Survey was not conducted from January-March, 2022.**	No standards	One time in dry season and one time in rainy season		

Remarks: Past trend and current statute including remedial measures, if necessary.

Note:

WHO: World Health Organization, SO_2: Sulfur Dioxide, COD: Chemical Oxygen Demand
MoE: Ministry of Environment, PM: Particulate Matters, TSS: Total Suspended Solid
NO_2: Nitrogen Dioxide, BOD: Biochemical Oxygen Demand

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

NR5-South Section : Contract Package 1

Table 1: Schedule of Seasonal Monitoring (☐ target monitoring during January-March, 2022)

Year	2018	2019				2020				2021				2022			
	Nov	Jan	April	July	Oct	Jan	April	July	Oct	Jan	April	July	Oct	Jan	April	July	Oct
Item	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy
1. Air Quality	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
	21st	18th	18th	12th	5th	4th of Feb	11th	21st	21st	9th	6th	9th	01st	14th			
2. Water Quality	●		●		●		●		●		●		●		●		
	23rd		8th		5th		6th		21st		29th		20th				
3. Noise	●		●		●		●		●		●		●		●		
	22nd		8th		5th		11th		21st		6th		01st				
4. Vibration	●		●		●		●		●		●		●		●		
	23rd		8th		5th		11th		21st		6th		01st				
8. Ecosystem		●	●		●		●		●		●		●		●		
		29th	8th		9th				25th		25th		25th				

