NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

May 2021

A	15 June 2021	Hendra WINASTU	Wanidaporn RODE	Khamlar PHONSAVAT	Final
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EXECUTIVE SUMMARY

The preparation and review of the ISO 14001:2015 documentation is continuing by co-working with the ISO consultant. The fourth online training on 'ISO14001:2015 Internal Audit' was conducted during 11-12 May 2021 (24 participants including 01 EGAT O&M staff). The ISO14001:2015 Internal Audit is expected to be conducted at all work sections by the assigned Internal Audit team in July 2021.

During May 2021, EMO received three documents (DWP and SS-ESMMPs) for review and approval. No Site Inspection Reports (SIR) was issued to the relevant Contractors.

Due to the COVID-19 pandemic and the measures announced by the GOL, the regular joint site inspections were suspended during the reporting period.

The construction of the wastewater treatment system modification and improvement at OSOV1 and OSOV2 were still on going by the Soulignet Choummanitham Construction Sole Co., Ltd. (SCC). The overall status of construction progress is within the schedule and it's expected to be completed by the contractual timeframe of 31 July 2021.

In May 2021, water quality depth profile measurements at R01, R02 and R03 (main reservoir) were suspended due to security concerns and water quality monitoring at NNG01, NCH01 and NPH01 was suspended due to COVID-19 lockdown. At R05 close to the dam, the Dissolved Oxygen (DO) levels at the surface were generally between 7 mg/L and 8 mg/L and the oxycline was generally found at a depth of 8.5-9.5 m - similar to April 2021. In the re-regulation reservoir, the mean DO levels over the entire water column were 1.0 mg/L in R06 and 0.9 mg/L in R07.

During May 2021, the discharge from the re-regulation dam mainly went through the turbine and occasionally through the gate or a combination of gate and turbine discharge. DO concentrations during monitored periods were less than 6 mg/L at the stations in Nam Ngiep immediately downstream of the Re-regulation Dam and therefore did not comply with the GOL Standard. No dead fish was observed in Nam Ngiep downstream during this monitoring period. NNP1PC is still in the process of collecting information to assist in developing measures to improve the DO levels downstream.

In May 2021 the local waste collection contractors continued collecting waste from the NNP1PC's operation sites and the nearby villages, and operating the project landfill and Houay Soup landfill. The work included waste segregation and disposal, waste cover, grass cutting and repairing of perimeter fences.

In May 2021, a total of 15.4 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 2.8 m^3 compared with April 2021. A total of 21.7 m^3 of solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed of at Houay Soup Landfill, a decrease of 6.4 m^3 compared with April 2021. There was no recycle waste trade activity in the Community Waste Bank during the reporting period.

Most of the activities under NNP1 WMP and NC-NX BOMP in May 2021 were postponed following the Prime Minister (PM) Order No.15/PM dated 21 April 2021 and PM Order No. No. 528/PM dated 20 May 2021 on the country wide lockdown as preventive measures for COVID-19. The only activities that continue during this lockdown period include the construction of Xaysomboun WRPO sub-office at Ban Huayxay as well as patrolling and snare removal in the NC-NX offset site.

The fish catch monitoring for March 2021 in Nam Ngiep Watershed was dominated by *Scaphiodonichthys acanthopterus* and *Oreochromis niloticus* and species groups of Poropuntius, Hampala and Mystacoleucus that are classified as Least Concern (LC) according to the IUCN Red List, except *Scaphiodonichthys acanthopterus* is classified as Data Deficient species (DD).

1. ENVIRONMENTAL MANAGEMENT MONITORING

1.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

The preparation and review of the ISO 14001:2015 documents are continuing by co-working with the ISO consultant. Completion of the fourth online training 'ISO14001:2015 Internal Audit' on 11-12 May 2021 for 24 participants including 01 EGAT O&M staff. The ISO14001:2015 Internal Audit is expected to be conducted at all work sections by the assigned Internal Audit team in July 2021.

TABLE 1-1: ENVIRONMENTAL MANAGEMENT SYSTEM WORK PLAN-REVISED IN MAY 2021

Item	ISO14001:2015 Work Plan	Year 2020		Year 2021			
		Q3	Q4	Q1	Q2	Q3	Q4
1	Continue to prepare EMS documents (8 Standard Operating Procedures are completed)						
2	**NNP1PC Environmental Policy announcement**						
3	NNP1PC ISO Committee establishment						
4	Training relevant staff on: - Requirement and Interpretation of ISO14001:2015 - Organization Context and Risk Management for ISO14001 - ISO14001:2015 Document Information - ISO14001:2015 Internal Audit						
5	Implement the EMS procedures and processes						
6	ISO14001:2015 Internal Audit						
7	Implement the corrective actions and preventive actions according to the Internal Audit						
8	Management Review by NNP1PC Management						
9	ISO 14001:2015 Assessment and Certification Audit – **1st Stage** (***remote audit*** on the documentation review)						
10	Implement the corrective actions and preventive actions according to the 1st Stage Audit						
11	ISO 14001:2015 Assessment and Certification Audit – **2nd Stage** (***on-site audit***)						
12	Implement the corrective actions and preventive actions according to the 2nd Stage Audit						
13	**Certify of ISO14001:2015 upon successful completion of the audit**						

	Completed activities per the original plan
	Delayed activities and postponed from the original plan
	Original plan activities

1.2 COMPLIANCE MANAGEMENT

In May 2021, EMO received 03 Detail Work Programs (DWPs) and Site Specific Environmental and Social Monitoring and Management Plans (SS-ESMMPs) for review and approval. The status of documents review is presented in ***Table 1-2***.

TABLE 1-2: SS-ESMMP AND DOCUMENT REVIEW STATUS IN MAY 2021

Title	Date Received	Status
DWP & SS-ESMMP for Project Solid Waste Management and Landfill Operation	14 May 2021 (2nd submission)	No objection with no further comments on 31 May 2021
DWP & SS-ESMMP for Community Solid Waste Management and Houay Soup Landfill Operation	18 May 2021 (2nd submission)	No objection with no further comments on 31 May 2021
DWP & SS-ESMMP for Wastewater Treatment Systems Improvement and Modification	06 May 2021 (2nd submission)	No objection with comments on 11 May 2021

Due to the Corvid-19 situation and the GOL's lockdown measures, the regular joint site inspections were suspended during the reporting period. However, the Compliance team conducted independent site inspections at the construction sites for the wastewater treatment system improvement and modification at OSOV1 and OSOV2.

FIGURE 1-1: PHOTOS OF SITE INSPECTION AT OSOV1 AND OSOV2 WWTS IMPROVEMENT AND THE REHABILITATED SITES

WWTS IMPROVEMENT AT OSOV1	WWTS MODIFICATION AT OSOV2
	

NNP1PC EMO did not issue any Observations of Non-Compliance during May 2021. The status of compliance reports (Observation of Non-Compliance or ONC, Non-Compliance Report or NCR) issued by NNP1PC is summarized in ***Table 1-3*** and all ONCs and NCRs have been solved.

TABLE 1-3: SUMMARY OF ONCS AND NCRS

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from April 2021	0	0	0	0
Newly Opened in May 2021	0	0	0	0
Total in May 2020	**0**	**0**	**0**	**0**
Resolved in May 2021	0	0	0	0
Carried over to May 2021	0	**0**	0	0
Unsolved Exceeding Deadlines	**0**	**0**	**0**	**0**

1.2.1 Site Inspection by Environment Management Unit (EMU)

The monthly site visit by the EMU of Bolikhan District and the quarterly site visit by the EMU of Xaysomboun Province were not carried out in May 2021.

1.2.2 Site Decommissioning and Rehabilitation

During the reporting period of May 2021, EMO continued to monitor the progress of rehabilitation for two sites (Phouhomxay Village's Irrigation canal rock and spoil disposal area and LILAMA10 camp). The status of the two sites as of 30 May 2021 are shown below.

FIGURE 1-2: PHOTOS STATUS OF FORMER LILAMA10 CAMP AND PHOUHOMXAY VILLAGE'S IRRIGATION CANAL'S ROCK AND SPOIL DISPOSAL AREA.

STATUS OF FORMER LILAMA10 CAMP REHABILITATED	STATUS OF FORMER IRRIGATION CANAL ROCK AND SPOIL DISPOSAL SITE REHABILITATED
	

1.3 WATER QUALITY MONITORING

The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD_5), Faecal Coliform Bacteria, Total Coliform Bacteria and *E.coli* have been carried out by NNP1PC's environmental laboratory since August 2017.

All data are reported to the Ministry of Natural Resources and Environment (MONRE) monthly, and quarterly to the ADB. The reports are also published on the Company's website at https://namngiep1.com/resources/monitoring-reports/

Due to the COVID-19 preventative measures imposed by the Lao Governments since 20 April 2021, the water samples were analysed at the NNP1 Project Environmental Laboratory only for TSS, BOD_5, *E.coli* bacteria, faecal coliform and total coliform and no water samples were shipped to the UAE Laboratory in Thailand. Therefore, there are no results for COD, ammonia-nitrogen, total nitrogen, TKN, TOC, phytoplankton biomass, total phosphorus, and oil and grease in this reporting month.

1.3.1 Effluent Discharge from Camps and Construction Sites

Detailed monitoring results are provided in the ***Annex B*** of this Report. The effluent camp monitoring results in May 2021 indicated non-compliances for some parameters in OSOV1 (EF01), OSOV2 (EF13) and the Main Powerhouse (EF19).

The status of implementation of the corrective actions addressing non-compliances at the camps and key project facilities are summarized in ***Table 1-4.***

TABLE 1-4: STATUS OF CORRECTIVE ACTIONS FOR NON-COMPLIANCES AT WWTSS IN MAY 2021

Site	Sampling ID	Status	Corrective Actions
OSOV1	EF01	Non-compliance for faecal coliform and total coliform.	Soulignet Choummanitham Construction Sole Company Limited Co., Ltd. (SCC) commenced the wastewater treatment systems improvement work on 26 April 2021. It is expected that the works will be completed by the end of July 2021.
OSOV2	EF13	Non-compliance for BOD_5, faecal coliform and total coliform in the first fortnightly sampling. However, fully compliance in the second fortnightly sampling.	
Main Powerhouse	EF19	Fully compliance in the first fortnightly sampling. No discharge during the second sampling.	

