Environmental Monitoring Form for Construction Stage
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 (July 21st, 2020) KP: 39+200 Okdong District Hospital, Kompong Speu Province.	**PM10**	AQS1 = 0.073mg/m^3	0.05 mg/m^3 (WHO, average 24h)	2 times in dry season 2 times in wet season	We will use mobile device to check for daily and weekly monitoring. The value of NO2, SO2, were not exceeded the Cambodian standard, but for PM2.5 and PM10 are seem to be a little exceeded Cambodian standard, because there are (at Odongk District Hospital) is nearby the urban area as well as Market area and the traffic is also congested. Therefore, it means that the air quality within those section was started polluted particle matter due to the human activities, so 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. The contractor will prepare and strictly implement plan around construction sites. The drivers of construction vehicles will comply with speed limits to minimize road dust.
		PM2.5	AQS1 = 0.038mg/m^3	0.025 mg/m^3 (WHO, average 24h)			
		SO_2	AQS1 = 0.032mg/m^3	0.30 mg/m^3 (WHO average 24h)			
		NO_2	AQS1 = 0.035mg/m^3	0.10 mg/m^3 (WHO average 24h)			

Environmental Monitoring Form for Construction Stage
Contract Package 1

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
Water Quality	WS-1 (06th of April 2020) KP:32+000 at LHS, Pond, 200m from ROW (water sampling point will be replaced due to far from the road WS-2 (06th of April 2020) KP: 32+300 at RHS, in Tonle Sap river, in front of Prek Prang Pagoda WS-3 (06th of April 2020) KP: 36+900 at RHS, downstream, border of Kandal and Kompong Chhnang WS-4 (06th of April 2020) KP: 40+900 at RHS, downstream near factory	Visual observation/inspection	No major adverse impacts	No standards	Every day	Contractor and inspector	
		pH	WS-1=7.68 WS-2=7.38 WS-3=7.52 WS-4=7.91	6.5-8.5 (MoE)	1 time in dry season 1 time in wet season	We will use mobile device to check for daily and weekly monitoring. Seasonal monitoring shall be done at the same point on EIA. Comparing this result with the Cambodian Standard, there are showing that the value of pH and BOD are below the standard, however, the value of COD for WS2 and WS3 are exceeded the standard, and value of TSS is higher the standard for WS1 and WS4. The value of Total-coliform are very higher than standard for WS1 and WS2.	Contractor will try to reduce any possible impacts from the construction sites such as improve the management of solid waste, oil waste, application of slope protection to reduce run off of the dirt with the rain water, etc.
		TSS	WS-1=152 WS-2=37 WS-3=42 WS-4=320	25-100 mg/l (MoE)			
		BOD	WS-1=2.40 WS-2=3.88 WS-3=5.26 WS-4=3.60	1-10 mg/l (MoE)			
		COD	WS-1=7.44 WS-2=10.19 WS-3=12.23 WS-4=9.80	1-8 mg/l (MoE)			
		Total Coliform	WS-1= 1.1×10^5 WS-2= 4.3×10^3 WS-3= 1.1×10^4 WS-4= 4.3×10^3	<5,000 (Japanese Standard)			
Noise	ANV-1 (April 11st, 2020) KP:39+200 Odong District, Kompong Speu Province (Odong district hospital)	Noise Level (MoE Laboratory)	ANV-1= -62dB (6:00-18:00) -59dB (18:00-22:00) -59dB (22:00-06:00)	- 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	Visual check and maintain the construction equipment. The value of noise was a little exceeded the Cambodian Standard and IFC Standard, because this area is nearby the urban area as well as market and the traffic also is congested.	Continue to do the NR5 maintenance and put on the traffic sign on the NR5 to lower the driving speed to reduce the noise during at night. Contractor select quiet equipment and working method as much as possible.
Vibration		Vibration Level (MoE Laboratory)	ANV-1 -21Hz (7:00-20:00) -20Hz (20:00-7-00)	- 65Hz (7:00-20:00) - 60Hz (20:00-7:00) (MoE)			

Environmental Monitoring Form for Construction Stage
Contract Package 1

Item	Location	Parameter/Means of Monitoring		Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
Waste Generation	Waste storage at construction site	Slurry and other construction waste	Discharged amount	The result was shown in table of waste data	No standards	Every day	Septic tank	
			Recycled amount					
			The way of recycle					
			Treated amount					
			Local of final disposal					
		General waste	Discharged amount	The result was shown in table of waste data				
			Recycled amount					
			The way of recycle					
			Treated amount					
			Local of final disposal				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 canels are crossing NR-5, sometime, was raining.	
Ecosystem	EC-1 KP 35 and KP 37+200 (April, 2020) Odong bypass as requested by JICA and Client	Visual observation of animals, reptiles, and amphibious		Mammal = 2 Amphibian =5 Reptile = 4 Birds = 21 Fishes = 20 Flora = 2 Insect = 4	No standards	One time in dry season and one time in rainy season	Visual survey shall be done near permanent river. Based on above team inspection and interviewing with local	Contractor shall use methods to mitigate the impacts of Ecosystem and educate the Engineers and

Environmental Monitoring Form for Construction Stage

Contract Package 1

						villager as well as farmers, there are existing some species are vulnerable some least concern which mentioned within IUCN list, and some other species are non within the IUCN list.	workers not to catch wild flura and fauna species around construction sites.

