



NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

February 2021




					
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REV	DATE	AUTHOR	CHECKED	APPROVED	MODIFICATION DETAILS
<u>Accessibility</u>		Document No. NNP1-O-J0904-RP-002-A			
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EXECUTIVE SUMMARY

The preparation of ISO 14001:2015 documentation is in progress of review and preparation including a Standard Operating Procedure of Environment Aspects Assessment and its relating forms. The assessment of environment aspects and its impact is scheduled to be conducted with the relevant parties in March 2021.

During February 2021, EMO received no document for review and approval.

With regard to the comments of Bolikhan-Environment Management Unit (EMU) on the low percentage of vegetation cover at the two decommissioned sites, the VSP contractor completed topsoil covering at the Phouhomxay Village's Irrigation Canal Rock and Spoil Disposal area in February 2021. EMO also issued a Site Inspection Report to instruct the HM Hydro contractor implement additional measures at the former LILAMA10 Camp.

The selection of the contractor for wastewater treatment system improvement and modification is still in PCD process. It is expected to have a qualified contractor onboard by mid-March 2021.

In February 2021, Dissolved Oxygen (DO) levels at the surface of the main reservoir were generally between 6 and 11 mg/L which was higher than in January 2021. In the re-regulation reservoir, the DO levels were below 4 mg/L.

During the first half of January 2021, the discharge from the re-regulation dam mainly went through the turbine and occasionally through the gate, and mainly through the gate during the second half of the month. The DO levels during the gate discharge were greater than 6 mg/L at the stations in Nam Ngiep immediately downstream of the Re-regulation Dam and complied 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 February 2021, a total of 15 m³ of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 3.7 m³ compared with January 2021. A total of 14.4 m³ of solid waste from Phouhomxay, Thaheua and Hat Gniun Villages was disposed of at Houay Soup Landfill. No recycle waste trade activities in the Community Waste Bank during the reporting period. A one-year service contract of MH Trading Construction and Trading Export-Import Sole Co., Ltd. for solid waste management and the two landfills operation ended on 26 February 2021.

NNP1PC has received technical proposals from three interested bidders (in district and provincial levels) for the service of solid waste management and landfill operation at the Project and community landfills. The selection process is expected to complete within March 2021.

The reservoir patrolling under NNP1 WMP by Xaysomboun and Bolikhamxay WRPO continued in February 2021. Biodiversity offset related activities under the components of law enforcement, community outreach, and conservation linked livelihood in the NC-NX offset site continued in February 2021.

The fish catch monitoring for January 2021 in Nam Ngiep watershed was dominated by *Oreochromis niloticus*, *Channa striata* and *Scaphiodonichthys acanthopterus* and species groups

of *Poropuntius* and *Hampala* 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 of ISO 14001:2015 documentation is in progress of review and preparation including a Standard Operating Procedure of Environment Aspects Assessment and its relating forms. The assessment of environment aspects and its impact is scheduled to be conducted with the relevant parties in March 2021.

TABLE 1-1: ENVIRONMENTAL MANAGEMENT SYSTEM WORK PLAN

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: <ul style="list-style-type: none"> - 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 1 st 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 2 nd Stage Audit						
13	Certify of ISO14001:2015 upon successful completion of the audit						

1.2 COMPLIANCE MANAGEMENT

In February 2021, EMO received no document for review and approval.

There were three Observations of Non-Compliance issued during February 2021. The status of compliance reports (Observation of Non-Compliance or ONC, Non-Compliance Report or NCR) issued by NNP1PC is summarized in **Table 1-2** and the status of the ONCs and NCRs that are unsolved exceeding deadlines are presented in **Table 1-3**.

TABLE 1-2: SUMMARY OF ONCs AND NCRs

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from January 2021	2	2	0	0
Newly Opened in February 2021	2	0	0	0
Total in February 2020	4	2	0	0
Resolved in February 2021	1	0	0	0
Carried over to March 2021	3	2	0	0
Unsolved Exceeding Deadlines	1	2	0	0

TABLE 1-3: SUMMARY OF THE ONCs AND NCRs THAT ARE UNSOLVED EXCEEDING DEADLINES

Document Number / Date of Issue	Subject Description	Current Status at the end of February 2021
ONC_AM-0003 / 28 Feb 2020	Issued to ADM to improve the second wetland pond similarly to the first wetland pond. (Based on the LTA's recommendation made during the mission in August 2019 to improve the OSOV's WWTS)	The selection of the contractor is expected to be completed with start of work in March 2021.
NNP1-ESD-EMO-NCR-VSP-0001 / 13 Jul 2020 (NCR Level 1)	Non-Compliance with site rehabilitation at the Spoil Disposal Area for the construction of the irrigation canal.	On 02 February 2021, the VSP contractor completed topsoil covering at the Phouhomxay Village's Irrigation Canal Rock and Spoil Disposal area. <i>The NCR1 will be closed after the site is inspected and accepted by the relating GOL's agencies.</i>
NNP1-ESD-EMO-NCR-HM-0007 / 06 Apr 2020 (NCR Level 1)	Non-Compliance with the site revegetation requirements at HM Hydro's Labour Camp No.2 (LILAMA10 Camp).	With regard to the comments of Bolikhan-Environment Management Unit (EMU) on the low percentage of vegetation cover during their monthly site visit in January 2021, EMO issued a Site Inspection Report to instruct the HM Hydro contractor implement additional measures at the former LILAMA10 Camp on 10 February 2021.