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

NR5-South Section : Contract Package 1

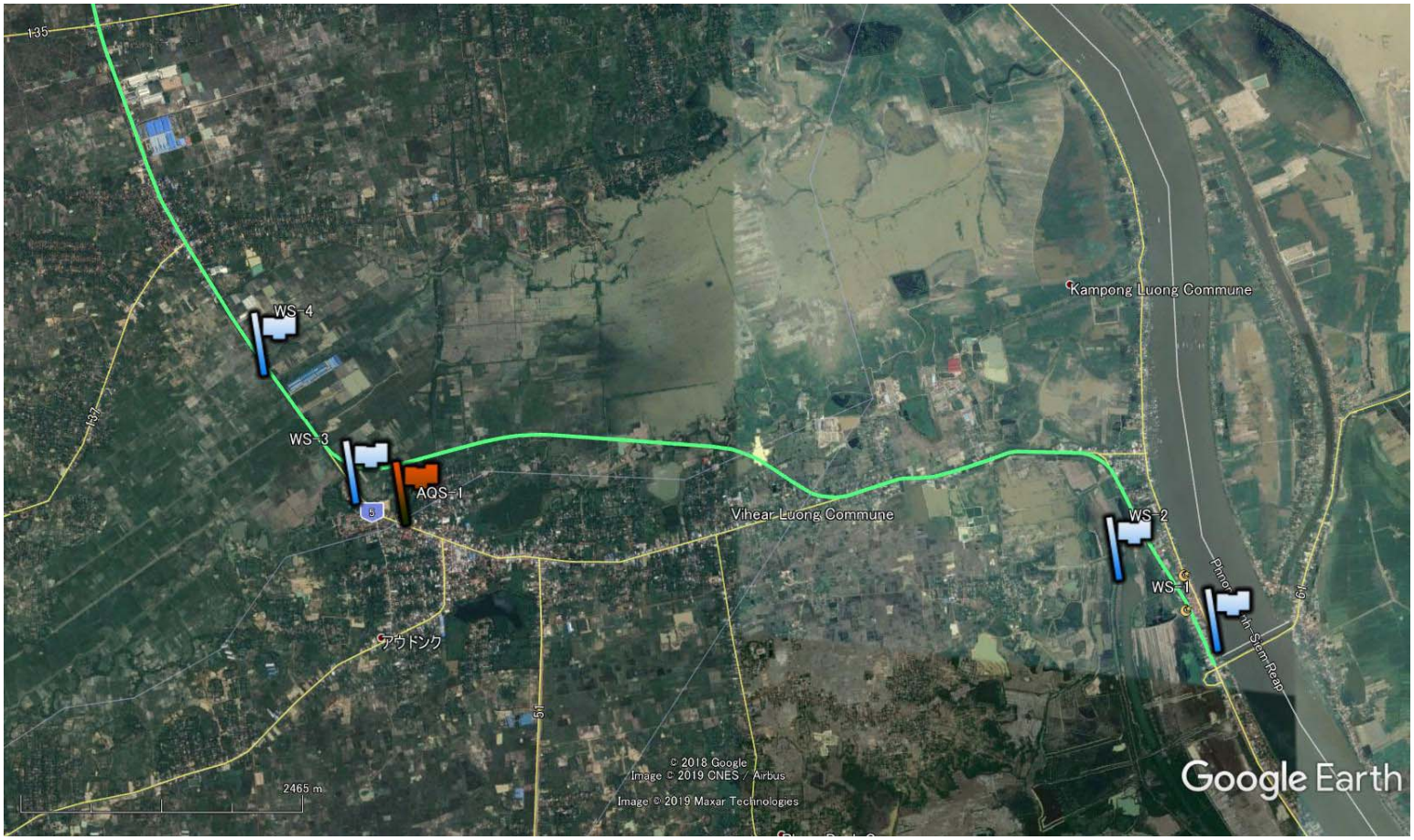

Figure 1: Seasonal Monitoring Points for CP1 (Sta 31+370 – 73+000)

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

South Section : Contract Package 2

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
Air Quality	Construction site	Visual inspection of mechanical condition and exhaust gas	No major adverse impacts	No standards	Every day before working	At construction campsites	
	Storage facilities for dust generation	Visual observation of dust	No major adverse impacts		Every day	site works	
						Every day, especially in dry season	
	AQS-2 (January 15th, 2022) KP: 89+250 At RHS in Department of Social Veteran and Youth Rehabilitation of Krong Kompong Chhnang, Kompong Chhnang Province. AQS-3 (January 15th, 2022) KP: 97+300 At LHS, rice field area more than 100m from ROW, in Trapaeng Por Village, Pong Ru commune, Rolea B'ear district, Komponng Chhnang province.	PM10	AQS-2=0.030 AQS-3=0.025	0.05 mg/m^3 (WHO, average 24h)	2 times in dry season 2 times in wet season	We use mobile device for daily and weekly monitoring. Compared to the previous study, we observed that the amount of all parameters was decreasing, and NO2 was not detected in this monitoring. It might be owing to the decreasing of traffic activities along NR.5 as result of COVID-19 pandemic. It was also owing to well performance of SMCC in air pollution control especially dust control through frequent water spraying on the access road, road repairing, surface road treatment with prime, and proper covering the loading trucks before allowing to run on NR-5.	Contractor will provide more watering regularly, especially during the day time. Surface Treatment (Prime coat and/or Calcium Chloride) was applied. The drivers of construction vehicles will comply with speed limits to minimize road dust and keeping driving speed of construction machines less than 60km/h The contractor will prepare and strictly implement plan around construction sites.
		PM2.5	AQS-2= 0.017 AQS-3=0.014	0.025 mg/m^3 (WHO, average 24h)			
		SO_2	AQS-2=0.017 AQS-3=0.017	0.30 mg/m^3 (WHO average 24h)			
		NO_2	AQS-2= 0.014 AQS-3= ND	0.10 mg/m^3 (WHO average 24h)			
Water Quality	WS-5 KP:82+500 at RHS, Chrey Bak river downstream, near Phnom Chompus Pagoda Andoung Svay commune, Rolea Bíer district, Kompong chhnang province.	Visual observation/inspection	No major adverse impacts	No standards	Every day	Contractor and inspector	
		pH	**The Water Quality was not conducted from January-March, 2022**	6.5-8.5 (MoE)	1 time in dry season 1 time in wet season		
		TSS		25-100 mg/l (MoE)			
		BOD		1-10 mg/l (MoE)			
		COD		1-8 mg/l (MoE)			
		Total Coliform		<5,000 (Japanese Standard)			

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)
South Section : Contract Package 2

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
	WS-6 KP: 91+700 at LHS of bypass, Srah Por lake, Thmar Keo village, Svay Chrum commune, Rolea B'ier district, Kompong Chhnang province. WS-7 KP: 106+350 at RHS, downstream Srah Angkam lake, Thmar Keo village, Svay Chrum commune, Rolea B'ier district, Kompong chhnang province. WS-8 KP: 117+118 at RHS, downstream Boribo river, Phsar village, Phsar commune, Boribo district, Kompong Chhnang province.						
Noise	ANV-2 PK 89+250 at RHS in Department of Social Veteran and Youth Rehabilitation of Krong Kampong Chhnang, Kampong Chhnang province ANV-3 PK 97+300 at LHS, residential area in Trapeang Por village, Pong Ro commune, Rolea B'ier	**Noise Level (MoE Laboratory)**	**The Noise and Vibration were not conducted from January-March, 2022**	- 60 dB(A) (06:00-18:00) - 50dB(A) (18;00-22:00) - 45dB(A) (22:00-06:00) (MoE, residential area)	1 time in dry season 1 time in wet season		