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

1. Schedule of Seasonal Monitoring

The seasonal periodical monitoring for air quality was done on 21st of July 2020, noise and vibration were done on 11st of April 2020, water quality sampling was conducted on 06th of April 2020 and ecosystem survey was conducted in April 2020 as the Attachment schedule table below:

Table 1.1 Monitoring Items and Frequency

Year	2018	2019				2020				2021				2022			
	29th 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	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
2. Water Quality	●		●		●		●		●		●		●		●		●
3. Noise	●		●		●		●		●		●		●		●		●
4. Vibration	●		●		●		●		●		●		●		●		●
8. Ecosystem		●	●		●		●		●		●		●		●		●

2. Seasonal Monitoring Points and Areas

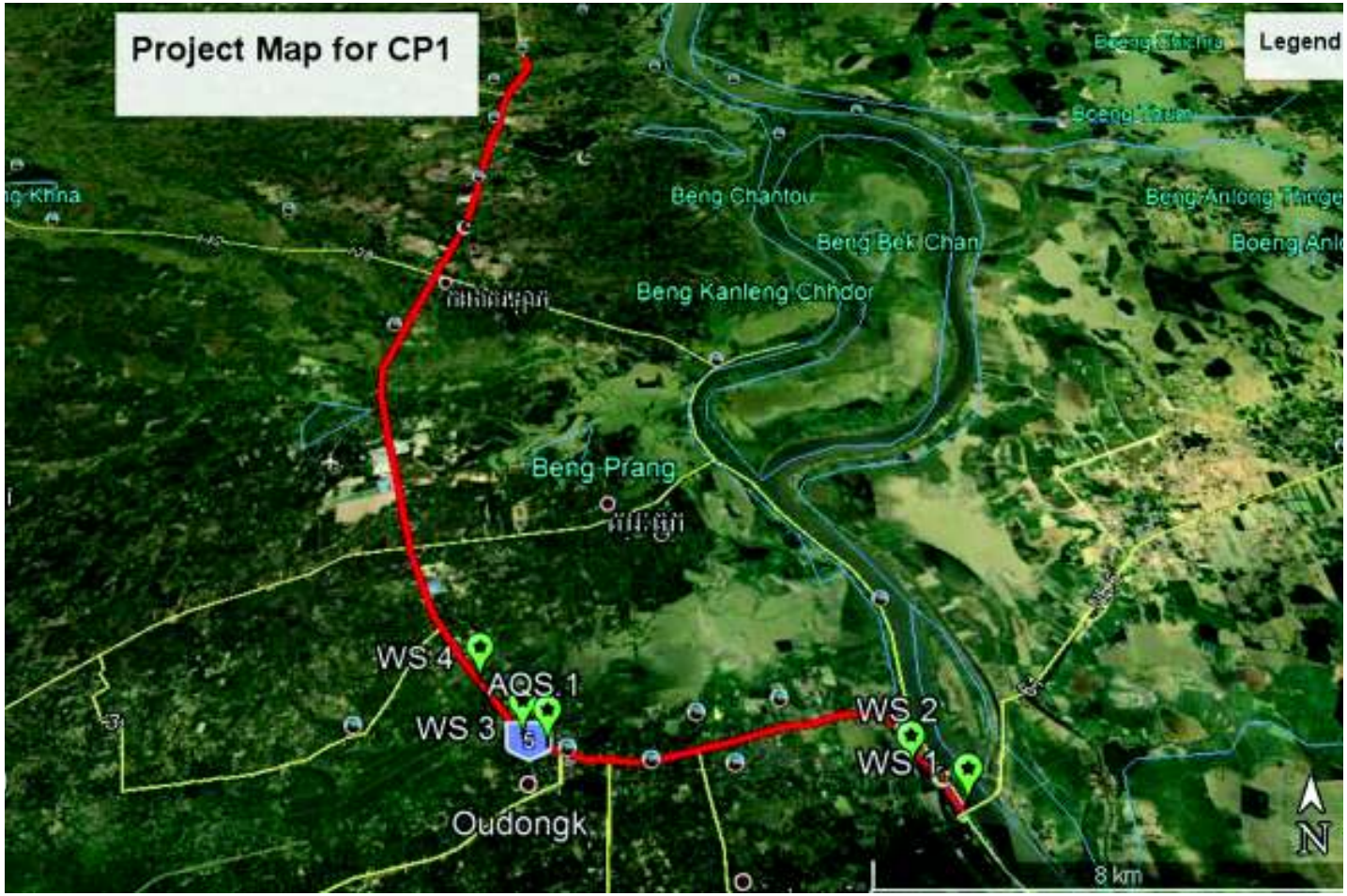
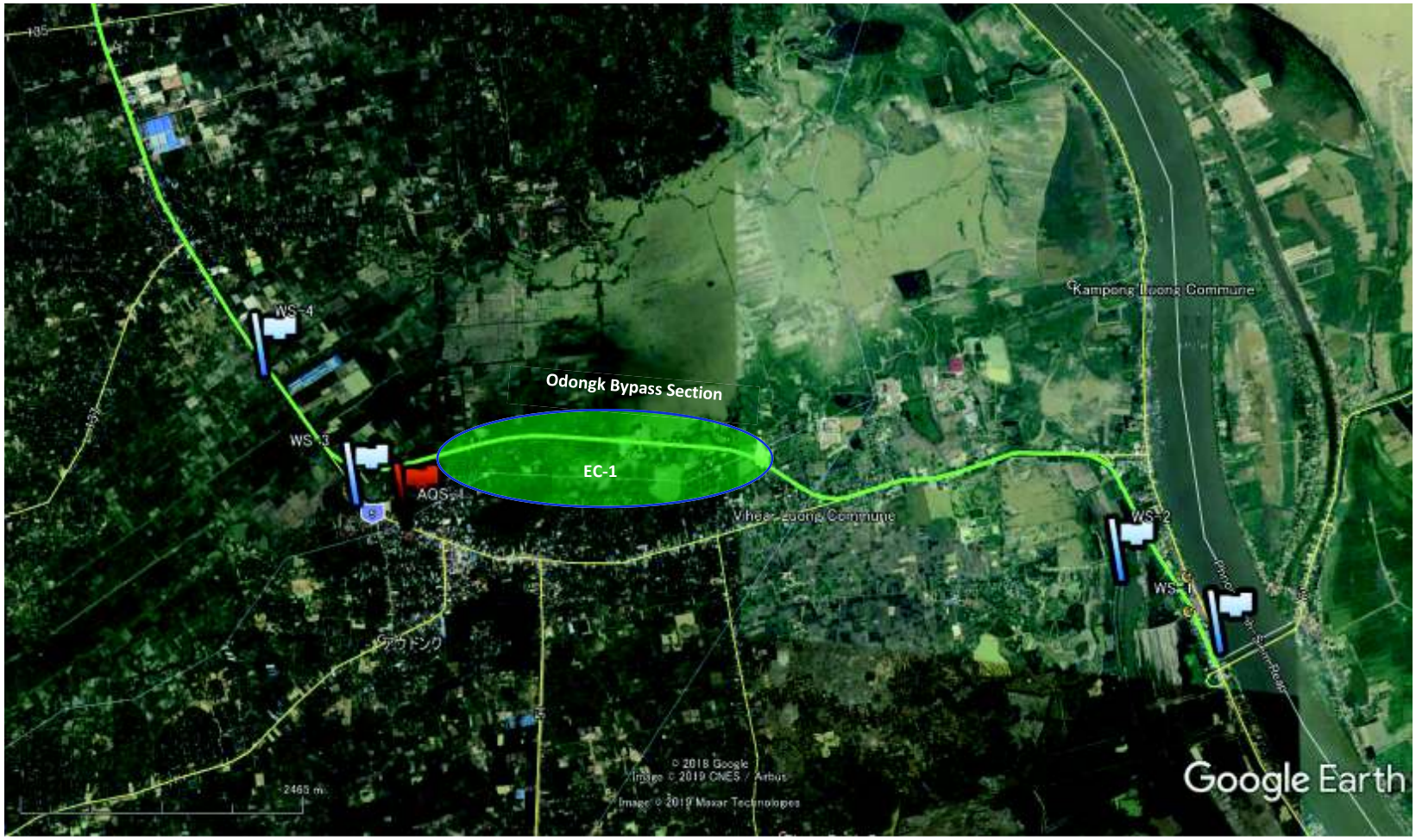