Document Number / Date of Issue	Subject Description	Current Status at the end of February 2021
		<i>The NCR1 will be closed after the Contractor has completed adding topsoil or other acceptable additional measures.</i>

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 February 2021.

A meeting with the Head of Bolikhan EMU was held on 15 February 2021 to discuss on the community solid waste management and the Houay Soup landfill operation matter and the handing over plan to GOL by 2022.

1.2.2 Site Decommissioning and Rehabilitation

A total of 32 revegetation sites were continually monitored in February 2021. The respective responsible civil work contractor and sub-contractors completed the final site decommissioning and cleaned up of temporary huts, fence of the re-vegetation sites and water pipe lines at the rehabilitation areas.

On 02 Feb 2021, the VSP contractor completed topsoil covering at the Phouhomxay Village's Irrigation Canal Rock and Spoil Disposal area.

After the Environment Management Unit (EMU) of Bolikhan District monthly site visit on 20 January 2021, EMO has received the official comments from the EMU on the low percentage of vegetation cover at the two decommissioned sites on 02 February 2021 and EMO issued a Site Inspection Report to instruct the HM Hydro contractor implement additional measures at the former LILAMA10 Camp on 10 February 2021.

FIGURE 1-1: PHOTOS OF CONTRACTOR'S CORRECTIVE ACTION AT THE PHOUHOMXAY VILLAGE'S IRRIGATION CANAL ROCK AND SPOIL DISPOSAL AREA



1.3 ENVIRONMENTAL QUALITY MONITORING

The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD₅), 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/>

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 February 2021 indicated non-compliances for some parameters in 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 FEBRUARY 2021

Site	Sampling ID	Status	Corrective Actions
OSOV1	EF01	Non-compliance for Total coliform in the first fortnightly sampling. However, fully compliance in the second fortnightly sampling.	The selection of a qualified Contractor is under process to improve the WWTSS in OSOV1 and the Main Dam as well as modify the WWTSS in OSOV2. The selection of the contractor is expected to be completed with start of work in March 2021.
OSOV2	EF13	Non-compliance for Ammonia Nitrogen and Total Nitrogen.	
Main Powerhouse	EF19	Non-compliance for Ammonia Nitrogen (first fortnightly sampling), Total Phosphorus (second fortnightly sampling) and Total Nitrogen.	

1.3.2 Ambient Surface Water Quality Monitoring

The ambient surface 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 1-2**.

The monitoring results for key parameters (DO, TSS and BOD₅) during February 2021 are presented in **Table 1-5, Table 1-6 and Table 1-7**. The full set of data for February 2021 is attached in **Annex A**. In addition, the results for DO are presented as line graphs in **Figure 1-3**.

Main Reservoir

From 01 to 28 February 2021, the water level in the main reservoir decreased from El. 311.10 m asl to El. 309.51 m asl.

At R05, the station closest to the main dam, as the water temperature increased and the thermocline was clearly observed in a shallower layer with higher DO levels in the upper 10 m varied between 6.2 mg/L and 8.6 mg/L. The stable stratification was recorded and the anoxic condition started to occur at the depth between 30 m to 60 m.

At R04, the DO levels in the upper 8.5 m varied between 5.6 mg/L and 9.5 mg/L. Below 13 m, the DO levels gradually fell to below 0.1 mg/L.

The DO levels at R03 were recorded between 5.3 mg/L and 10.7 mg/L in the upper 7 m, and at deeper levels, the DO concentrations were dropped from about 5 mg/L to 0.1 mg/L.

The DO levels at R02 were recorded between 5.7 mg/L and 10.8 mg/L in the upper 6 m, and at deeper levels, the DO concentrations were generally between 1 mg/L and 7 mg/L with occasional concentrations below 1 mg/L.

At R01, the DO levels were generally between 6.9 mg/L and 11.3 mg/L in the entire water column.

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 BOD₅ measurements at R03, R04 and R05 in the epilimnion were less than 1.0 mg/L, but in the hypolimnion, BOD₅ was recorded less than 1.0 mg/L at R03 and R04, and 2.9 mg/L at R05.

Re-regulation Reservoir

In February 2021, the turbine discharges from the main powerhouse varied between 12 and 242 m³/s usually interrupted by night-time periods with no discharge.

The DO measurements at R06 and R07 representing turbine discharges from the main dam generally had DO concentrations below 4 mg/L in the entire water column.

The BOD₅ concentrations in R06 and R07 was 3.1 mg/L and 2.6 mg/L respectively.

Downstream

During the first half of January 2021, the discharge from the re-regulation dam mainly went through the turbine and occasionally through the gate, and mainly through the gate during the second half of the month. The DO levels during the gate discharge were greater than 6 mg/L at the stations in Nam Ngiep immediately downstream of the Re-regulation Dam and complied 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.

The BOD₅ in the downstream station (NNG05) was less than 1 mg/L and complied with the national surface water quality standard.