1.3.2 Ambient Surface Water and Reservoir Water Quality Monitoring

The ambient surface water and reservoir water quality monitoring programme comprises five monitoring stations in the main reservoir (R01-R05), two stations in the Re-regulation reservoir (R06 and R07), five stations in the mainstream Nam Ngiep (NNG01 and NNG05 to NNG08) and four stations in the main tributaries to Nam Ngiep (Nam Chiane [NCH01], Nam Phouan [NPH01], Nam Xao [NXA01] and Nam Houay Soup [NHS01]).

In addition, weekly depth profile monitoring (pH, DO, conductivity and temperature) has been undertaken since 18 September 2018 for stations located in the Re-regulation and main reservoirs. The locations of the monitoring stations are shown in ***Figure 1-3.***

The monitoring results for key parameters (DO, TSS and BOD_5) during May 2021 are presented in ***Table 1-5, Table 1-6*** *and* ***Table 1-7.*** The full set of data for May 2021 is attached in ***Annex A***. In addition, the results for DO are presented as line graphs in ***Figure 1-4***.

Main Reservoir

From 01 to 31 May 2021, the water level in the main reservoir decreased from El. 302.21 m asl to El. 297.45 m asl.

Depth profile measurements and sampling at R01, R02 and R03 were suspended due to security concerns during May 2021.

At R05, the station closest to the main dam, as the water temperature increased, the thermocline was clearly observed at a depth interval from about 8.0 m to 9.5 m. The average DO concentration of 8.2 mg/L in the upper 8.5 m varying between 5.6 mg/L and 9.4 mg/L, and the oxycline was generally found at a depth of 8.5-9.5 m with DO concentrations between about 2 mg/L and 4 mg/L - similar to April 2021. At a depth of 11 m, the DO concentrations were at or below 2 mg/L. DO concentrations below 0.5 mg/L (anoxic condition) were recorded at depths below 18 m corresponding to 8 m above the centre line of the Intake in early May 2021 to 4 m above the centre line by the end of the month, taking into consideration the lowering of the reservoir level over the period.

At R04, the DO levels in the upper 7.0 m varied between 5.8 mg/L and 9.1 mg/L, and the DO concentrations dropped to below 0.5 mg/L at a depth of about 14 m.

As expected, the TSS concentrations in the main reservoir have been consistently low since the start of impounding with a mean of 5 mg/L compared with the high flow season means of about 100 – 250 mg/L and low flow season means of 20 mg/L - 50 mg/L.

The BOD_5 measurements at R04 and R05 in both epilimnion and hypolimnion were less than 1.0 mg/L.

Re-regulation Reservoir

In May 2021, the turbine discharges from the main powerhouse varied between 62 and 232 m^3/s usually interrupted by night-time periods with no discharge.

The mean DO levels over the entire water column were 1.0 mg/L in R06 and 0.9 mg/L in R07 during May 2021.

The BOD_5 concentrations in R06 and R07 was less than 1.0 mg/L and 1.2 mg/L respectively.

Nam Ngiep Downstream

During May 2021, the discharge from the re-regulation dam mainly went through the turbine and occasionally through the gate or as a combination of gate and turbine discharge.

During periods with turbine discharge, the DO concentrations at NNG05 about 1.8 km downstream of the re-regulation dam varied between 2.2 mg/L and 2.7 mg/L and gradually increased to between 3.7 mg/L and 4.8 mg/L at NNG07 some 25.9 km from the dam. At NNG08 close to the confluence with the Mekong River (47.2 km from the dam), the DO levels were between 4.6 mg/L and 5.5 mg/L with an average of 5.2 mg/L.

No dead fish was observed in Nam Ngiep downstream during this monitoring period. NNP1PC is still in the process of collecting information to assist in developing measures to improve the DO levels downstream.

The BOD_5 in the downstream station (NNG05) was less than 1mg/L and complied with the national surface water quality standard.

Main Tributaries to Nam Ngiep

No water quality monitoring for Nam Chian and Nam Phouan during May 2021.

All monitored parameters in the Nam Xao and Nam Houaysoup complied with the standard, except DO at NHS01, DO and BOD_5 at NXA01.

FIGURE 1-3: SURFACE WATER AND RE-REGULATION RESERVOIR WATER QUALITY MONITORING STATIONS

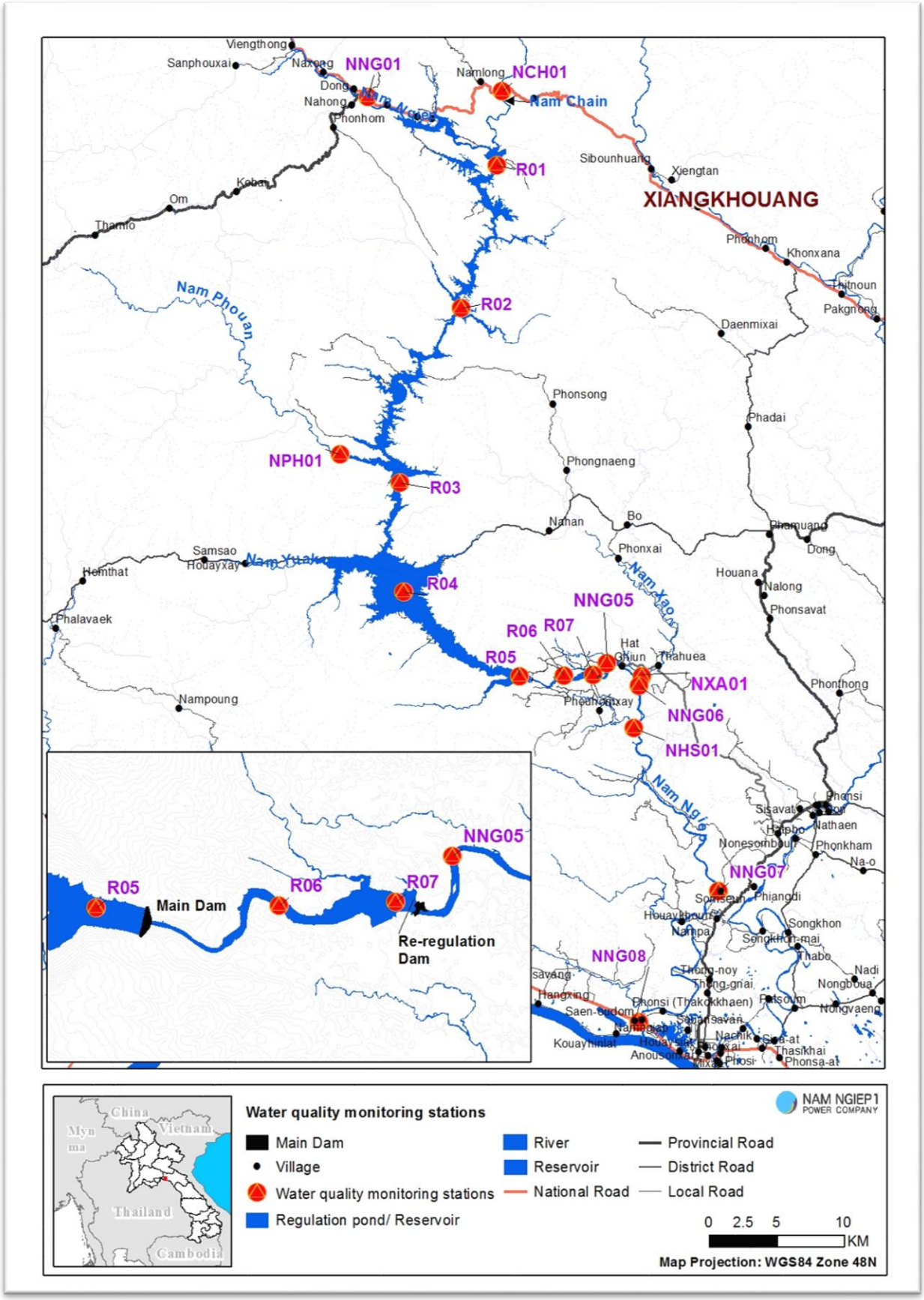


Figure 1-4: Concentration of Dissolved Oxygen (mg/L) in the upper 0.2 m since September 2019 to May 2021

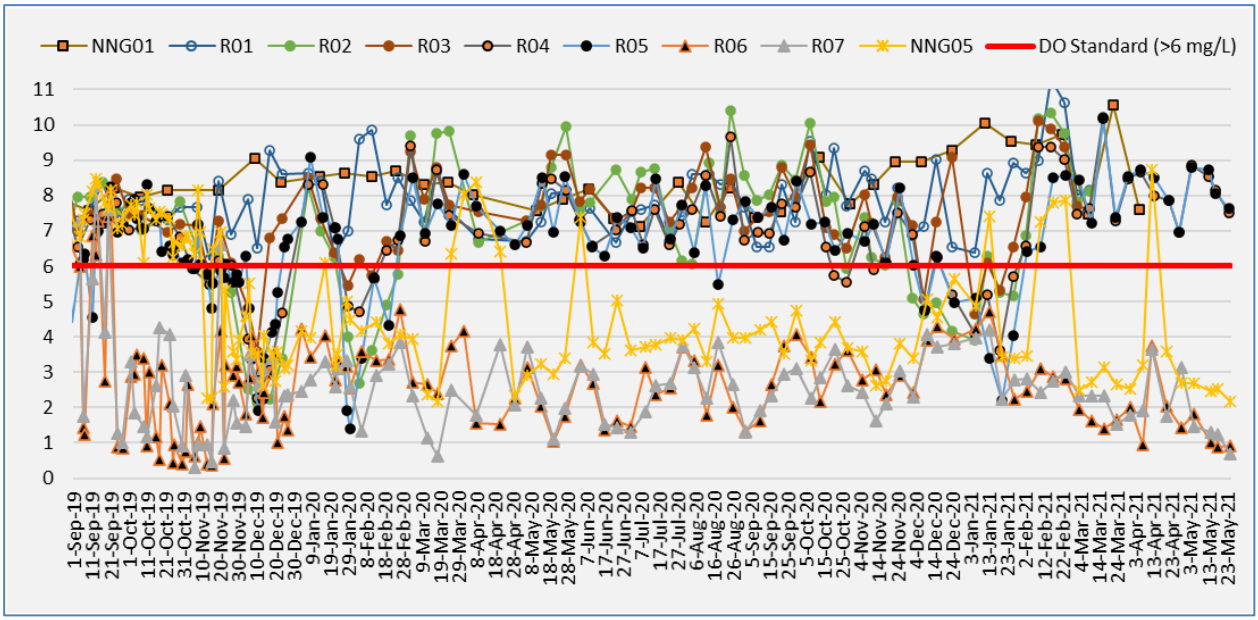


Table 1-5: Results of Surface Water Quality Monitoring for Dissolved Oxygen (mg/L) in the upper 0.2 m, National Water Quality Standard: >6.0 mg/L