Figure-1: Designed Monitoring Points for Package 1 Section (Sta 31+370 - Sta 73+000)

3. Ecosystem Map and Area for CP1 (Odong Bypass)



4. The Solid Waste Generation in September, 2020

Total Solid Waste Generation in September 2020											
No.	Location Name	Location P.K.	General Waste				Construction waste				
			General Amount Kg/month	Recycled Amount (kg/month)	Recycle meant	Dispose meant	General Amount Kg/month	Recycled Amount (kg/month)	Recycled Amount (m3/month)	Recycle meant	Dispose meant
1	SMCC C.P.01 Office	PK49+800 RHS	32kg	0	Sold to scavenger	Dispose to dump site	0	0		N/A	N/A
2	EWT Office	PK51+000 RHS	15kg	0	Sold to scavenger	Dispose to dump site	0	0		N/A	N/A
3	J.P. Office	PK39+000 LHS	12kg	0	Sold to scavenger	Dispose to dump site	0	0		N/A	N/A
4	SMCC Precast Concrete Yard	PK78+100 RHS	34kg	0	Sold to scavenger	Dispose to dump site	165kg	165kg	0.069 m3	Backfill/Sold to scavenger	Dispose to disposal areas
5	SMCC Concrete Stone Yard	PK72+100 RHS	28kg	0	Sold to scavenger	Dispose to dump site	0	0		N/A	N/A
6	SMCC Staff Accommodations	PK51+000 RHS	65kg	0	Sold to scavenger	Dispose to dump site	0	0		N/A	N/A
7	SMCC Management Accommodations	PK35+550 LHS	34kg	0	Sold to scavenger	Dispose to dump site	0	0		N/A	N/A
8	Bridge 11	PK46+220 MID	10kg	0	Sold to scavenger	Dispose to dump site	10kg	10kg	0.004m3	Backfill/Sold to scavenger	Dispose to disposal areas
9	Bridge 13	PK49+000 MID	23kg	0	Sold to scavenger	Dispose to dump site	11kg	11kg	0.004m3	Backfill/Sold to scavenger	Dispose to disposal areas
10	Construction Site	PK70+355 RHS (RCBC)	20kg	0	Sold to scavenger	Dispose to dump site	90kg	80kg	0.033m3	Backfill/Sold to scavenger	Dispose to disposal areas
11	Construction Site	PK43+424 RHS (RCBC)	13kg	0	Sold to scavenger	Dispose to dump site	185kg	185kg	0.075m3	Backfill/Sold to scavenger	Dispose to disposal areas

12	Construction Site	PK62+733 LHS (RCBC)	12kg	0	Sold to scavenger	Dispose to dump site	100kg	90kg	0.037m3	Backfill/Sold to scavenger	Dispose to disposal areas
13	Construction Site	PK36+100 to 220RHS/ LHS (G.Riprap)	16kg	0	Sold to scavenger	Dispose to dump site	25kg	25kg	0.010m3	Backfill/Sold to scavenger	Dispose to disposal areas
14	Construction Site	PK37+380 to 480RHS/ LHS (G.Riprap)	14kg	0	Sold to scavenger	Dispose to dump site	32kg	20kg	0.010m3	Backfill/Sold to scavenger	Dispose to disposal areas
15	Construction Site	PK66+124 LHS (RCPC)	12kg	0	Sold to scavenger	Dispose to dump site	120kg	120kg	0.052m3	Backfill/Sold to scavenger	Dispose to disposal areas
16	Construction Site	PK52+952 RHS (RCPC)	17kg	0	Sold to scavenger	Dispose to dump site	135kg	80kg	0.035m3	Backfill/Sold to scavenger	Dispose to disposal areas
Total General Waste			**357kg**	**0**	**Total Construction Waste**		**873kg**	**786kg**	**0.203m3**		