FIGURE 1-2: SURFACE WATER AND RE-REGULATION RESERVOIR WATER QUALITY MONITORING STATIONS

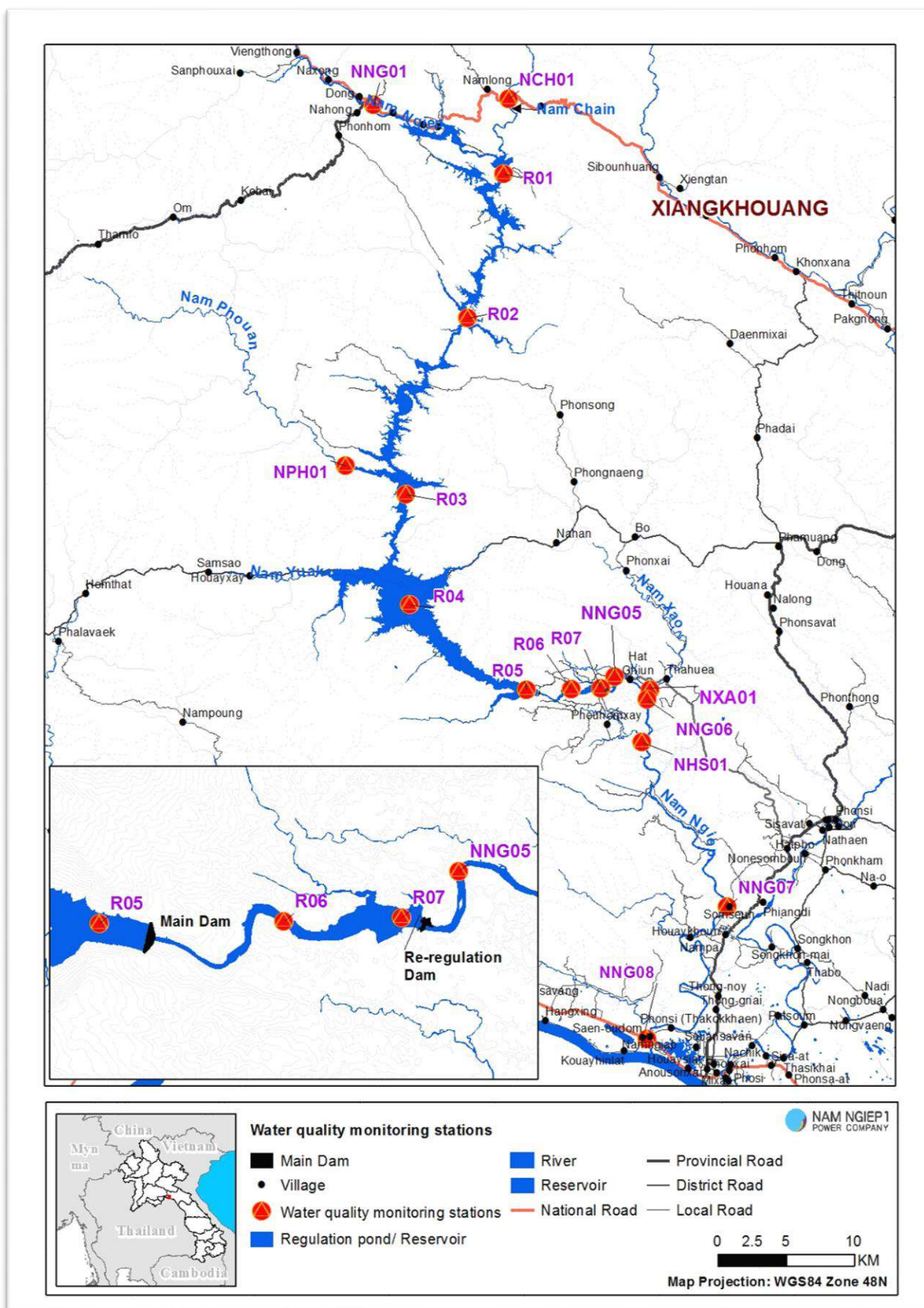


FIGURE 1-3: CONCENTRATION OF DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M SINCE SEPTEMBER 2019 TO FEBRUARY 2021

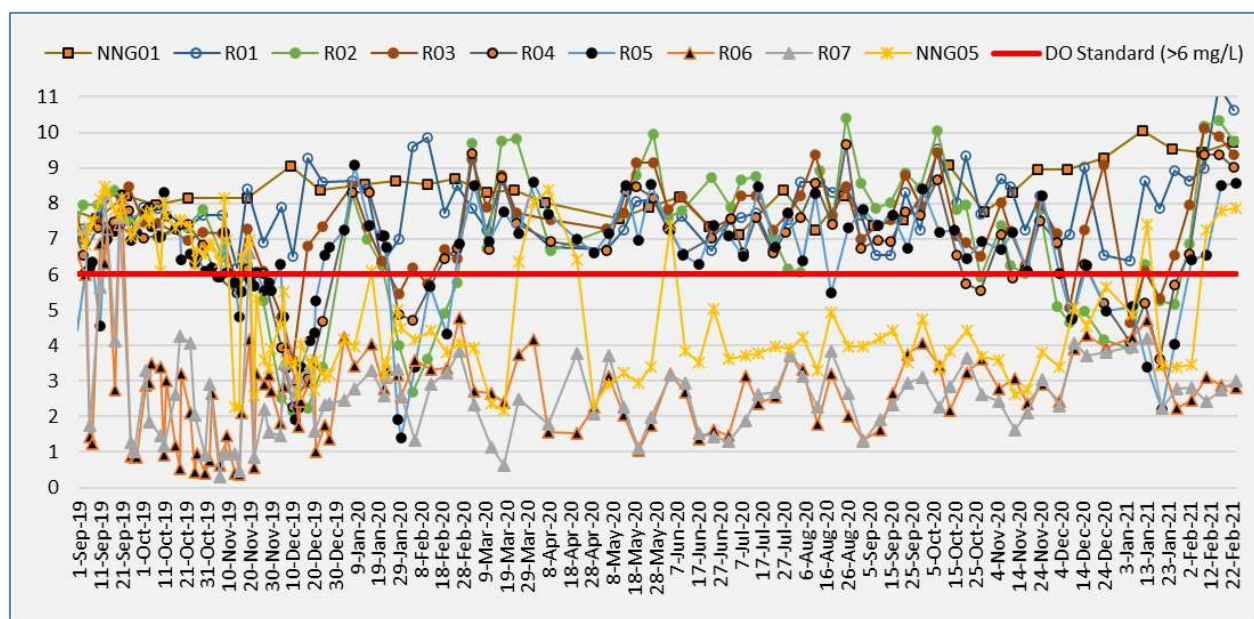


TABLE 1-5: RESULTS OF SURFACE WATER QUALITY MONITORING FOR DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M, NATIONAL WATER QUALITY STANDARD: >6.0 MG/L