DO (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
4-May-21					8.87	8.8										
5-May-21							1.81	1.46	2.7	2.8	4.01	5.04			4.7	4.48
13-May-21					8.55	8.72										
14-May-21							1.02	1.3	2.47	2.98	4.83	5.51			6.22	6.06
17-May-21					8.14	8.05										
18-May-21							0.89	1.25	2.52	3.28	4.22	5.48			4.38	4.88
24-May-21					7.52	7.63										
25-May-21							0.92	0.69	2.16	4.56	3.7	4.65			4.62	4.27

TABLE 1-6: RESULTS OF SURFACE WATER QUALITY MONITORING FOR TOTAL SUSPENDED SOLIDS (MG/L)

Total Suspended Solids (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
13-May-21					<5	<5										
13-May-21 Hypolimnion					<5	<5										
14-May-21							<5	<5	<5	<5	<5	9.73			<5	<5

TABLE 1-7: RESULTS OF SURFACE WATER QUALITY MONITORING FOR BOD_5 (MG/L) - WATER QUALITY STANDARD: < 1.5 MG/L

BOD_5 (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
13-May-21					<1	<1										
13-May-21 Hypolimnion					<1	<1										
14-May-21							<1	1.18	<1	1	<1	<1			2.28	<1

1.3.3 Groundwater Quality Monitoring

During May 2021, community groundwater quality analyses were carried out for five wells located in Somseun Village, Nam Pa Village, Thong Noy Village and Phouhomxay Village. The community groundwater samples were taken from household water tap, except in Phouhomxay Village where the groundwater samples were taken at sampling points before entering into the water storage tank. No groundwater sampling in Pou Village due to lockdown measures.

The results indicate that:

- Only one of two wells in Phouhomxay Village (GPHX02) did not complied with the groundwater quality standards for faecal coliform and *E.coli* bacteria, and both monitored wells had pH less than the lower threshold;
- The well in ThongNoy Village and one well in Nam Pa Village did not comply with the standards for faecal coliform and *E.coli* bacteria.
- The well in Somsuen Village complied with the groundwater quality standards for drinking purpose.

The community groundwater quality monitoring results are presented in ***Table 1-8.***

The villagers were advised to boil water before drinking. This advice is in accordance with the Law on Hygiene, Disease Prevention and Health Promotion No 01/NA of 10 April 2001, which states that domestic water supply for daily use is not required to be readily drinkable but would normally have to be boiled or otherwise treated before it would be suitable for drinking. The villagers generally use tap water for washing and cleaning. They were informed about the monitoring results and recommended to carry out the operation and maintenance improvement as well as were encouraged to boil water before drinking.

TABLE 1-8: GROUNDWATER QUALITY MONITORING RESULTS IN SOMSUEN, NAM PA, THONGNOY AND POU VILLAGES

Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	Nampa Village	Thongnoy Village	Pou Village
	Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01
	Guideline *						
pH	6.5 - 9.2	6.08	6.27	6.69	7.06	6.51	
Sat. DO (%)		39.2	33.5	85.1	93.3	74.3	No
DO (mg/L)		2.97	2.54	6.07	6.8	5.39	Sampling
Conductivity (µS/cm)		138.1	213	196.8	205.4	219.6	Due to
Temperature (°C)		27.6	27.5	31.4	29.9	30.5	Lockdown
Turbidity (NTU)	<20	0.99	0.63	0.64	0.58	0.61	
Faecal coliform (MPN/100mL)		4	0	0	4.5	240	
E.coli Bacteria (MPN/100mL)	0	4	0	0	4.5	240	

*These are groundwater quality standards for drinking purposes attached in the concession agreement.

1.3.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

The results of the Gravity Fed Water Supply water quality analyses are presented in ***Table 1-9***.

Faecal Coliform and *E.coli* exceeded the drinking water quality standards in the water supply of Hat Gnuin Village (WHGN02) and Phouhomxay Village (WPHX02 – Primary School Water Tap and WPHX03 – Household Water Tap). Note here that during sampling of tap water in Phouhomxay Village, surface water from Houay Soup Stream was still supplied into the system and the samples likely represent a mixture of surface water and groundwater from the boreholes, where, as mentioned in ***Section 1.3.3*** and as shown in **Table 1-8**, *E.coli* bacteria were only detected (at a low level) in one of the two wells. No GFWS sampling in Thaheua Village due to the water supply system was broken.

As observed in the field during water sampling, livestock are roaming around the water intake areas and feces from birds may also contribute to the presence of Faecal Coliform Bacteria and *E.coli* in GFWS samples. The villagers were advised to boil water before drinking. This advice is in accordance with the Law on Hygiene, Disease Prevention and Health Promotion No 01/NA of 10 April 2001, which states that domestic water supply for daily use is not required to be readily drinkable but would normally have to be boiled or otherwise treated before it would be suitable for drinking. The villagers generally use tap water for washing and cleaning. They were informed about the monitoring results and were encouraged to boil water before drinking.

TABLE 1-9: RESULTS OF THE GRAVITY FED WATER SUPPLY QUALITY MONITORING

	Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village	
	Station	WTHH02	WHGN02	WPHX02	WPHX03
Parameter (Unit)	Guideline*				
pH	6.5 - 8.6	Water Supply System Broken	7.03	6.39	6.47
Sat. DO (%)			94.8	85.2	101.4
DO (mg/L)			6.71	6.3	7.08
Conductivity (µS/cm)	<1,000		52	71.2	74.9
Temperature (°C)	<35		31.7	31	30.3
Turbidity (NTU)	<10		1.25	0.91	0.7
Faecal Coliform (MPN/100 mL)	0		920	79	17
E.coli Bacteria (MPN/100 mL)	0		920	49	17

*These are drinking water quality standards attached in the concession agreement.

1.3.5 Landfill Leachate Monitoring

During May 2021, landfill leachate monitoring was not conducted at NNP1 Project Landfill and Houay Soup Solid Waste Landfill due to the ponds were dry.

1.4 DISCHARGE MONITORING

1.4.1 Main Reservoir – Water Level, Inflow and Discharge

The water level in the main reservoir, inflow to the reservoir and discharge from the reservoir have been monitored since the start of the impounding on 15 May 2018. The graph in ***Figure 1-5*** *and* ***Figure 1-6*** presents the values recorded since May 2018.

During May 2021, the mean inflow to the main reservoir was 67 m^3/s. The minimum and maximum inflows were 42 (on 10 May 2021) and 89 m^3/s (on 22 May 2021) respectively.

From 01 to 31 May 2021, the water level of the main reservoir decreased by 4.76 m from El. 302.21 m asl to El. 297.45 m asl.

In May 2021, the turbine discharges from the Main Powerhouse varied between 62 and 232 m^3/s usually interrupted by night-time periods with no discharge.

FIGURE 1-5: INFLOW FOR THE MAIN RESERVOIR

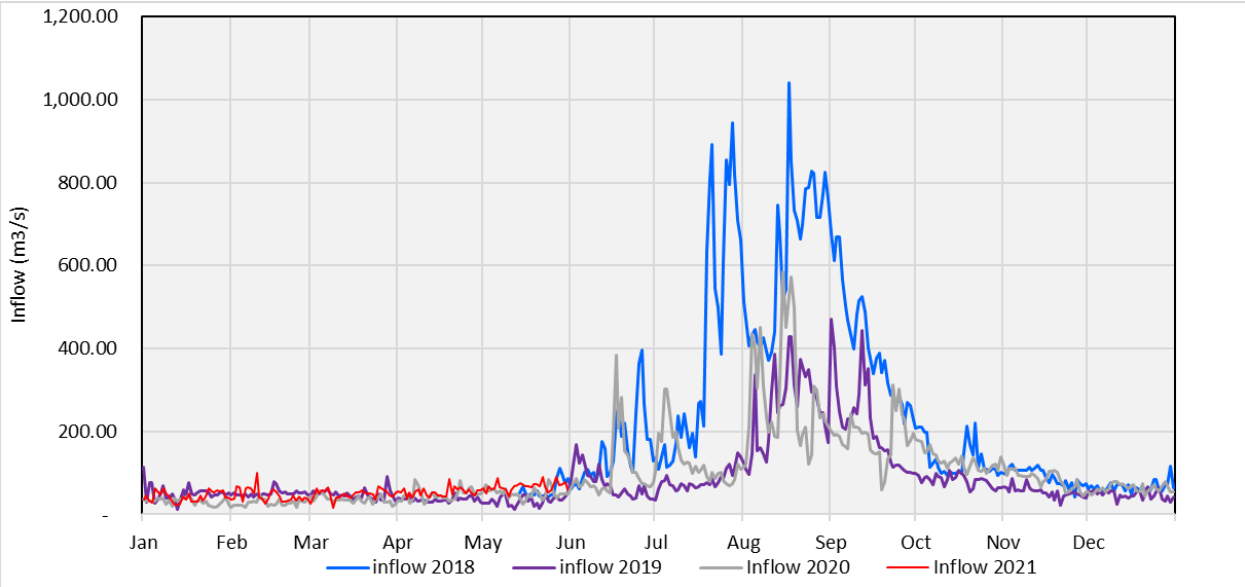
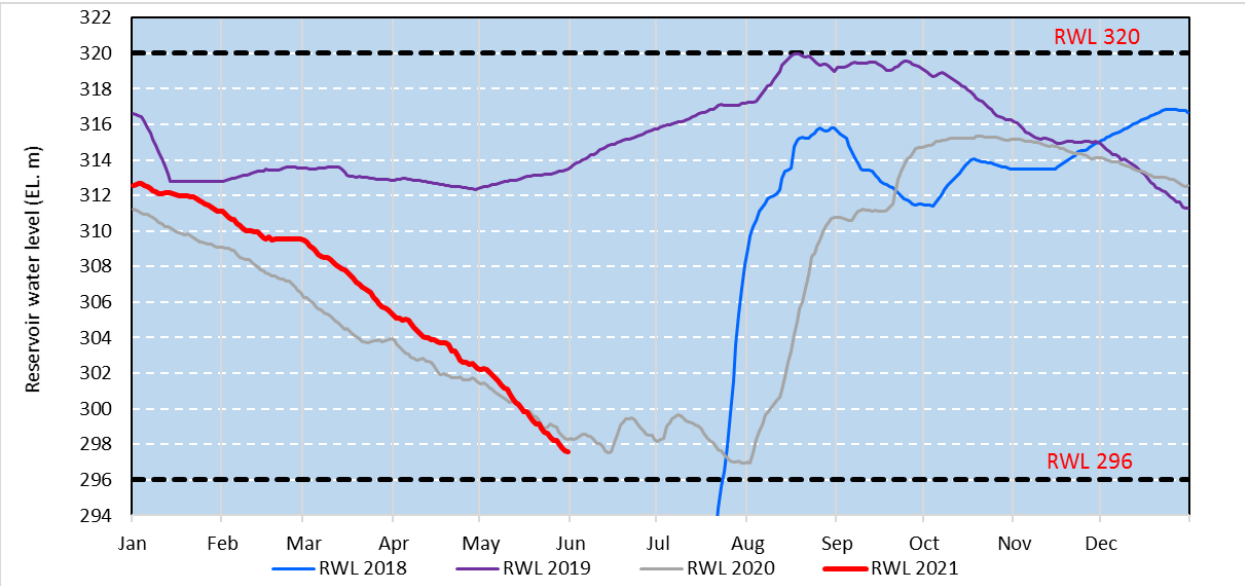