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

South Section : Contract Package 2

Item	Location	Parameter/Means of Monitoring		Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
Vibration	district, Kampong Chhnang province	Vibration Level (MoE Laboratory)			- 65dB (07:00-20:00) - 60dB (20:00-07:00)			
Waste Generation	Waste storage at construction site and campsites in September, 2021	Slurry and other construction waste	Discharged amount	370kg/month	No standards	Every day	Septic tank	
			Recycled amount	370kg/month				
			The way of recycle	Stored in the yard				
			Treated amount					
			Local of final disposal	Local Dumpsite				
		General waste	Discharged amount	655kg/month				
			Recycled amount	52kg/month				
			The way of recycle	Sold to scavenger				
			Treated amount					
			Local of final disposal	Local dumpsite			Land-fill of provincial authority	
Subsidence	Subsidence prone locations along the project road	Visual inspection and interview to the local people		No impact at construction site	No standards	1 time/week to 1 time/month (depending on situation)	Minor affects to prone locations along the project road.	
Hydrology	River, stream, and reservoir where construction works are executed	Visual inspection on volume and speed of water flow		No impacts at construction site		Every day	In The main rivers and canals are crossing NR-5, sometime, was raining.	
Ecosystem	EC-02, EC-03, EC-04, EC-05 and EC-06	Interview the local people and visual observation of animals, reptiles and amphibious.		**The ecosystem survey was not conducted from January-March, 2022**	No standards	One time in dry season and one time in rainy season		

Remarks: Past trend and current statute including remedial measures, if necessary.

Note:

WHO: World Health Organization,
MoE: Ministry of Environment,
NO_2: Nitrogen Dioxide,
SO_2: Sulfur Dioxide,
PM: Particulate Matters,
BOD: Biochemical Oxygen Demand,
COD: Chemical Oxygen Demand
TSS: Total Suspended Solid
LC: Least Concern,
VU: Vulnerable,
EN: Endangered,
NT : Near Threatened

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

South Section : Contract Package 2

Table 1: Schedule of Seasonal Monitoring (☐ target monitoring during January-March, 2022)

Year	2018	2019				2020					2021				2022			
	Nov	Jan	Apr	Jul	Oct	Feb	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
Item	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy
1. Air Quality	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
	21st	28th	7th	10th	4th	8th	8th	22nd	22nd	8th	5th	7th	2nd	15th			
2. Water Quality	●		●		●		●		●		●		●		●		●
	31st		5th		10th		1st		8th		29th		12th				
3. Noise	●		●		●		●		●		●		●		●		●
	22nd		7th		4th		8th		22nd		5th		2nd				
4. Vibration	●		●		●		●		●		●		●		●		●
	22nd		7th		4th		8th		22nd		5th		2nd				
8. Ecosystem		●	●		●		●		●		●		●		●		●
		26th	23rd		16th		8th		23rd		1st		22nd				