DO (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
2-Feb-21		8.63	6.86	7.95	6.59									8.55		
3-Feb-21						6.41	2.45	2.82	3.45	3.59	4.78	5.43			7.17	6.04
8-Feb-21	9.44												9.58			
9-Feb-21		9.0	10.19	10.12	9.38									11.04		
10-Feb-21						6.56	3.12	2.44	7.25	6.72	5.57	6.08			6.9	6.98
16-Feb-21		11.3	10.34	9.89	9.38									10.26		
17-Feb-21						8.51	2.87	2.75	7.8	6.7	5.13	5.1			7.71	7.27
22-Feb-21	9.72												9.15			
23-Feb-21		10.62	9.75	9.37	9.01									9.29		
24-Feb-21						8.57	2.81	3.01	7.86	7.36	7.44	7.28			7.43	7.61

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
08-Feb-21	<5												<5			
09-Feb-21		5.12		<5	<5									144		
09-Feb-21 Hypolimnion				<5	<5											
10-Feb-21						<5	<5	<5	<5	<5	<5	7.7			10.56	20.6
10-Feb-21 Hypolimnion						<5										

TABLE 1-7: RESULTS OF SURFACE WATER QUALITY MONITORING FOR BOD₅ (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
08-Feb-21	<1												<1			
09-Feb-21		<1		<1	<1									3.3		
09-Feb-21 Hypolimnion				<1	<1											
10-Feb-21						<1	3.06	2.56	<1	<1	<1	<1			1.26	2.28
10-Feb-21 Hypolimnion						2.92										

1.3.3 Groundwater Quality Monitoring

During February 2021, community groundwater quality analyses were carried out for six wells located in Somseun Village, Nam Pa Village, Thong Noy Village, Pou Village and Phouhomxay Village. The community groundwater samples were taken from household's water tap, except in Phouhomxay Village where the groundwater samples were taken at the sampling points before entering into the water storage tank.

The results indicate that:

- One out of two wells in Phouhomxay Village (GPHX01) non-comply with the groundwater quality standards for Total Iron,
- One well in Somsuen Village and one well in Nam Pa Village non-comply for pH.
- One well in Thong Noy Village non-comply for pH, Faecal coliform and E.coli bacteria.
- One well in Pou Village comply fully with the groundwater quality standards.

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

	Site Name	Phouhomxay Village		Somseun Village	Nampa Village	Thongnoy Village	Pou Village
Parameter (Unit)	Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01
	Guideline						
pH	6.5 - 9.2	6.13	6.00	6.11	6.24	6.37	7.89
Sat. DO (%)		45.9	52	66.8	86.4	80	96.9
DO (mg/l)		4.01	4.42	5.61	7.97	6.97	7.8
Conductivity (µS/cm)		121.6	293	228	276	271	18.59
Temperature (°C)		20.4	22.0	22.5	21.9	20.5	24
Turbidity (NTU)	<20	6.21	3.28	3.64	3.81	3.97	2.53
Faecal coliform (MPN/100mL)	0	0	0	0	0	240	0
E.coli Bacteria (MPN/100mL)	0	0	0	0	0	240	0
Arsenic (mg/L)	<0.05	<0.0003	0.0005	0.0011	0.0007	0.0016	<0.0003
Cadmium (mg/L)	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Total Iron (mg/L)	<1	1.66	0.185	0.009	0.012	0.017	0.010
Total hardness (mg/L)	<300	91.5	232	165	179	189	15.5
Lead (mg/l)	<0.05	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003

1.3.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

Although the two new groundwater boreholes (*GPHX01* and *GPHX02* – **Table 1-8**) were connected to the existing water supply tanks commencing on 21 October 2020 (and as mentioned in Section **Error! Reference source not found.**, these groundwater samples complied with the *GOLD Rinking Water Standards* for all parameters except total Iron in *GPHX01*), in February 2021, the surface water from Houay Soup Stream is still used occasionally as alternative water supply source for Phouhomxay Village.

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

Faecal Coliform and *E.coli* exceeded the standards in the water supply of Thaheua Village (WTHH02), Hat Gnuin Village (WHGN02) and Phouhomxay Village (WPHX02 – Primary School Water Tap and WPHX03 – Household Water Tap). As observed in the field during water sampling, livestock are roaming around the water intake areas which may 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 - 8.5	6.26	6.33	6.83	6.66
Sat. DO (%)		104	103.2	94.6	93.4
DO (mg/L)		8.84	8.35	8.54	8.46
Conductivity (μS/cm)	<1,000	42.3	57.2	17.7	15.98
Temperature (°C)	<35	21.8	20.1	22.3	22.7
Turbidity (NTU)	<10	6.22	6.48	4.26	3.7
Faecal Coliform (MPN/100 mL)	0	22	7.8	79	79
E.coli Bacteria (MPN/100 mL)	0	22	7.8	49	23
Arsenic (mg/L)	<0.05	<0.0003	<0.0003	<0.0003	<0.0003
Cadmium (mg/L)	<0.003	<0.002	<0.002	<0.002	<0.002
Iron (mg/L)	<1.0	0.099	0.09	0.115	0.13
Lead (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01
Total hardness (mg/L)	<300	34.3	44.1	15.5	17.1
Mercury (mg/L)	<0.001	<0.0002	<0.0002	<0.0002	<0.0002