FIGURE 1-6: WATER LEVEL FOR THE MAIN RESERVOIR



Note: The 2018 and 2019 Reservoir Water Level represent the reservoir before the COD (05 September 2019)

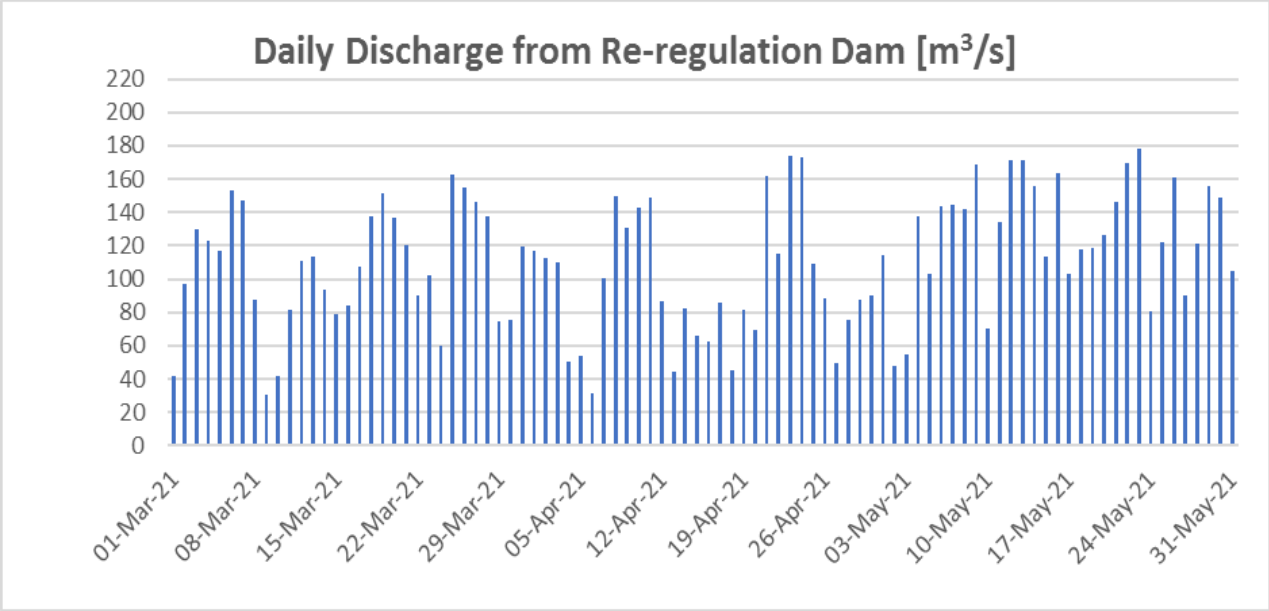
1.4.2 Re-regulation Reservoir – Discharge

The daily discharge monitoring data for the re-regulation dam during March to May 2021 is presented in ***Figure 1-7***.

During May 2021, the mean hourly discharge from the Re-regulation Dam was about 128 m^3/s with hourly turbine discharges varying between 50 m^3/s and 160 m^3/s, hourly gate discharge varied between 27 m^3/s and 210 m^3/s, and hourly total discharge varying between 27 m^3/s and 219 m^3/s. The hourly discharge was kept above the minimum flow requirement of 27 m^3/s at all times.

The changes in the discharge from the Re-regulation Dam were informed in advance to the RMU and to the heads of the downstream villages, who then announced the changes to the communities over the village speaker systems.

FIGURE 1-7: DAILY DISCHARGE MONITORING AT THE RE-REGULATION DAM IN MARCH TO MAY 2021



1.4.3 Nam Ngiep Downstream Water Depth Monitoring

In May 2021, EMO carried out four boat missions to monitor the water depth in the Nam Ngiep downstream of the Re-regulation Dam. A total of 19 sites have been identified with potential shallow water depths and the talweg water depth in all four boat missions was greater than 0.5 m as required.

1.5 PROJECT WASTE MANAGEMENT

1.5.1 Solid Waste Management

In May 2021, a total of 15.4 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 2.8 m^3 compared with April 2021.

During this reporting period, the contractor conducted regular waste collection from the NNP1PC's operation sites and operated the project landfill for 3 days per week. The work included waste segregation and disposal, waste cover, grass cutting and repairing of perimeter fence.

FIGURE 1-8: WASTE MANAGEMENT ACTIVITIES AT NNP1 LANDFILL DURING MAY 2021

GRASS AND SEDIMENT CLEAN UP FROM THE LEACHATE POND	LEACHATE POND MAITENANCE
	

Due to the COVID19 lockdown for the sites and camps, there were less activities and waste during the month. The total amount of recyclable waste collected this month is 439 kg– see ***Table 1-10.***

TABLE 1-10: AMOUNTS OF RECYCLABLE WASTE SOLD

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by May 2021
1	Plastic bottles	kg	0	89
2	Aluminium	kg	0	44
3	Paper/Cardboard	kg	0	103
4	Glass	kg	0	203
Total		**kg**	**0**	**439**

The villagers from Phouhomxay Village collected no food waste from the OSOV1 canteen for animal feed in May 2021 due to the OSOV1 Lockdown from 21 April 2021 which restricts access to the site and collection of food waste. EMO tried to contact the villagers for alternative options to pick up the food waste for their animals feeding and propose them to pick up the food waste from the Community Landfill.

1.5.2 Hazardous Materials and Waste Management

The types and amounts of hazardous materials and hazardous waste stored on site in May 2021 are shown in ***Table 1-11*** and ***Table 1-12.***

TABLE 1-11: RECORD OF HAZARDOUS MATERIAL INVENTORY

No.	Type of Hazardous Material	Unit	Total in May 2021 (A)	Used (B)	Remaining at the end of May 2021 (A – B)
1	Diesel	Litre	7,224	2,100	**5,124**
2	Gasoline	Litre	1,089	319	**770**
3	Lubricant (Turbine oil)	Litre	7,834	4	**7,830**
4	Colour Paint	Litre	250	5	**245**
5	Thinner	Litre	8	0	**8**
6	Grease Oil	Litre	160	0	**160**
7	Gear Oil	Litre	470	0	**470**
8	Chlorine Liquid	Litre	143	40	**103**
9	Chlorine Powder	kg	65	0	**65**
10	SIKA	Litre	7	0	**7**

TABLE 1-12: RECORD OF HAZARDOUS WASTE INVENTORY

No.	Hazardous Waste Type	Unit	Total in May 2021 (A)	Disposed (B)	Remaining at the end of May 2021 (A - B)
1	Used Oil (Hydraulic and Engine)	Litre	1960	0	**1960**
2	Used oil mixed with water	Litre	150	0	**150**
3	Empty 200L drum of used oil	Unit	2	0	**2**
4	Contaminated soil, sawdust and textile material	m^3	1.39	0	**1.39**
5	Used tires	Piece	18	0	**18**
6	Empty 20L chemical drum	Drum	10	0	**10**
7	Lead battery	Unit	5	0	**5**
8	Empty paint and spray cans	Can	139	0	**139**
9	Halogen/fluorescent bulbs	Unit	275	0	**275**
10	Empty cartridge (Ink)	Unit	195	0	**195**
11	Clinic Waste	kg	2.5	0	**2.5**

1.6 COMMUNITY WASTE MANAGEMENT

1.6.1 Community Recycling Programme

In May 2021, there was no trading of recyclable waste at the community waste bank. Due to the continuation of COVID-19 measures, many local recycling businesses and vendors have not yet resumed their recyclable waste trading.

The total amount of recyclable waste in the waste bank is 2,519 kg - same as the amount recorded in April 2021.

TABLE 1-13: TYPES AND AMOUNTS OF RECYCLABLE WASTE TRADED AT THE COMMUNITY RECYCLE WASTE BANK

Types of Waste	Unit	Remaining in April 2021	Additional in May 2021	Sold/ dispose	Remaining in May 2021
Glass bottles	kg	2,358	0	0	**2,358**
Paper/ cardboard	kg	126	0	0	**126**
Plastic bottles	kg	35	0	0	**35**
Aluminium cans	kg	0	0	0	**0**
Scrap metal	kg	0	0	0	**0**
Total	**kg**	**2,519**	**0**	**0**	**2,519**

1.6.2 Community Solid Waste Management

In May 2021, approximately 21.7 m^3 of solid waste was collected from Phouhomxay Village and the host villages for disposal at the Houay Soup Landfill, a decrease of 6.24 m^3 compared with April 2021. There was an increase in daily waste amounts from the villages compared with last year. Improper waste segregation has been observed and this has contributed to the increase in waste. The inability of the local waste collection contractor to conduct waste segregation awareness training for the villagers due to the COVID-19 situation has likely contributed to the observed improper waste segregation.