5. Fauna and flora survey at EC-01

Category-1	Category -2	Family	Local Name	English name	Scientific name	IUCN Status
a) Mammal	None	None				
			Kambrok por	Northern Treeshrew	Callosciurus Erythraeus	N/A
			Sam pouch Vor	Variable squirrel	Viverricula indica	LC
b) Amphibian	None	None				
			Kingkuok	Common Asian Toad	Bufo Melanosttrictus	N/A
			Hing	Common Asian Bullfrog	Kaloula Pulchra	LC
			Kangkeb	Paddy Frog	Fejevarya limnocharis	N/A
			Kanhkebkob	Regulose Bullfrog	Hoblobatrachus Rugulosus	N/A

Category-1	Category -2	Family	Local Name	English name	Scientific name	IUCN Status
			Kanhchanhchek	Common tree frog	Polypedates leucomystax	LC
c) Reptile	None	None				
			Pous Vek Dom Bouk	Indochinese Spitting Cabra	Naja Siamensis	VU
			Pous Vek Krobei	Monocled Cobra	Naja Kaouthia	LC
			Pous thlan touch	Burmese Python	Pyfthon Molurus Bivittaftus	N/A
			Pous thlan thom	Reticulate python	Pyfthon Reticulatus	N/A
d) Birds	None	None				
			Popustoek	Little Grebe	Tachybaptus Ruficollis	LC
			Populchampusthum	Thick-Billed Green pigeon	Treron Curvirostra	LC
			Populchoeung	Yellow-Footed Green Pigeon	Treron Phoenicoptera	N/A
			Chochatkrem	Common kingfisher	Alcedo atthis	LC
			Porltouk thngaskhmao	Blue-Eared Barbet	Megalaima Australis	LC
			Porltouk Kbal	Lineated Barbet	Megalaima Lineata	LC
			Porltouk Ambuk	Coppersmith Barbet	Megalaima Haemacephala	LC
			Chek tum	Black-Naped Oriole	Oriolus chinensis	LC
			Sek Sourm	Alexandrine Parakeet	Psittacula Eupatria	LC
			Sek sork	Red-Breasted Parakeet	Loriculus vemalis	N/A
			Kvaek	Black-Crowned Night Heron	Nycticorax Nycticorax	LC
			Ngeav kork	Stork-Billed kingfisher	Halcyon Capensis	N/A
			Antep toing	Greater Racket- Tailed Drongo	Dicrurus Paradiseus	LC
			Kok krourng	Intermediate Egret	Egretta Intermedia	N/A
			Kok Kmao Thleurm Andeurk	Black Bittem	Bupetor Flavicollis	N/A
			La out thom	Greater Coucal	Centropus sinensis	LC
			Preab Srok	Rock Pigeon	Columba Livia	LC
			Pror Voek	Lesser Whistling Duck	Dedrocygna Javanica	N/A
			Tror Ses Knorng Plerng Toch	Common Flamedback	Dinopium Javanense	LC
			Tavao	Common koel	Eudynamys Scolopacea	N/A
			Teav Kiev	Indian Roller	Coracias Benghalensis	LC
				Yellow Breasted Bunting	Emberiza Aureola	N/A
				Green Bushlark	Mirafra Marionae	N/A
				Yellow Bushlark	Mirafra Marionae	N/A

Category-1	Category -2	Family	Local Name	English name	Scientific name	IUCN Status
e) Fishes	None	None				
			Trey andaeng roeng	Walking catfish	Clariasbatrachus	LC
			Trey andaengtun	Black skin catfish	Clariasmelladerma	N/A
			Trey Bra kae		Pangasiusconchophilus	LC
			Trey Bra kchao		Pangasiusbocourti	LC
			Trey Bra thom	Sutchi catfish	Pangasianodonhypophthalmus	N/A
			Trey chhkaok		Cyclocheichthys Enoplos	N/A
			Trey chhpin	Goldfin tinfoil barb	Hypsibarbus Malcolmi	N/A
			Trey ka Ek	Black sharkminnow	Labeo Chreysophekadion	L/C
			Trey kaes		Microbenacheveyi	N/A
			Trey kanhchrouk	Skunk botia	Yasuhikotakia morleti	LC
			Trey khchoeung	Frecklefin Eel	Trey Chonluanh Moan	N/A
			Trey khman	Hampala barb	Hampala Macrolepidota	LC
			Trey kray	Clown Featherbaack	Chitala Ornata	LC
			Trey Krus	Dusky face carp	Osteochilus lini	LC
			Trey Sanday/Trey Ros	Snakehead Murrel	Chana Striata	LC
			Trey Proma	Boeseman Croader	Boesemania	NT
			Trey slat	Bronze Featherback	Notopterus Notopterus	LC
			Trey Stuok		Wallagoleerii	N/A
			Trey ta oun		Ompokhypophthalmus	N/A
			Trey chhlaing	Asian Redtail Catfish	Hemibagrusnemurus	N/A
f) Insect	None	None				
				Scarlet lily beetle	Lilioceris	N/A
			Kantum Ruy	Dragon Fly	Anisoptera	N/A
				Butterfly	Rhopalocera	N/A
			Sramaoch	Ant		N/A
g) Flora	None	None				
				Alstonia	Alstonia Scholaris	N/A
				Sleeping grass	Mimosa Pudica	N/A