1.3.5 Landfill Leachate Monitoring

During February 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

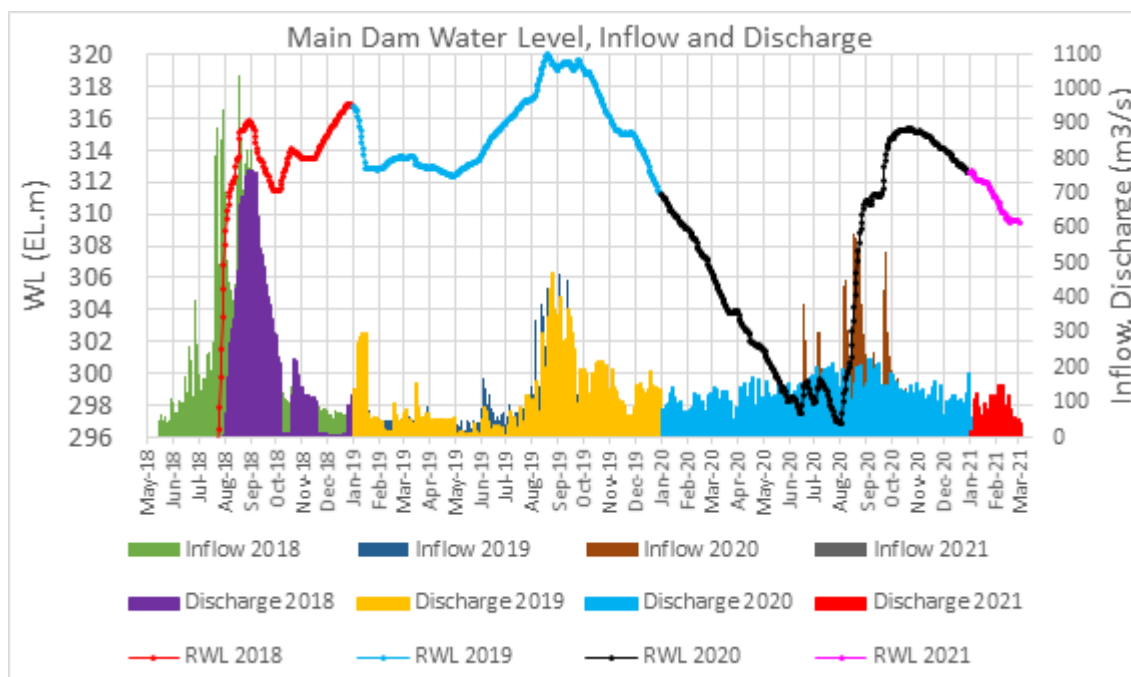
The water level in the main reservoir, inflow to the reservoir and discharge from the reservoir have been monitored since the start of the impounding on 15 May 2018. The graph in

Figure 1-4 presents the values recorded since May 2018.

During February 2021, the mean inflow to the main reservoir was 46 m³/s. The minimum and maximum inflows were 24 (on 12 February 2021) and 100 m³/s (on 10 February 2021) respectively.

From 01 to 28 February 2021, the water level of the main reservoir slightly decreased by 1.59 m from El. 311.10 m asl to El. 309.51 m asl.

In February 2021, the turbine discharges from the Main Powerhouse varied between 12 and 242 m³/s usually interrupted by night-time periods with no discharge.