During this reporting period, the local waste collection contractor conducted regular waste collection from the three villages and operated the Houay Soup landfill for two days per week. The work included waste collection, segregation and disposal, waste cover, grass cutting and repairing of perimeter fence.

FIGURE 1-9: WASTE MANAGEMENT ACTIVITIES DURING MAY 2021

WASTE BAGS SPOT CHECKS AT HSL	***WASTE COVER AT HSL***
	

2. WATERSHED AND BIODIVERSITY MANAGEMENT

2.1 WATERSHED MANAGEMENT

2.1.1 Implementation of Annual Implementation Plan (AIP) 2020

The construction of the sub-office for Xaysomboun WRPO at Ban Houay Xay, Hom District under the approved AIP2020 continued to progress in May 2021.

The reservoir patrol of Xaysomboun and Bolikhamxay WPPO as well as forest patrol of Bolikhamxay WRPO were postponed to June 2021 following the Prime Minister (PM) Order No.15/PM dated 21 April 2021 and PM Order No. No. 528/PM dated 20 May 2021 on the country-wide lockdown as preventive measures for COVID-19.

The camera-trap installation within NNP1 watershed TPZ is still postponed because the relevant GOL committees have not yet come to an agreement about the accommodation allowance for the field work in the forest area.

The procurement of a local consultant to support implementing the Action Plan of Sustainable Livelihood Opportunities is being processed by NNP1 PCD team.

2.1.2 Preparation of Annual Implementation Plan (AIP) 2021

DOF-MAF provided their comments on the 5-year plan of both WRPOs on 21 May 2021 and these were discussed with EMO at the end of May 2021. Further review and improvement on the draft AIP2021 of Bolikhamxay WRPO will be made after the conclusion of 5-year plan. Xaysomboun WRPO was not able to finalize their draft AIP2021 because there was no final decision yet about allowances.

ESD and EMO management followed up with the Director General of DOF-MAF and the provincial management of both provinces on their internal coordination related to the allowance issue and noted that no further discussions had taken place among them until end of May 2021.

2.2 BIODIVERSITY OFFSET MANAGEMENT

2.2.1 Implementation of BOMP Annual Implementation Plan (AIP) 2019 and 2020

The progress on the implementation of key activities by Component in May 2021 are described below:

a. Component 1 - Spatial Planning and Regulation

The representative of NC-NX BOMC and BOMU was scheduled to settle the issue on the TPZ boundary demarcation in the remaining village, Ban Vangphieng of Viengthong district at the end of May 2021 but the activities agreed to postpone due to the representatives have become unavailable.

b. Component 2 – Law Enforcement

NC-NX BOMU agreed with EMO recommendation to continue the patrolling work during the COVID-19 lockdown period because the team and activity are not within the COVID-19 outbreak or risk areas.

The four patrol teams continued the patrolling between 14 May and 14 June 2021 in which two teams focused on TPZ Highest priority area and two teams focused on TPZ Nam Ma high priority area including upstream of Nam Kapong & Nam Sa Nga, and mountain ridges as well as Nam Pang

and mountain ridges. The results of patrolling in May 2021 will be presented and discussed in June 2021 Monthly Report.

The results of patrolling activity in April 2021 are as follows:

Team	Patrolling Area/distance	Observations/Actions Taken
1	TPZ highest priority area including Nam Sone and Nam Chang (16 days covering a 66.5 km distance of forest patrol and 24.37 km distance of road patrol)	The team did not encounter any threats during patrolling.
2	TPZ high priority area including Nam Houng, Nam Kapa, Nam Somfard and streams and surrounding Na Gnang sub-station including Nam Houng and Nam Kha Gna upstream. (16 days covering a distance of 76.57 km of forest patrol)	• The team observed two plots of forest clearing for livestock raising located in the upstream of Nam Kha Gna and Nam Tong (inside CUZ) with a total area of approximately 0.7 ha. • The team also encountered and destroyed a fishing camp at Nam Houng. • The team also found and issued a written warning to four Na Gnang villagers who were fishing illegally at Nam Houng (inside TPZ priority area). The illegal fishing gears such as two spears, two dive masks and a fishing net were seized.
3	TPZ highest priority area including Nam Sone, Houayxai Gnai, Nam Chouan, Houayxai Noi, Hou Poung and mountain ridges. (16 days covering an 86.38 km distance of forest patrol and 14 km distance of road patrol)	The team encountered and destroyed a fresh hunting camp located close to Nam Chouan.
4	TPZ highest priority area including Nam San, Houay Payang and mountain range between Nam San and Nam Chang. (13 days covering a 53.95 km distance of forest patrol and 12.27 km distance of road patrol)	The team observed a walking track and a fireplace for fishing at Nam San.

FIGURE 2-1: MAP OF THREATS RECORDED BY PATROLLING TEAMS IN APRIL 2021

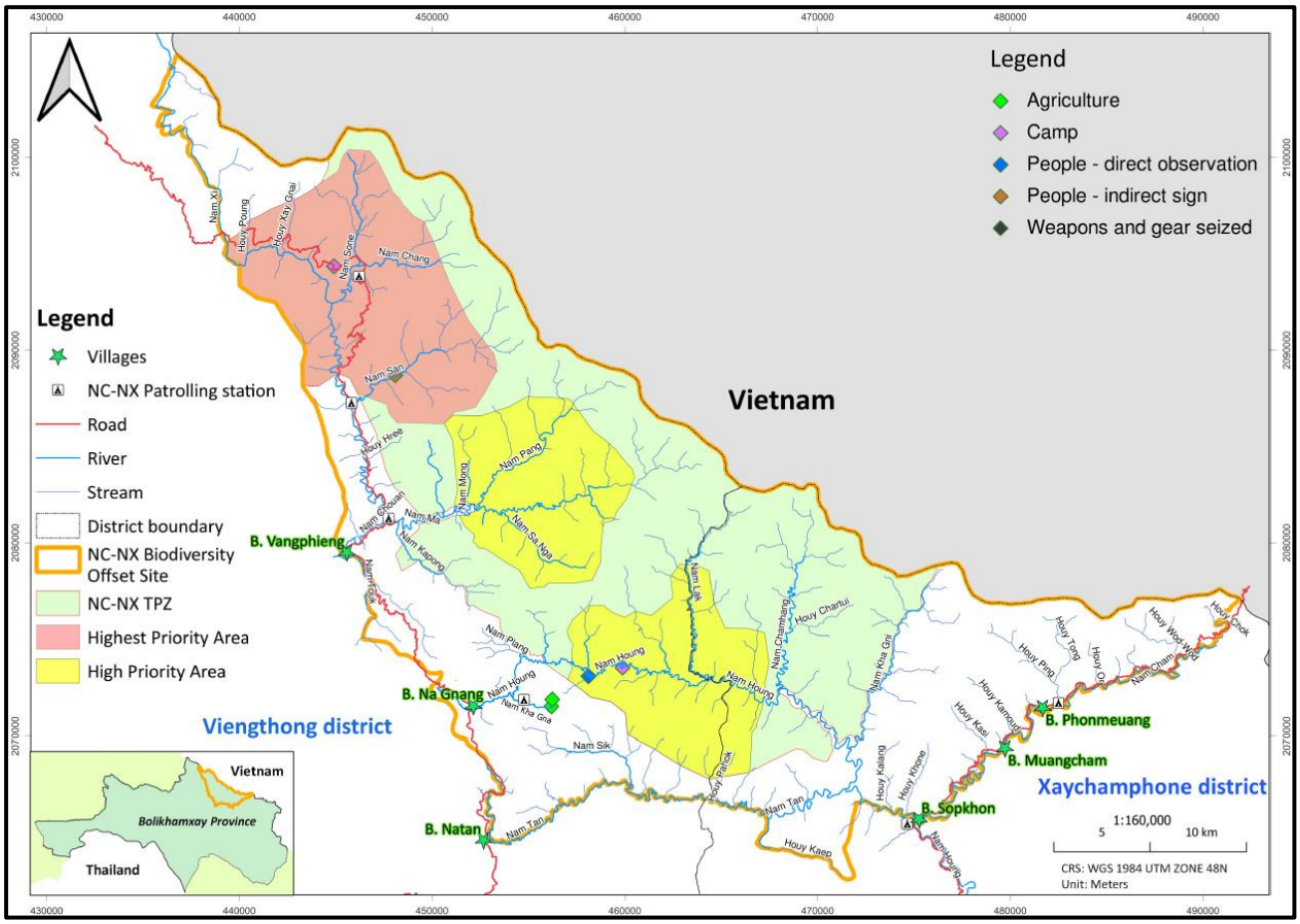


FIGURE 2-2: NEW LAND CLEARING FOUND BY TEAM 2 AT UPSTREAM OF NAM KHA GNA	***FIGURE 2-3: THE PEOPLE (FISHERS) ENCOUNTERED WITH TEAM 2 AT NAM HOUNG***
	

FIGURE 2-4: HUNTING CAMP FOUND BY TEAM 3 AT NAM CHOUAN	*FIGURE 2-5: FIREPLACE FOUND BY TEAM 4 AT NAM SAN*
	

c. Component 3 – Conservation Outreach

BSP is working on the activities identified for the 5-year plan, the agenda and materials for 2021 outreach campaign while EMO is producing the NC-NX demarcation and TPZ sign installation/placement as part of the material for the campaign. Due to the COVID-19 preventive and control measures, the activity will be further postponed to after the rainy season.

d. Component 4 – Conservation linked livelihood development

The Lao version of CDP was finalized on 22 February 2021 and submitted to NC-NX BOMU for their final review. The Lao CDP was reviewed by the Provincial Forestry section of Bolikhamxay PAFO and Viengthong DAFO and will be further submitted to Xaychamphone DAFO, Xaychamphone Vice District Governor and Viengthong District Governor for their further review before submitting it to Bolikhamxay PAFO for the approval.