Environmental Monitoring Form for Construction Stage
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 (July 22nd, 2020) KP: 89+250 At RHS in Department of Social Veteran and Youth Rehabilitation of Krong Kompong Chhnang, Kompong Chhnang Province. AQS-3 (July 22nd, 2020) 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=0.069 AQS-3=0.062	0.05 mg/m^3 (WHO, average 24h)	2 times in dry season 2 times in wet season	Monitoring on air quality at two sites at PK89+250 and PK97+300 along the National Road 5 found that the amount of fine particulate matter, both PM10 and PM2.5, were exceeding the standard of ambient air quality of the government of Cambodia as well as the IFC standard. The monitoring results showed a trend of increasing amount of pollutant comparing to the monitoring results in last rainy season in 2019, but a similar value to the dry seasons in 2019. The main cause of this large amount of particulate matters in the ambient air might be due to the dust emission from traffic on the National Road 5, and very small contribution from the construction activities.	Contractor will continue and enhance the fugitive dust emission control along its construction sites. Contractor will spray water on the access road to construction site and apply the Calcium chloride on the detour road. The contractor will prepare and strictly implement plan around construction sites. The drivers of construction vehicles will comply with speed limits to minimize road dust.
		PM2.5	AQS-2= 0.033 AQS-3=0.028	0.025 mg/m^3 (WHO, average 24h)			
		SO_2	AQS-2=0.050 AQS-3=0.030	0.30 mg/m^3 (WHO average 24h)			
		NO_2	AQS-2= 0.038 AQS-3= 0.028	0.10 mg/m^3 (WHO average 24h)			

Environmental Monitoring Form for Construction Stage
Contract Package 2

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
Water Quality	WS-5 (01st of April 2020) KP:82+500 at RHS, Chrey Bak river downstream, near Phnom Chompus Pagoda Andoung Svay commune, Rolea Bier district, Kompong chhnang province. WS-6 (01st of April 2020) 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 (01st of April 2020) KP: 106+350 at RHS, downstream Srah Angkam lake, Thmar Keo village, Svay Chrum commune, Rolea B'ier district, Kompong chhnang province. WS-8 (01st of April 2020) KP: 117+118 at RHS, downstream Boribo river, Phsar village, Phsar commune, Boribo district, Kompong Chhnang province.	Visual observation/inspection	No major adverse impacts	No standards	Every day	Contractor and inspector	
		pH	WS-5=7.01 WS-6=8.44 WS-7=6.81 WS-8=7.29	6.5-8.5 (MoE)	1 time in dry season 1 time in wet season	The analysis results by the Laboratory of the Ministry of Environment showed that WS-06 had amount of suspended solid (SS) and chemical oxygen demand (COD) exceed the standard value of the public water of the Kingdom of Cambodia. These might be because of the activities of the cattle that came to the lake for drinking, and urinating and defecating at the lake. The result also showed that WS-07 had more amount of chemical oxygen demand (COD) exceed the standard of public water quality. This should be owing to the reduction of amount of water in this dry season, and the increasing of the amount of inorganic substances in the lake by construction activities.	Contractor will try to reduce any possible impacts from the construction sites such as improve the management of solid waste, oil waste, application of slope protection to reduce run off of the dirt with the rain water, etc.
		TSS	WS-5=70 WS-6=288 WS-7=18 WS-8=28	25-100 mg/l (MoE)			
		BOD	WS-5=2.00 WS-6=5.40 WS-7=2.00 WS-8=2.60	1-10 mg/l (MoE)			
		COD	WS-5=3.78 WS-6=9.21 WS-7=5.92 WS-8=4.11	1-8 mg/l (MoE)			
		Total Coliform	WS-5=920 WS-6=1,500 WS-7=1,500 WS-8=2,300	<5,000 (Japanese Standard)			

Environmental Monitoring Form for Construction Stage
Contract Package 2

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
Noise	ANV-2 (08th of April, 2020) PK 89+250 at RHS in Department of Social Veteran and Youth Rehabilitation of Krong Kampong Chhnang, Kampong Chhnang province ANV-3 (08th of April, 2020) PK 97+300 at LHS, residential area in Trapeang Por village, Pong Ro commune, Rolea B'ier district, Kampong Chhnang province	Noise Level (MoE Laboratory)	ANV-2 - 60dB (06:00-18:00) **- 67dB (18:00-22:00)** **- 60dB (22:00-06:00**) ANV-3 **- 68dB (06:00-18:00)** **- 59dB (18:00-22:00)** **- 55dB (22:00-06:00)**	- 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	The noise levels were found slightly over the allowable standard for the residential area stipulated in the Sub-Decree on Air Pollution Control and Noise Disturbance (2000) of the Government of Cambodia. These were owing to traffic activities on the NR5 which is the main road connected between the crowed cities of Poipet & Battambong to Phnom Penh city.	Continue to do the NR5 maintenance and put on the traffic sign on the NR5 to lower the driving speed to reduce the noise during at night. Contractor select quiet equipment and working method as much as possible.
Vibration		Vibration Level (MoE Laboratory)	ANV-2 - 17Hz (07:00-20:00) - 16Hz (20:00-07:00) ANV-3 - 23Hz (07:00-20:00) - 16Hz (20:00-07:00)	- 65Hz (07:00-20:00) - 60Hz (20:00-07:00)		The vibration level found during the measurement at site along NR5 were generally within the standard of the Japanese government for the construction activities. This means that daily traffic activities and construction activities of the project might not have result in any concern over the vibration.	