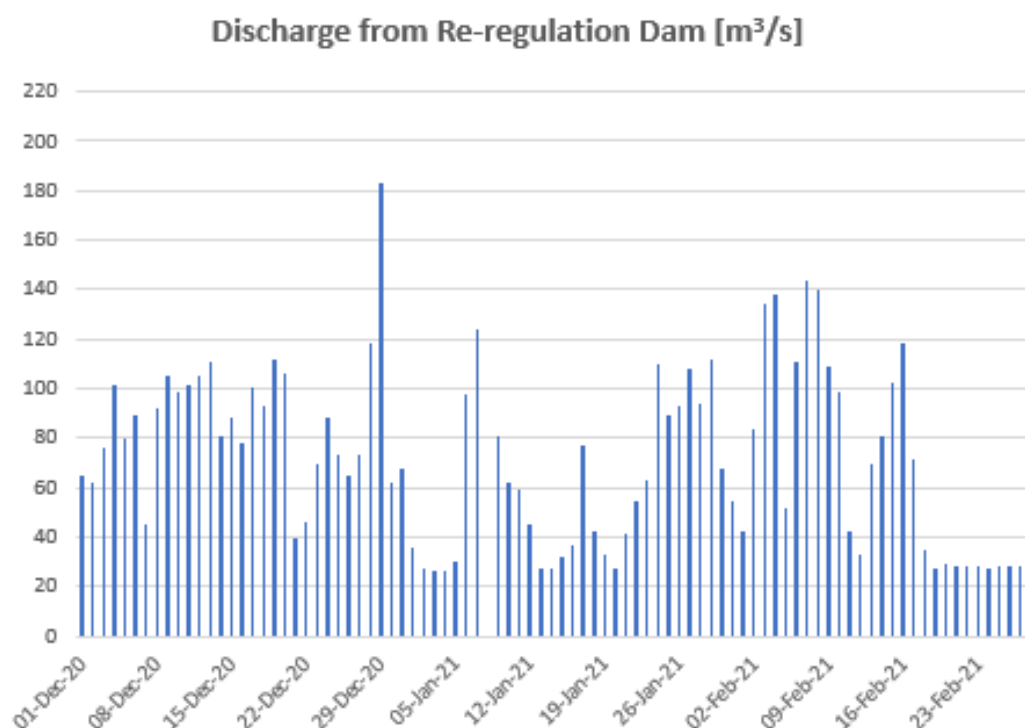
FIGURE 1-4: WATER LEVEL, INFLOW AND DISCHARGE FOR THE MAIN RESERVOIR

1.4.2 Re-regulation Reservoir – Discharge

The discharge monitoring data for the re-regulation dam during December 2020 to February 2021 is presented in **Figure 1-5**.

During February 2021, the mean discharge from the Re-regulation Dam was about 68 m³/s with turbine discharges varying between 49 m³/s and 161 m³/s, combined with gate discharge varying between 27 m³/s and 203 m³/s. The discharge was kept above the minimum flow requirement of 27 m³/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 1-5: DISCHARGE MONITORING AT THE RE-REGULATION DAM IN DECEMBER 2020 TO FEBRUARY 2021

1.4.3 Nam Ngiep Downstream Water Depth Monitoring

In February 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. During the discharge rates between 28 and 29 m³/s, there are two of the sites (on 10 February 2021), six of the sites (on 17 February 2021) and four of the sites (on 24 February 2021) were recorded having a water depth less than 0.5 m.

1.5 PROJECT WASTE MANAGEMENT

1.5.1 Solid Waste Management

In February 2021, a total of 15 m³ of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 3.7 m³ compared with January 2021.

During February 2021, the local Waste Collection Contractor continued their routine operation and maintenance activities of both landfills which included waste separation, waste covering and waste inventory, and clean-up of scattered waste until their last working day. A one-year service contract of the local contractor MH Trading Construction and Trading Export-Import Sole Co., Ltd. for solid waste management and the two landfills operation ended on 26 February 2021.

NNP1PC has received technical proposals from three local interested bidders (in district and provincial levels) for the service of solid waste management and landfill operation at the Project and the community landfills. The selection process is expected to complete within March 2021.

During this transition period, NNP1PC ADM team was requested to support for collecting solid wastes in the project areas, and NNP1PC EMO also scheduled to conduct weekly waste collection from the three villages and transport to dispose at the Houay Soup landfill.

A total of 216 kg recyclable waste was sold this month. The cumulative amounts are presented in **Table 1-10**.

TABLE 1-10: AMOUNTS OF RECYCLABLE WASTE SOLD

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by February 2021
1	Plastic Bottle	kg	63	64
2	Aluminium	kg	143	35
3	Paper/Cardboard	kg	10	72
4	Glass	kg	0	112
Total		kg	216	283

The villagers from Phouhomxay Village collected a total of 580 kg of food waste from the OSOV1 canteen for animal feed in January 2021, an increase of 70 kg compared with January 2021.

1.5.2 Hazardous Materials and Waste Management

The types and amounts of hazardous material and hazardous waste stored on site in February 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 February 2021 (A)	Used (B)	Remaining (A – B)
1	Diesel	Litre	9,590	4,066	5,524
2	Gasoline	Litre	889	320	569
3	Lubricant (Turbine oil)	Litre	7,210	0	7,210
4	Colour Paint	Litre	266	0	266
5	Thinner	Litre	12	0	12
6	Grease Oil	Litre	725	0	725
7	Gear Oil	Litre	220	0	220
8	Chlorine Liquid	Litre	80	50	30
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 February 2021 (A)	Disposed (B)	Remaining (A - B)
1	Used Oil (Hydraulic and Engine)	Litre	452.3	0	452.3
2	Empty 200L drum of used oil	Unit	3	0	3
3	Contaminated soil, sawdust and textile material	m ³	0.52	0	0.52
4	Used tires	Piece	18	0	18
5	Empty 20L chemical drum	Drum	6	0	6
6	Lead battery	Unit	7	0	7
7	Empty paint and spray cans	Can	138	0	138
8	Halogen/fluorescent bulbs	Unit	259	0	259
9	Empty cartridge (Ink)	Unit	176	0	176
10	Clinic Waste	Kg	9.5	0	9.5

1.6 COMMUNITY WASTE MANAGEMENT

1.6.1 Community Recycling Programme

In February 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. In addition, there were also less trading activities in the project site and nearby communities due to reduced amounts of recyclable waste after the completion of project construction and decommissioning of the contractors' camps.

A total amount of recyclable waste in the waste bank is 2,519 kg which maintains the same amount as recorded in January 2021.

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

Types of Waste	Unit	Remaining in January 2021	Additional in February 2021	Sold/ dispose	Remaining in February 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 February 2021, approximately 14.4 m³ of solid waste was collected from Phouhomxay Village and the host villages for disposal at the Houay Soup Landfill, an increase of 1.9 m³ compared with January 2021.

A one-year service contract of the local contractor for solid waste management and the Houay Soup landfill operation ended on 26 February 2021. During this transition period, NNP1PC-EMO scheduled to conduct weekly waste collection from the three villages and transport to dispose at Houaysoup landfill.