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

South Section : Contract Package 2

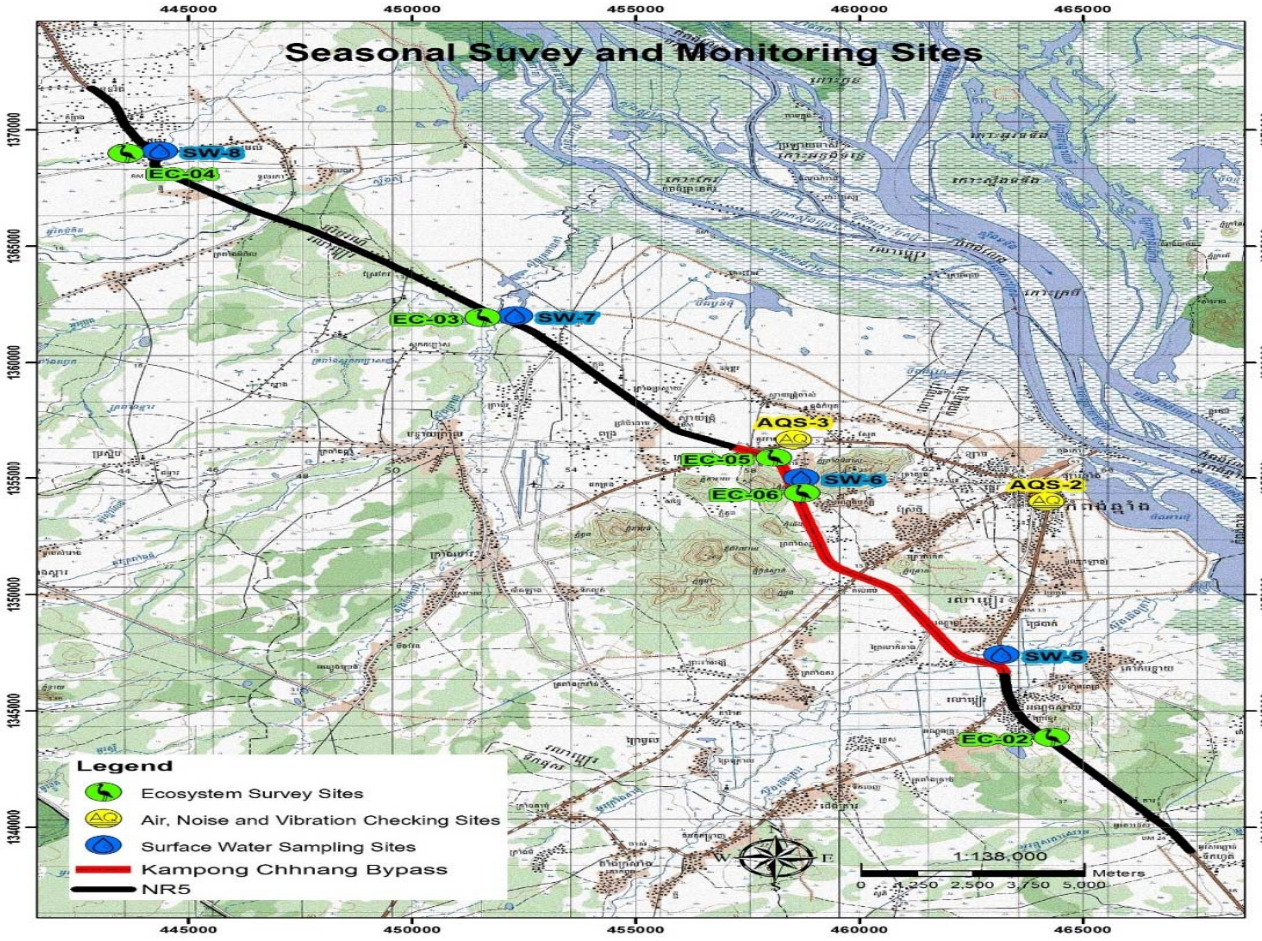

Figure 1: Seasonal Monitoring Points for CP2 (Sta 73+000 – Sta 120+000)

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)
South Section : Contract Package 3

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
Air Quality	Construction site	Visual inspection of mechanical condition and exhaust gas	No major adverse impacts	No standards	Every day before working	At construction camp site	
	Construction site	Visual observation of dust			Every day	site works	
	Storage facilities for dust generation		No major adverse impacts			Every day, especially in dry season	
	AQS-4 (January 20th, 2022) PK-135+600 Kbal Damrei village, Ansa Chambork commune, Krakor district, Pursat province AQS-5 (January 20th, 2022) PK-170+340 Kcandol Sar Village, Beung Kantout commune, Krakor district, Pursat province	**PM10**	AQS-4 = **0.176**mg/m^3 AQS-5 = **0.093**mg/m^3	0.05 mg/m^3 (WHO, average 24h)	2 times in dry season 2 times in wet season	We use mobile device for daily and weekly monitoring. The result was shown that PM10 and PM2.5 were exceeded the standard of Cambodian Standard and IFC Standard. This problem is due to the sampling location near the road with the opening traffic side road during the sub-base surface without prime coat/surface treatment to control dust, only spraying water in day time, not proper and impact local in the night time.	With regard to reduction of dust, the Consultant strongly request to the Contractor to provide more watering regularly, especially during the day time or using "Surface Treatment" (Prime coat) . Additionally, based on the Consultant's instructions, the drivers of construction vehicles will comply with speed limits to minimize road dust and keeping driving speed of construction machines less than 60km/h
		PM2.5	AQS-4 = **0.075**mg/m^3 AQS-5 = **0.054**mg/m^3	0.025 mg/m^3 (WHO, average 24h)			
		SO_2	AQS-4 = 0.047mg/m^3 AQS-5 = 0.039mg/m^3	0.30 mg/m^3 (WHO average 24h)			
		NO_2	AQS-4 = 0.039mg/m^3 AQS-5 = 0.031mg/m^3	0.10 mg/m^3 (WHO average 24h)			
Water Quality	WS-9 PK-170+700 Ou Chankok river, Tnot Chum commune, Krokor district, Pursat province	Visual observation/inspection	No major adverse impacts	No standards	Every day	Contractor and inspector	
		pH	**The Water Quality was not conducted from January-March, 2022**.	6.5-8.5 (MoE)	1 time in dry season 1 time in wet season		
		TSS		25-100 mg/l (MoE)			
		BOD		1-10 mg/l (MoE)			
		COD		1-8 mg/l (MoE)			
		Total Coliform		<5,000 (Japanese Standard)			
Noise	ANV-4 PK-134+600, Kbal Damrei village, Ansar Chambork commune, Krakor district, Pursat province.	Noise Level (MoE Laboratory)	**The Noise and Vibration were not conducted**	- 60 dB (06:00-18:00) - 50dB (18;00-22:00) - 45dB (22:00-06:00) (MoE, residential area)	1 time in dry season 1 time in wet season		