Environmental Monitoring Form for Construction Stage
Contract Package 2

Item	Location	Parameter/Means of Monitoring		Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
Waste Generation	Waste storage at construction site and campsites	Slurry and other constructio n waste	Discharged amount	The attached result table will be shown	No standards	Every day	Septic tank	
			Recycled amount					
			The way of recycle					
			Treated amount					
			Local of final disposal					
		General waste	Discharged amount	The attached result table will be shown				
			Recycled amount					
			The way of recycle					
			Treated amount					
			Local of final disposal				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 (08TH of April, 2020)	Visual observation of animals, reptiles, and amphibious		Mammal = 6 Amphibian =5 Reptile = 13 Birds = 35 Fishes = 52 Insect = 5 Flora = 39	No standards	One time in dry season and one time in rainy season	Visual survey shall be done near permanent river Most of the mammal, amphibian, reptile and bird are generally present in the area both rainy season and dry season. The survey found that 2 species of	Contractor shall use methods to mitigate the impacts of Ecosystem and educate the Engineers and workers not to catch wild flura and fauna species around

Environmental Monitoring Form for Construction Stage
Contract Package 2

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
						reptile namely Pous Vek Dom Bok (Naja Siamensis), and An Deurk (Malayemys subtrijuga) are classified as Vulnerable Species in IUCN Red List, and other 61 Species are not yet listed in the IUCN Red List.	construction sites.

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

1. Schedule of Seasonal Monitoring

The seasonal periodical monitoring for air quality was done on 22nd of July 2020, noise and vibration were done on 03rd and 04th of October 2019, water quality was conducted on 10th of October 2019 and ecosystem survey was implemented on 16th of October, 2019.

Table 1.1 Schedule of Seasonal Monitoring

Year	2018	2019				2020				2021				2022			
	29th 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	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
2. Water Quality	●		●		●		●		●		●		●		●		●
3. Noise	●		●		●		●		●		●		●		●		●
4. Vibration	●		●		●		●		●		●		●		●		●
8. Ecosystem		●	●		●		●		●		●		●		●		●

2. Seasonal Monitoring Points and Areas

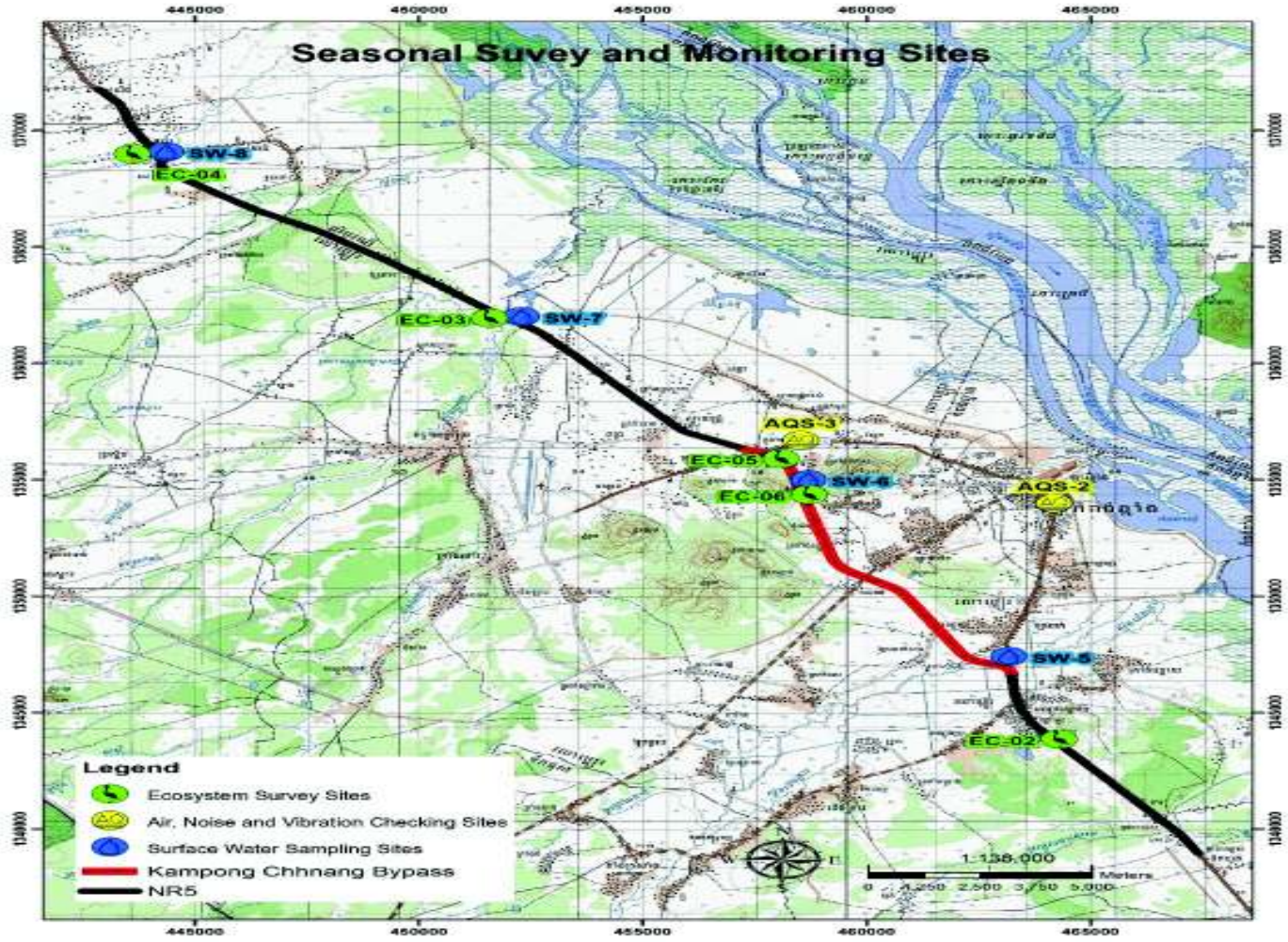


Figure 2.1: Designed Monitoring Points for Package 2 Section (Sta 73+000 - Sta 120+000)