FIGURE 1-6: WASTE MANAGEMENT ACTIVITIES DURING FEBRUARY 2021

<p>THE CONTRACTOR'S FINAL MAINTENANCE FOR THE NNP1 LANDFILL</p>	<p>THE FINAL WASTE COVER AT HSL BY THE EXISTING LOCAL WASTE COLLECTION CONTRACTOR</p>
	
<p>STATUS OF NNP1 LANDFILL ON THE LAST WORKING DAY OF THE EXISTING LOCAL WASTE COLLECTION CONTRACTOR</p>	<p>STATUS OF HSL ON THE LAST WORKING DAY OF THE EXISTING LOCAL WASTE COLLECTION CONTRACTOR</p>
	

2. WATERSHED AND BIODIVERSITY MANAGEMENT

2.1 WATERSHED MANAGEMENT

2.1.1 Implementation of Annual Implementation Plan (AIP) 2020

Xaysomboun WRPO continues the reservoir patrolling in the last week of February 2021.

EMO submitted the official review of the detailed design and Bill of Quantity (BoQ) of the sub-office of Xaysomboun WRPO which will be established at Ban Houay Xay of Hom District under the approved AIP2020.

EMO has reviewed the report prepared by Bolikhamxay WRPO on the forest resources utilization at the six adjacent villages to NNP1 watershed.

Bolikhamxay completed the reservoir patrolling on 08 February 2021 and the results are recorded in the SMART database.

EMO team installed two reservoir signs at the access to TPZ1 in Thathom District and TPZ2 in the third week of February 2021.

EMO was also exploring the collaboration opportunities with GOL institutions and universities for providing training courses on the land-use and forest resources management to WRPO and GOL staff under the Activity 1.4 of the approved NNP1 WMP - Strengthening of institutional capacity of village authorities, WRPO and relevant government agencies related to land use and natural resource management. A meeting with professors of Agriculture and Forestry College of Bolikhamxay was organized on 16 February 2021 to discuss on this collaboration opportunities.

FIGURE 2-1: RESERVOIR SIGNS AT THE ENTRY OF TPZ1 (LEFT PHOTO) AND TPZ2 (RIGHT PHOTO)



2.1.2 Preparation of Annual Implementation Plan (AIP) 2021

Bolikhamxay WRPO is still improving the draft AIP2021 in February 2021.

EMO has finalized the comments and made further improvement on the drafted AIP2021 of Xaysomboun WRPO on 09 February 2021. The draft is being reviewed by Xaysomboun WRPO for their confirmation prior to further submission to ADB and BSP.

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 February 2021 are described below:

a. Component 1 - Spatial Planning and Regulation

The TPZ boundary demarcation in the remaining village, Ban Vangphieng of Viengthong district was postponed to March 2021.

b. Component 2 – Law Enforcement

The four patrol teams continued the patrolling between 05 February 2021 to the first week of March 2021 in which three teams focused on TPZ Highest priority area and one team focused on Nam Ma TPZ High priority area. The results of patrolling in February 2021 will be presented and discussed in March 2021 Monthly Report.

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

Team	Patrolling Area/distance	Observations/Actions Taken
1	Nam Kha Gni, Nam Houng, Nam Lak, Nam Cham Hang, Nam Chantui and Houy Kasae (16 days covering a distance of 97 km of forest patrol and 21 km of road patrol)	The team heard a gunshot at Nam Cham Hang and assumed that it was shot by local hunter(s) either from Sopkhone or Meungcham village.
2	TPZ highest priority area including Nam Chang and Nam Sone (16 days covering a distance of 89 km on forest patrolling and 24 km on road patrolling)	The team did not encounter any threats during patrolling but found carcasses at Nam Chang including one fresh muntjac, some fresh internal organs of a serow and some old hair and bones of a civet. There were no trace of hunters or poachers around the areas, and so it was assumed that these carcasses caused by other predators.
3	TPZ highest priority area including Nam Chouan, Nam Sone, Houay Xay Noi and Houay Xay Gnai	The team found and destroyed a fresh hunting camp at Houay Xay Gnai that was used by local hunters from the villages in the northwest of NC-NX offset site.

Team	Patrolling Area/distance	Observations/Actions Taken
	(16 days covering a distance of 61 km on forest patrolling and 18 km on road patrolling)	
4	TPZ highest priority area around Nam San (16 days covering a distance of 70 km on forest patrolling)	The team did not encounter any threats during patrolling but found a carcass of a wild pig at Nam San which was assumed caused by hunting.