NC-NX BOMU agreed with EMO recommendation that the snare removal activities could be implemented as scheduled during the COVID-19 lockdown, because the activities are not within the COVID-19 outbreak or risk areas. The first snare removal field work scheduled from 21 May to 04 June 2021 was led by one BOMU staff and one Viengthong DAFO staff and implemented by six village Snare Removal Team members. The team focuses on the TPZ highest priority area including Thongnachang and Nam Sone Mountain ridge areas.

e. Component 6 – Biological Monitoring

BSP has updated the biological monitoring matrix and shared it to ADB, IAP, and EMO on 14 May 2021. The matrix reviewed by EMO team and the comments were provided to BSP in the week of 24 May 2021. Further procurement of the experts/specialists for the survey under NNP1 NNL fund will be processed after ADB and IAP acknowledgement.

2.2.2 Preparation of Annual Implementation Plan (AIP) 2021

EMO communicated with NC-NX BOMU on the AIP 2021 timing or budget revision and suggesting two options:

1. Revise the time schedule to only 6 months (Jul-Dec 2021) and remove the budget for some of the activities during period Jan-Jun 2021 and the activities which will not able to be implemented in 2021;

2. Keep the timing and budget for 12 months period but with the time schedule from Jul 2021-Jun 2022.

BOMU has consulted with DOF-MAF and Bolikhamxay PAFO Forestry Section and they agree with the option 1 and also suggested to have online meeting with all parties during the country wide lockdown for COVID-19.

3. FISHERY MONITORING

Three species groups and two species dominated the fish catch by weight in March 2021 as listed in ***Table 3-1.*** All species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species, except *Scaphiodonichthys acanthopterus* is classified as Data Deficient species (DD).

Table 3-1*: *Fish Species dominating the Fish Catch in March 2021

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Poropuntius normani, Poropuntius laoensis, Poropuntius carinatus	ປາຈາດ	136.2	LC
Hampala dispar, Hampala macrolepidota	ປາສູດ	112.6	LC
Scaphiodonichthys acanthopterus	ປາມ້ອມ	77.4	DD
Oreochromis niloticus	ປານິນ	74.5	LC
Mystacoleucus atridorsalis, Mystacoleucus marginatus	ປາຫັງໜາມ	113.9	LC

The recorded catch of Threatened species (IUCN Red List classification) in March 2021 is presented in ***Table 3-2***. The list includes four species that are classified as Vulnerable species (VU).

Table 3-2*: *Threatened Species of March 2021 Fish Catch

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Cirrhinus cirrhosus	ປາແກງ/ປາມວນຈັນ	5	VU
Cyprinus carpio	ປາໄນ	4	VU
Scaphognathops bandanensis	ປາວຽນໄຟ/ປາປ່ຽນ	12.5	VU
Tor sinensis	ປາແດງ	13.3	VU

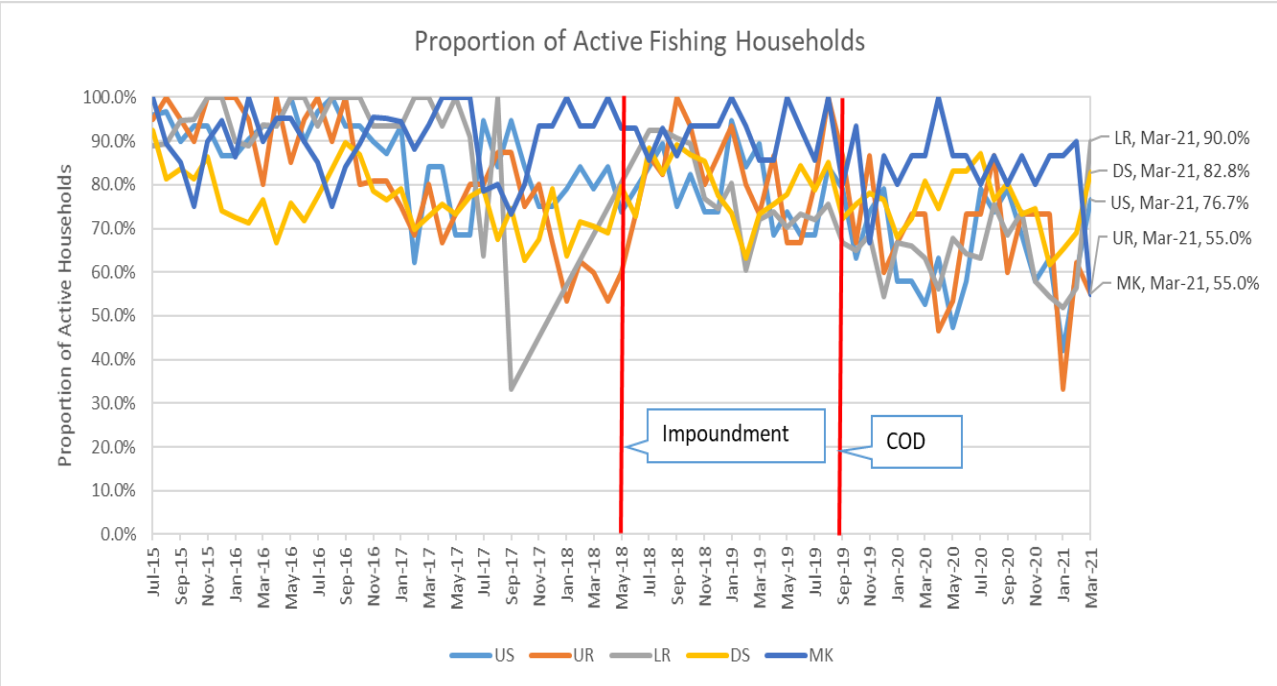
Species abundance and occurrence is based on the 7-day reported catch from the DCL survey in March 2021. The catch is divided in 3 areas including above the main dam, below the main dam and Mekong area. There are 40 species and species groups in the catch above the main dam, while there are 32 species and species groups for below the main dam and 35 species and species group for Mekong. Main biodiversity indicators in March 2021 for above dam, below dam and Mekong area is presented in ***Table 3-3***

Table 3-3: Main Biodiversity Indicators for March 2021

Biodiversity Indicators	Mekong	Below dam	Above dam
Total species and groups	35	32	40
Single species	29	19	28
Species groups	6	13	12
Top 15 species (% total catch weight)	90.54%	84.90%	88.42%
Proportion for species groups	24.96%	61.91%	46.43%
Diversity index (Shannon)	2.6531	2.8821	2.9048

Figure 3-1 shows the proportion of total number of households actively fishing by fishing zone including upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK). It ranges between 55% and 90% of active fishing households for all fishing zones in March 2021, the lower reservoir area was observed the most active households fishing at 90%.

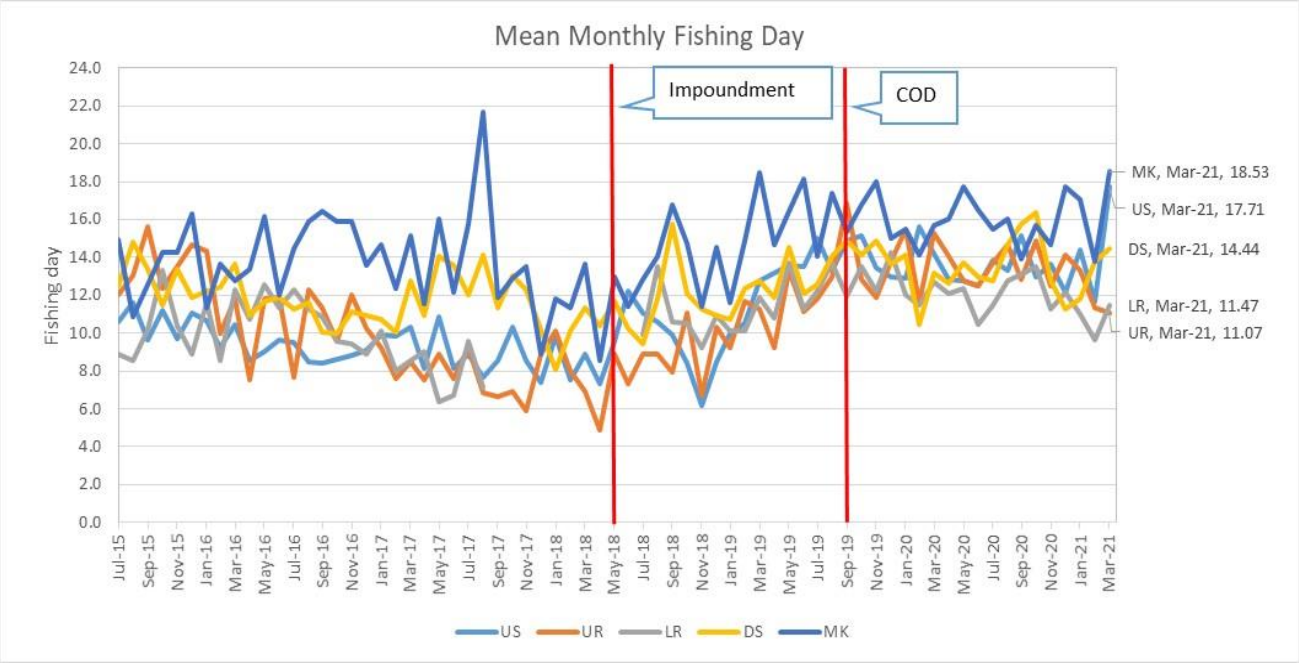
Figure 3-1: Proportion of total number of households actively fishing by fishing zone



Note: Proportion of Active Fishing Households = (Active Fishing Households/Total Interviewed Households) x 100%

Figure 3-2 shows the average (mean) of monthly fishing day from July 2015 to March 2021 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area.