3. The Solid Waste Generation in September, 2020

Location	General Waste				Construction Waste			
	GA (Kg/m)	RA (Kg/m)	MR	DS	GA (Kg/m)	RA (Kg/m)	MR	DS
CP2 Office	210	20	Sold to scavenger	Dumpsite	-	-	-	-
SMCC Accommodation	100	15	Sold to scavenger	Dumpsite	-	-	-	-
MOTORPOOL	500	25	Sold to scavenger	Dumpsite	75 (scrap)	75	Sold to scavenger	-
LOT1	120	7	Sold to scavenger	Dumpsite	-	-	-	-
LOT2	110	5	Sold to scavenger	Dumpsite	-	-	-	-
SMCC Fabrication Yard A	500	25	Sold to scavenger	Dumpsite	120 (scrap)	120	Sold to scavenger	
SMCC Fabrication Yard B	350	20	Sold to scavenger	Dumpsite	-	-	-	-
SMCC Fabrication Yard C	250	15	-	Dumpsite	-	-	-	-
Contractor's Yard	150	8	Sold to scavenger	Dumpsite			-	-
All Box Culvert	200	5	Sold to scavenger	Dumpsite	-	-	-	-
TOTAL	**2,490**	**145**			**175**	**175**		

Note: GA = Generated amount ; RA = Recycling amount ; MR = Mean of Recycling, DS = Disposal Site ;
Kg/m = Kilogram per month ; Dumpsite is at Traok Keut village, Sre Thmey commune, Rolea B'ier district, Kampong Chhnang province.

Environmental Monitoring Form for Construction Stage
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 (03rd of July, 2020) PK-135+600 Kbal Damrei village, Ansa Chambork commune, Krakor district, Pursat province AQS-5 (04th of July, 2020) PK-170+340 Kcandol Sar Village, Beung Kantout commune, Krakor district, Pursat province	**PM10**	**AQS4 = 0.019mg/m^3** AQS5 = 0.014mg/m^3	0.05 mg/m^3 (WHO, average 24h)	2 times in dry season 2 times in wet season	The results showed that the ambient air quality in sampling site AQS-4 and AQS-5 along the national road no.5 withing package 3 is in acceptable condition. The result is under standard of the Ministry of Environment and guideline value of Environmental, Health, and Safety General Guidelines (IFC).	The contractor will prepare and strictly implement plan around construction sites. The drivers of construction vehicles will comply with speed limits to minimize road dust. Contractor will spray water on the access road to construction site.
		PM2.5	**AQS4 = 0.013mg/m^3** AQS5 = 0.010mg/m^3	0.025 mg/m^3 (WHO, average 24h)			
		SO_2	AQS4 = 0.011mg/m^3 AQS5 = 0.013mg/m^3	0.30 mg/m^3 (WHO average 24h)			
		NO_2	AQS4 = 0.020mg/m^3 AQS5 = 0.015mg/m^3	0.10 mg/m^3 (WHO average 24h)			

Item	Location	Parameter/Means of Monitoring	Result (Average/ Max /Total..)	Standards (Local/Inter Standard)	Frequency	Remarks	Mitigation Measure
Water Quality	WS-9 (17th of April, 2020) 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	7.02	6.5-8.5 (MoE)	1 time in dry season 1 time in wet season	The water quality in this main river (Thlea Ma'am) is under the water quality standard as stipulated in the Sub-decree on Water Pollution Control (1990) of Ministry of	Contractor will try to reduce any possible impacts from the construction sites such as improve the
		TSS	**117**	25-100 mg/l (MoE)			
		BOD	6.85	1-10 mg/l (MoE)			
		COD	**10.31**	1-8 mg/l (MoE)			
		Total Coliform	**240000**	<5,000 (Japanese Standard)			

Environmental Monitoring Form for Construction Stage
Contract Package 3

						Environment, except TSS and Total Coliform parameter are higher than MoE standard and Japanese standard, caused by agriculture and business activity at upstream of river since 2000 according to interview local people and survey.	management of solid waste, oil waste, application of slope protection to reduce run off of the dirt with the rain water, etc.
Noise	ANV-4 (18th of April, 2020) PK-135+600, Kbal Damrei village, Ansar Chambork commune, Krakor district, Pursat province. ANV-5 (17th of April, 2020) PK-170+340, Kandol Sar village, Beung Kantuot commune, Krakor district, Pursat province.	Noise Level (MoE Laboratory)	ANV-4, 61 dB (06:00-18:00) 57 dB (18:00-22:00) 56 dB (22:00-06:00) AQS-5 70 dB (06:00-18:00) 64 dB (18:00-22:00) 61 dB (22:00-06:00)	- 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	We found that even there is no many construction activities at the monitoring site during the monitoring date, the monitoring sites are already disturbed by the transportation activities on NR5, which is an important route connecting Phnom Penh capital city to Battambong and Poipet, an international border gate to Thailand.	Continue to do the NR5 maintenance and put on the traffic sign on the NR5 to lower the driving speed to reduce the noise during at night. Contractor select quiet equipment and working method as much as possible.
Item	**Location**	**Parameter/Means of Monitoring**	**Result (Average/ Max /Total..)**	**Standards (Local/Inter Standard)**	**Frequency**	**Remarks**	**Mitigation Measure**
Vibration		Vibration Level (MoE Laboratory)	AQS-4 41 Hz (7:00-20:00) 37 Hz (20:00-07:00) AQS-5 39 Hz (7:00-20:00) 34 Hz (20:00-07:00)	- 65Hz (06:00-18:00) - 60Hz (18:00-06:00) (MoE)		Vibration levels are under the allowable maximum standard level of MoE, guideline value of IFC and Japanese Standard. This is because of no major construction activities have been during the point of time of the construction stage.	