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)
South Section : Contract Package 3

Item	Location	Parameter/Means of Monitoring		Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
Vibration	ANV-5 PK-170+340, Kandol Sar village, Beung Kantuot commune, Krakor district, Pursat province.	Vibration Level (MoE Laboratory)			- 65 dB (06:00-18:00) - 60 dB (18:00-06:00) (MoE)			
Waste Generation	Waste storage at construction site and campsites in September, 2021	Slurry and other construction waste	Discharged amount	0.5m^3/month	No standards	Every day	Septic tank	
			Recycled amount	0.5m^3/month				
			The way of recycle	Backfill at courtyard				
			Treated amount					
			Local of final disposal	Dumpsite				
		General waste	Discharged amount	100.6kg/month				
			Recycled amount	3kg/month				
			The way of recycle	Provide to scavenger				
			Treated amount					
			Local of final disposal	Local dumpsite				
Subsidence	Subsidence prone locations along the project road	Visual inspection and interview to the local people		No impact at construction site	No standards	1 time/week to 1 time/month (depending on situation)	Minor affects to prone locations along the project road.	
Hydrology	River, stream, and reservoir where construction works are executed	Visual inspection on volume and speed of water flow		No impacts at construction site		Every day	In The main rivers and canals are crossing NR-5, sometime, was raining.	
Ecosystem	EC-1 KP 170+700	Interview the local people and Visual observation of animals, reptiles, and amphibious		**The Ecosystem was not surveyed from January-March, 2022**	No standards	One time in dry season and one time in rainy season		

Remarks: Past trend and current statute including remedial measures, if necessary.

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

South Section : Contract Package 3

Note:

WHO:	World Health Organization,	SO_2:	Sulfur Dioxide,	COD:	Chemical Oxygen Demand
MoE:	Ministry of Environment,	PM:	Particulate Matters,	TSS:	Total Suspended Solid
NO_2:	Nitrogen Dioxide,	BOD:	Biochemical Oxygen Demand,	LC:	Least Concern
VU:	Vulnerable,	EN:	Endangered,	NT :	Near Threatened

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

South Section : Contract Package 3

Table 1: Schedule of Seasonal Monitoring (☐ target monitoring during January-March, 2022)

Year	2018	2019				2020				2021				2022			
	Nov	Feb	Apr	July	Oct	Jan	April	July	Oct	Jan	April	July	Oct	Jan	April	July	Oct
Item	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy
1. Air	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
	27th Dec	21st	11th May	22nd	23rd	16th	18th	4th	14th Nov	10th	10th	8th	12th	20th			
2. Water	●		●		●		●		●		●		●		●		
	27th Dec		11th May		10th		17th		13th Nov		8th		12th				
3. Noise	●		●		●		●		●		●		●		●		
	27th Dec		11th May		23rd		18th		14th Nov		10th		12th				
4. Vibration	●		●		●		●		●		●		●		●		
	27th Dec		11th May		23rd		18th		14th Nov		10th		12th				
8. Ecosystem		●	●		●		●		●		●		●		●		
		22nd	24th		22nd		15th		13th Nov		8th		12th				

Environmental Monitoring Form for Construction Stage (the 1st Quarterly / January-March, 2022)

South Section : Contract Package 3

Figure 1: Seasonal Monitoring Points for CP3 (Sta 120+000 – 171+200)