Figure 3-2: Mean of monthly fishing day from July 2015 to March 2021



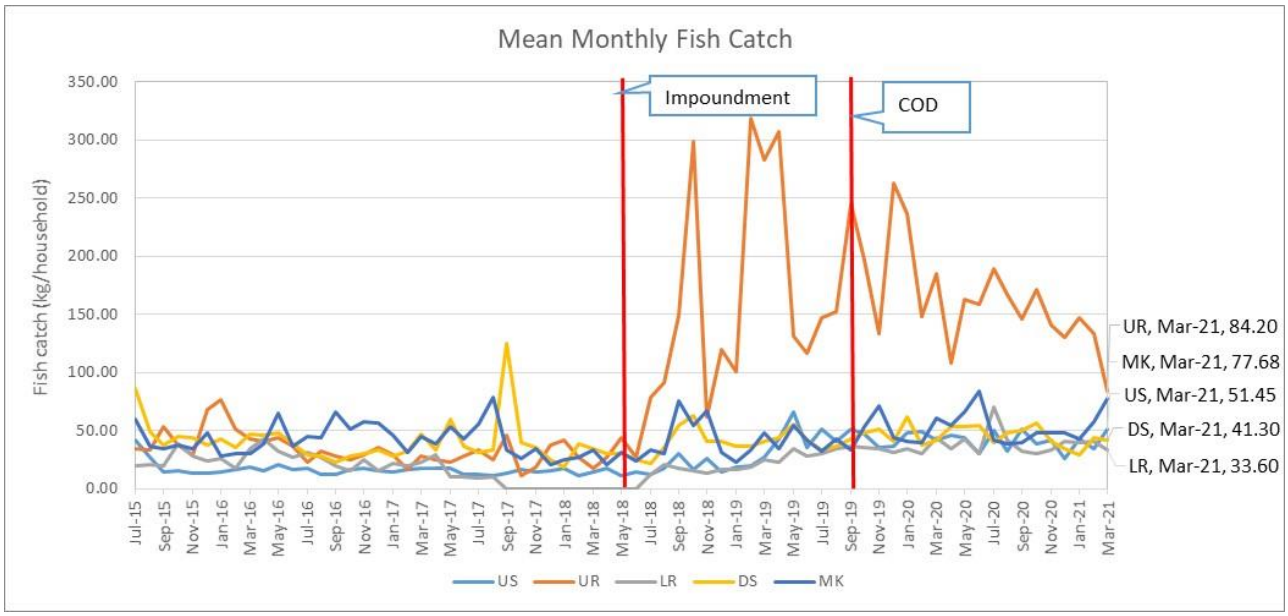
The mean monthly number of fishing day in March from 2016 to 2021 for the upstream, upper reservoir, lower reservoir, downstream and Mekong area are displayed in ***Table 3-4.***

Table 3-4*: *Mean reported number of fishing days by fishing zone in March

Fishing Zone	March 2016 (day)	March 2017 (day)	March 2018 (day)	March 2019 (day)	March 2020 (day)	March 2021 (day)
Upstream	10.47	10.33	8.86	12.76	14.17	17.71
Upper reservoir	11.81	8.45	6.89	11.27	15.30	11.07
Lower reservoir	12.26	8.54	0.00	11.88	12.67	11.47
Downstream	13.65	12.73	11.32	12.75	13.17	14.44
Mekong	12.76	15.13	13.65	18.45	15.67	18.53

The mean monthly household fish catch from July 2015 to March 2021 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area are presented in ***Figure 3-3.***

Figure 3-3: Mean Monthly Household Fish Catch



The mean household fish catch for the month of March from 2016 to 2021 in the upstream, upper reservoir, lower reservoir, downstream and Mekong area are displayed in ***Table 3-5.***

Table 3-5*: *Mean Monthly Household Fish Catch for the month of March from 2016 to 2021

Fishing Zone	March 2016 (kg)	March 2017 (kg)	March 2018 (kg)	March 2019 (kg)	March 2020 (kg)	March 2021 (kg)
Upstream	18.20	18.05	14.17	27.17	41.63	51.45
Upper reservoir	42.54	28.02	17.81	282.74	184.63	84.20
Lower reservoir	34.37	22.55	NA	24.80	44.25	33.60
Downstream	47.07	46.91	34.84	41.23	42.11	41.30
Mekong	30.17	44.62	33.14	48.27	60.67	77.68

The mean daily fish catch per household are displayed in ***Figure 4-3*** and the mean fish catch per household per fishing day for the month of March from 2016 to 2021 are shown in ***Table 3-6.***

Figure 3-4*: *Mean Daily Fish Catch per Household

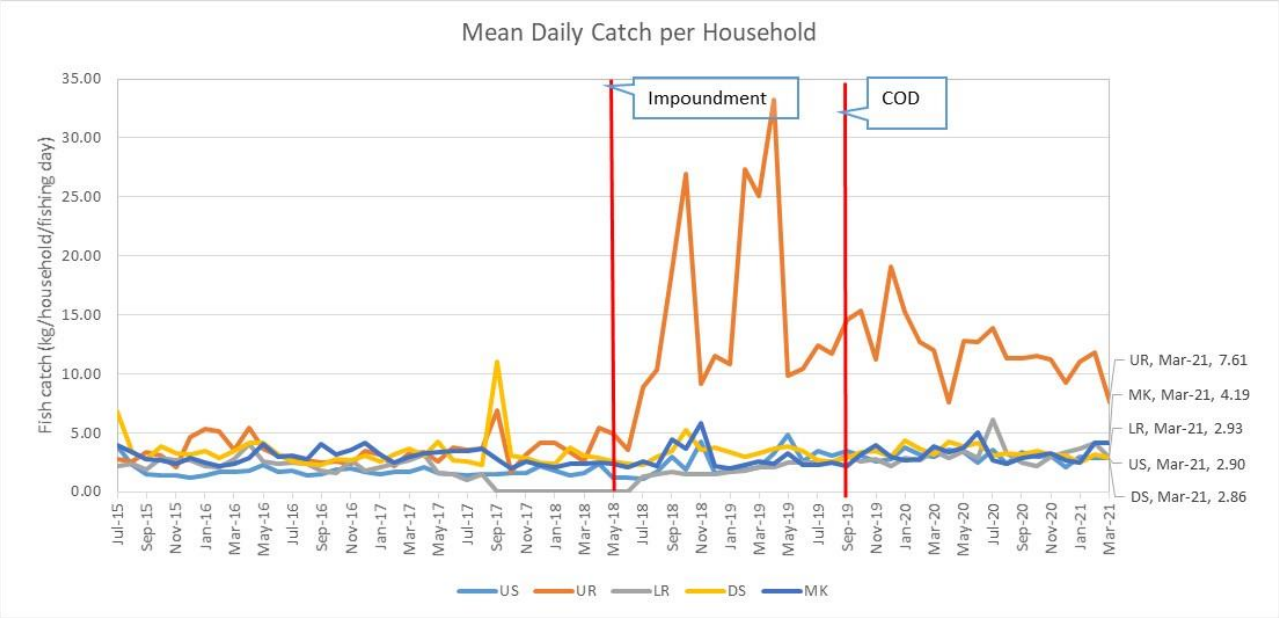


Table 3-6*: *Mean Daily Fish Catch per Household for the month of March from 2016 to 2021

Fishing Zone	March 2016 (kg)	March 2017 (kg)	March 2018 (kg)	March 2019 (kg)	March 2020 (kg)	March 2021 (kg)
Upstream	1.74	1.75	1.60	2.13	2.94	2.90
Upper reservoir	3.60	3.31	2.59	25.08	12.07	7.61
Lower reservoir	2.80	2.64	NA	2.09	3.49	2.93
Downstream	3.45	3.68	3.08	3.23	3.20	2.86
Mekong	2.36	2.95	2.43	2.62	3.87	4.19

The survey results in March 2021 found that tributaries and streams are the main fishing habitat for downstream and lower reservoir zones, while the main fishing habitat in upper reservoir, upstream and Mekong zones are reservoir, Nam Ngiep and Mekong respectively. The proportion of fishing habitats in March 2021 are displayed in ***Table 3-7***.

Table 3-7*: *Proportion of the catch reported by main habitats (%) in March 2021

Habitats	MK	DS	LR	UR	US
Mekong	90.43%	15.62%	0.00%	0.00%	0%
Nam Ngiep	0.00%	26.85%	0.00%	39.32%	64.63%
Nam Xan	0.00%	0.00%	0.00%	0.00%	0%
Reservoir	0.00%	0.00%	3.00%	52.36%	0%
Tributary and stream	0.00%	49.46%	86.88%	7.23%	35.37%
Wetland	9.57%	8.07%	10.13%	1.10%	0%
Others	0.00%	0.00%	0.00%	0.00%	0%

Total reported fish and OAA catch (proportion of OAA) for the same 7-day period from July 2015 to March 2021 are presented in ***Figure 3-5*** and the proportion of OAA catch for the month of March from 2016 to 2021 are shown in ***Table 3-8.***

Figure 3-5: Proportion of OAA to the total reported number of fish and OAA for a 7-day period by fishing zone.

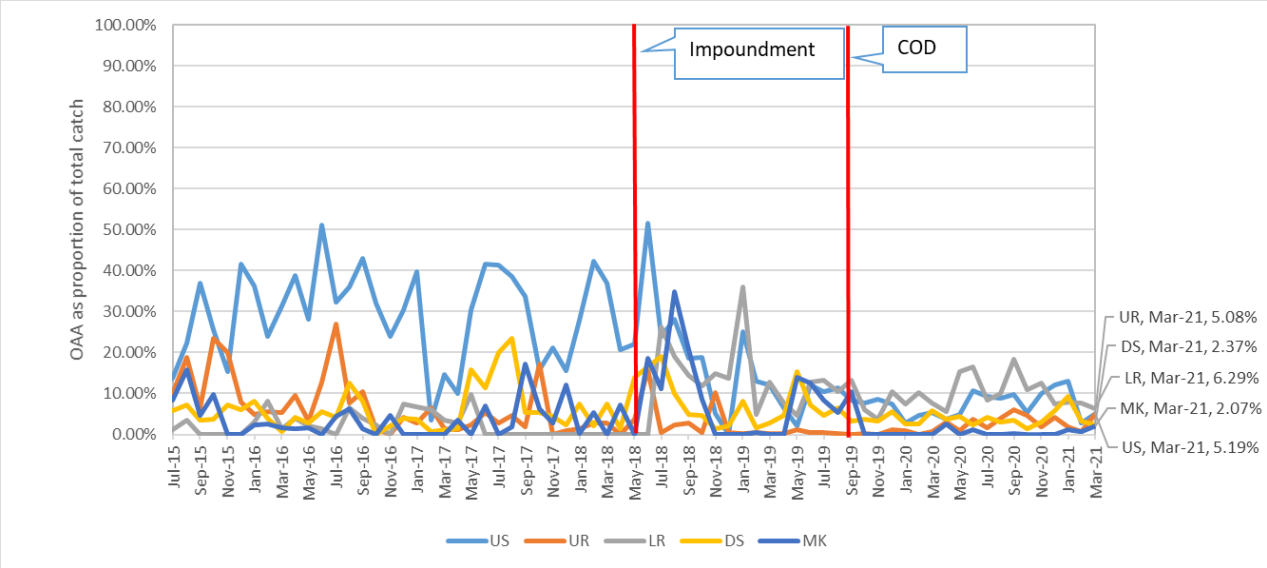


Table 3-8*: *Proportion of OAA to the total reported number of fish and OAA for the month of March from 2016 to 2021