Environmental Monitoring Form for Construction Stage
Contract Package 3

Waste Generation	Waste storage at construction site and campsites	Slurry and other construction waste	Discharged amount	The result table will be shown below.	No standards	Every day	Septic tank	
			Recycled amount					
			The way of recycle					
			Treated amount					
			Local of final disposal					
		General waste	Discharged amount	The result table will be shown below.				
			Recycled amount					
			The way of recycle					
			Treated amount					
			Local of final disposal					
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.	
Item	**Location**	**Parameter/Means of Monitoring**		**Result (Average/ Max /Total..)**	**Standards (Local/Inter Standard)**	**Frequency**	**Remarks**	**Mitigation Measure**
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 (15th of April, 2020)	Visual observation of animals, reptiles, and amphibious		Mammal = 2 Amphibian = 5 Reptile = 8 Birds = 12 Flora = 61 Insect = 3 Fish = 29	No standards	One time in dry season and one time in rainy season	Visual survey shall be done near permanent river This survey was conducted by interviewing with local fisherman and local people about the presence of fauna resource listed in the table of checklist and taking	Contractor shall use methods to mitigate the impacts of Ecosystem and educate the Engineers and workers not to

Environmental Monitoring Form for Construction Stage

Contract Package 3

						photos of observation fauna resource by the environmentalist.	catch wild flura and fauna species around construction sites.

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

1. Schedule of Seasonal Monitoring

The seasonal periodical monitoring for air quality was conducted on 03rd and 04th July, 2020, noise and vibration were done on 17th - 18th April 2019, water quality was conducted on 17th of April, 2020 and ecosystem survey was implemented on 15th of April, 2020.

Table 1.1 Schedule of Seasonal Monitoring

Year	2018	2019					2020				2021				2022			
	Dec	Feb	Apr	May	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct	Jan	Apr	Jul	Oct
Item	Dry	Dry	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy	Dry	Dry	Rainy	Rainy
1. Air Quality	●	●		●	●	●	●	●	●	●	●	●	●	●	●	●	●	●
2. Water Quality	●			●		●		●		●		●		●		●		●
3. Noise	●			●		●		●		●		●		●		●		●
4. Vibration	●			●		●		●		●		●		●		●		●
8. Ecosystem		●	●			●		●		●		●		●		●		●

2. Seasonal Monitoring Points/Areas and Ecosystem survey

Figure-2: Designed Monitoring Points for Package 3 Section (Sta 120+000 - Sta 171+200)

3. The Solid waste Generation in September, 2020

Location	General waste				Construction waste			
	General amount	Recycle amount	Mean of recycle	Disposal	General amount	Recycle amount	Mean of recycle	Disposal
HS office (sta.145)	80.5 kg	23.2 kg	provide to cleaner	dumpsite				
					11.3 kg of scarp waste	6.5	provide to scavenger	dumpsite
DP office (sta.144)	86.3 kg	36.4 kg	provide to cleaner	dumpsite	0.5 m3 of concrete waste	0.5 m3	backfill at courtyard	
					10.7 kg of scarp waste	8.5	provide to scavenger	dumpsite
VHCM office (sta.145)	40.1 kg	9.8 kg	provide to cleaner	dumpsite	0.5 m3 of concrete waste	0.5 m3	backfill at courtyard	
					6.5 kg of scarp waste	3.1 kg	provide to scavenger	dumpsite
LSC office (sta.132)	25.0 kg	5.5 kg	provide to cleaner	dumpsite				
					4.5 kg of scarp waste	1.6 kg	provide to scavenger	dumpsite
SORIN (sta.166)	20.4 kg	10.6 kg	provide to cleaner	dumpsite				
					4.8 kg of scarp waste	2.3 kg	provide to scavenger	dumpsite
Bridge 33 (sta.150+220)	0.3 kg			dumpsite	0.1 m3 of concrete waste	0.1 m3	backfill at courtyard	
Bridge 28 (sta.135+978)	0.3 kg			dumpsite	0.6 m3 of concrete waste	0.6 m3	backfill at courtyard	
Box culvert 37 (sta.170+071)	0.2 kg			dumpsite	0.2 m3 of concrete waste	0.2 m3	backfill at courtyard	
Box culvert 30 (sta.161+081)	0.2 kg			dumpsite	0.5 m3 of concrete waste	0.5 m3	backfill at courtyard	
Box culvert 28 (sta.157+777)	0.2 kg			dumpsite	0.2 m3 of concrete waste	0.2 m3	backfill at courtyard	
Box culvert 27 (sta.157+442)	0.2 kg			dumpsite	0.2 m3 of concrete waste	0.2 m3	backfill at courtyard	
Box culvert 16 (sta.140+615)	0.2 kg			dumpsite	0.2 m3 of concrete waste	0.2 m3	backfill at courtyard	
Box culvert 14 (sta.139+117)	0.2 kg			dumpsite	0.2 m3 of concrete waste	0.2 m3	backfill at courtyard	
Box culvert 12 (sta.137+701)	0.2 kg			dumpsite	0.2 m3 of concrete waste	0.2 m3	backfill at courtyard	
Pipe culvert 30 (sta.161+230)	0.1 kg			dumpsite	0.2 m3 of concrete waste	0.2 m3	backfill at courtyard	
Pipe culvert 29 (sta.159+612)	0.1 kg			dumpsite	0.1 m3 of concrete waste	0.1 m3	backfill at courtyard	
Pipe culvert 24 (sta.151+921)	0.1 kg			dumpsite	0.1 m3 of concrete waste	0.1 m3	backfill at courtyard	
Pipe culvert 14 (sta.137+445)	0.1 kg			dumpsite	0.1 m3 of concrete waste	0.1 m3	backfill at courtyard	
Pipe culvert 12 (sta.135+060)	0.1 kg			dumpsite	0.1 m3 of concrete waste	0.1 m3	backfill at courtyard	
Pipe culvert 11 (sta.132+480)	0.1 kg			dumpsite	0.2 m3 of concrete waste	0.2 m3	backfill at courtyard	
Total	**254.9 kg**	**85.5 kg**			**37.8 kg + 4.2 m3**	**22 kg + 4.2 m3**		