Fishing Zone	March 2016 (kg)	March 2017 (kg)	March 2018 (kg)	March 2019 (kg)	March 2020 (kg)	March 2021 (kg)
Upstream	31.41%	14.66%	36.98%	11.98%	5.43%	5.19%
Upper reservoir	5.38%	1.42%	2.69%	0.28%	0.74%	5.08%
Lower reservoir	1.46%	3.52%	0.00%	12.80%	7.77%	6.29%
Downstream	0.78%	1.13%	7.37%	2.72%	5.72%	2.37%
Mekong	1.53%	0.00%	0.00%	0.00%	0.00%	2.07%

ANNEXES

ANNEX A: RESULTS OF WATER QUALITY MONITORING

TABLE A-1: RESULTS OF MAIN RESERVOIR, RE-REGULATION RESERVOIR AND SURFACE WATER (NAM NGIEP RIVER) QUALITY MONITORING

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Re-reg Reservoir		Downstream			
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG0 6	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
4-May-21	pH	5.0 - 9.0					6.55	6.45						
5-May-21	pH	5.0 - 9.0							6.49	6.95	6.51	6.78	7.12	6.85
13-May-21	pH	5.0 - 9.0					6.96	7						
14-May-21	pH	5.0 - 9.0							6.82	6.88	6.89	7.03	6.94	7.23
17-May-21	pH	5.0 - 9.0					7.09	6.5						
18-May-21	pH	5.0 - 9.0							6.48	6.42	6.68	6.89	6.84	7.05
24-May-21	pH	5.0 - 9.0					6.46	6.51						
25-May-21	pH	5.0 - 9.0							6.54	6.48	6.57	6.82	6.6	6.48
4-May-21	Sat. DO (%)						117.9	115.9						
5-May-21	Sat. DO (%)								21.4	17.1	32.1	34	49.5	62.4
13-May-21	Sat. DO (%)						115.1	116.8						
14-May-21	Sat. DO (%)								11.9	15.4	29.7	35.8	59.1	67.7
17-May-21	Sat. DO (%)						110.5	108.4						
18-May-21	Sat. DO (%)								10.6	15	30.3	39.9	51.6	67.4
24-May-21	Sat. DO (%)						101.2	102.3						
25-May-21	Sat. DO (%)								11.1	8.4	26	54.9	44.8	57.2
4-May-21	DO (mg/L)	>6.0					8.87	8.8						
5-May-21	DO (mg/L)	>6.0							1.81	1.46	2.7	2.8	4.01	5.04
13-May-21	DO (mg/L)	>6.0					8.55	8.72						
14-May-21	DO (mg/L)	>6.0							1.02	1.3	2.47	2.98	4.83	5.51
17-May-21	DO (mg/L)	>6.0					8.14	8.05						
18-May-21	DO (mg/L)	>6.0							0.89	1.25	2.52	3.28	4.22	5.48
24-May-21	DO (mg/L)	>6.0					7.52	7.63						
25-May-21	DO (mg/L)	>6.0							0.92	0.69	2.16	4.56	3.7	4.65
4-May-21	Conductivity (µs/cm)						67	67						
5-May-21	Conductivity (µs/cm)								74	75	74	78	73	72
13-May-21	Conductivity (µs/cm)						67	67						
14-May-21	Conductivity (µs/cm)								76	73	75	77	74	73
17-May-21	Conductivity (µs/cm)						67	67						
18-May-21	Conductivity (µs/cm)								82	80	82	81	79	78
24-May-21	Conductivity (µs/cm)						70	70						
25-May-21	Conductivity (µs/cm)								84	82	83	83	81	81

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Re-reg Reservoir		Downstream			
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG0 6	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
4-May-21	Temperature (°C)						30.07	29.72						
5-May-21	Temperature (°C)								23.53	23.46	24.29	24.92	26.06	26.23
13-May-21	Temperature (°C)						31.01	30.57						
14-May-21	Temperature (°C)								24.16	24.23	24.39	24.91	25.52	25.82
17-May-21	Temperature (°C)						31.51	31.04						
18-May-21	Temperature (°C)								24.28	24.53	24.48	25.15	25.43	26.07
24-May-21	Temperature (°C)						30.58	31.06						
25-May-21	Temperature (°C)								24.55	24.55	24.53	24.86	24.99	25.77
4-May-21	Turbidity (NTU)						0.68	0.78	0.76	0.88	1.06	3.16	2.08	2.71
5-May-21	Turbidity (NTU)													
13-May-21	Turbidity (NTU)						1.02	0.66						
13-May-21	Turbidity (NTU)-hypolimnion						0.76	0.45						
14-May-21	Turbidity (NTU)								0.83	1.34	1.06	1.22	1.28	1.9
17-May-21	Turbidity (NTU)						0.89	0.74						
18-May-21	Turbidity (NTU)								0.77	1.06	1.32	1.28	1.66	2.54
24-May-21	Turbidity (NTU)						1.32	0.97						
25-May-21	Turbidity (NTU)								0.88	1.39	1.51	1.56	1.58	2.17
13-May-21	TSS (mg/L)						<5	<5						
13-May-21	TSS (mg/L)-hypolimnion						<5	<5						
14-May-21	TSS (mg/L)								<5	<5	<5	<5	<5	9.73
13-May-21	BOD_5 (mg/L)	<1.5					<1	<1						
13-May-21	BOD_5 (mg/L)-hypolimnion						<1	<1						
14-May-21	BOD_5 (mg/L)	<1.5							<1	1.18	<1	1	<1	<1
13-May-21	Faecal coliform (MPN/100 mL)	<1,000					0	0						
13-May-21	Faecal coliform (MPN/100 mL)-hypolimnion						0	0						
14-May-21	Faecal coliform (MPN/100 mL)	<1,000							0	13	8	11	70	130
13-May-21	Total Coliform (MPN/100 mL)	<5,000					0	2						
13-May-21	Total Coliform (MPN/100 mL)-hypolimnion						0	0						
14-May-21	Total Coliform (MPN/100 mL)	<5,000							0	79	49	40	350	170

TABLE A-2: RESULTS OF SURFACE WATER QUALITY MONITORING IN NAM CHIAN, NAM PHOUAN, NAM XAO AND NAM HOUAY SOUP

		River Name	Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites			
			Tributaries Upstream		Tributaries Downstream	
		Station Code	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline				
5-May-21	pH	5.0 - 9.0			7.22	7.13
14-May-21	pH	5.0 - 9.0			7.14	7.26
18-May-21	pH	5.0 - 9.0			7.1	7.23
25-May-21	pH	5.0 - 9.0			7	6.97
5-May-21	Sat. DO (%)				60.7	57.9
14-May-21	Sat. DO (%)				74.6	77
18-May-21	Sat. DO (%)				58.3	59.8
25-May-21	Sat. DO (%)				60.3	54.5
5-May-21	DO (mg/L)	>6.0			4.7	4.48
14-May-21	DO (mg/L)	>6.0			6.22	6.06
18-May-21	DO (mg/L)	>6.0			4.38	4.88
25-May-21	DO (mg/L)	>6.0			4.62	4.27
5-May-21	Conductivity (µs/cm)				129	57
14-May-21	Conductivity (µs/cm)				152	59
18-May-21	Conductivity (µs/cm)				151	67
25-May-21	Conductivity (µs/cm)				159	71
5-May-21	Temperature (°C)				28.9	28.49
14-May-21	Temperature (°C)				30.96	27.65
18-May-21	Temperature (°C)				30.33	28.4
25-May-21	Temperature (°C)				29.82	27.9
4-May-21	Turbidity (NTU)				1.69	2.46
14-May-21	Turbidity (NTU)				1.04	1.61
18-May-21	Turbidity (NTU)				1.69	2.17
25-May-21	Turbidity (NTU)				1.6	2.56
14-May-21	TSS (mg/L)				<5	<5
14-May-21	BOD_5 (mg/L)	<1.5			2.28	<1
14-May-21	Faecal coliform (MPN/100 mL)	<1,000			240	240
14-May-21	Total Coliform (MPN/100 mL)	<5,000			240	920

TABLE A-3: RESULTS OF CAMP EFFLUENTS IN MAY 2021

	Site Name	OSOV1 (Owner's Site Office and Village)		OSOV2 (ESD Camp)		Main Powerhouse	
	Station Code	EF01		EF13		EF19	
	Date	06-May-21	20-May-21	06-May-21	20-May-21	06-May-21	20-May-21
Parameters (Unit)	**Guideline**						
pH	6.0 - 9.0	6.55	6.26	7.73	7.52	6.84	
Sat. DO (%)		18.1	19.1	4.8	20.4	86.1	
DO (mg/L)		1.42	1.46	0.37	1.55	6.45	
Conductivity (µs/cm)		553	597	482	914	1,054	No
Temperature (°C)		28.35	29.35	27.73	29.15	30.43	Discharge
Turbidity (NTU)		2.26	3.97	2.84	22.1	7.27	
TSS (mg/L)	<50	11.3	14.95	<5	7.2	39.3	
BOD_5 (mg/L)	<30	12.96	29.49	41.58	<6	7.26	
COD (mg/L)	<125	n/a	n/a	n/a	n/a	n/a	
NH_3-N (mg/L)	<10.0	n/a	n/a	n/a	n/a	n/a	
Total Nitrogen (mg/L)	<10.0	n/a	n/a	n/a	n/a	n/a	
Total Phosphorus (mg/L)	<2	n/a	n/a	n/a	n/a	n/a	
Oil & Grease (mg/L)	<10.0	n/a	n/a	n/a	n/a	n/a	
Total coliform (MPN/100 mL)	<400	16,000	16,000	35,000	0	240	
Faecal Coliform (MPN/100 mL)	<400	16,000	16,000	35,000	0	79	
Effluent Discharge Volume (L/mn)		4	6	3	6	1500	
Chlorination Dosing Rate (mL/mn)		n/a	n/a	5.00	40.00	375	
Residual Chlorine (mg/L)	<1.0	n/a	n/a	0.02	0.98	0.57	