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

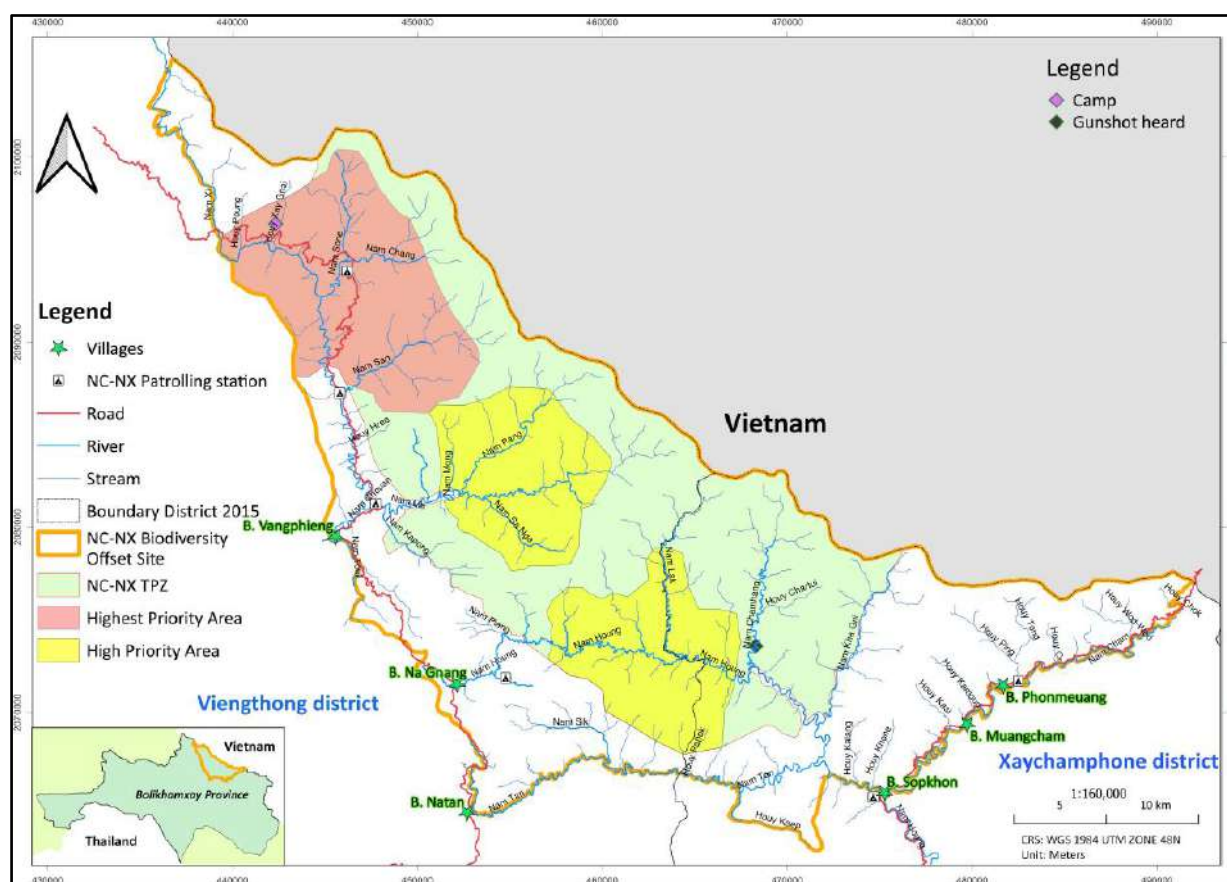


FIGURE 2-3: FRESH CARCASS OF MUNTJAC OBSERVED BY PATROLLING TEAM AT NAM CHANG**FIGURE 2-4: FRESH HUNTING CAMP AND WILDLIFE TRAP OBSERVED BY PATROL TEAM AT TPZ HIGHEST PRIORITY AREA**

c. Component 3 – Conservation Outreach

BSP team presented and discussed with EMO and NC-NX BOMU on the overall schedule of outreach activity in 2021 on 03 February 2021. Further discussion on the results of pre-assessment survey was postponed to the first week of March 2021.

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.

BSP is finalizing the snare removal plan based on the comments provided and discussed in February 2021. The team establishment and training are scheduled in the second week of March 2021.

e. Component 6 – Biological Monitoring

EMO and BSP team had discussion on 22 February 2021 on the improved monitoring matrix and the preparation of other surveys that are scheduled in 2021. BSP will have further discussion with ADB and IAP on the fishery survey and bird survey in the NC-NX offset site, and turtle survey in the NNP1 watershed.

NC-NX BOMU, EMO, and BSP team completed the camera traps retrieving in the second week of February 2021. There are a total of six camera traps and one memory cards lost on site. EMO extracted and compiled all the images from the camera traps for further analysis by BSP team.

2.2.2 Preparation of Annual Implementation Plan (AIP) 2021

Bolikhamxay NC-NX BOMU submitted the improved draft plan to EMO on 27 January 2021. The draft plan in English was finalized and submitted to ADB and IAP on 18 February 2021. ADB and IAP provided their comments on 18 and 22 February 2021 respectively. EMO and BSP Team have

provided the clarification accordingly and the improved plan was re-submitted to ADB and IAP on 26 February 2021 for their confirmation and approval.

3. FISHERY MONITORING

Two species groups and three species dominated the fish catch by weight in January 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 January 2021

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Poropuntius normani</i> , <i>Poropuntius laoensis</i> , <i>Poropuntius carinatus</i>	ປາຈາດ	115.5	LC
<i>Hampala dispar</i> , <i>Hampala macrolepidota</i>	ປາສຸດ	92.7	LC
<i>Oreochromis niloticus</i>	ປານິນ	72.6	LC
<i>Channa striata</i>	ປາຄໍ້	63.2	LC
<i>Scaphiodonichthys acanthopterus</i>	ປາມ້ອມ	35.4	DD

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

Table 3-2: Threatened Species of January 2021 Fish Catch

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Cirrhinus molitorella</i>	ປາແກງ	8	NT
<i>Cyprinus carpio</i>	ປາໄນ	13.8	VU
<i>Neolissochilus stracheyi</i>	ປາສອງ	1.8	NT
<i>Onychostoma gerlachi</i>	ປາຄຶງ	6.3	NT
<i>Scaphognathops bandanensis</i>	ປາວຽນໄຟ/ປາປ່ຽນ	10.6	VU
<i>Tor sinensis</i>	ປາແກງ	26.6	VU

The total recorded monthly fish catch for the downstream and upstream fishing households and the Mekong control group involved in the monitoring programme from July 2015 to January 2021 is presented in **Figure 3-1**. Note that the upstream fish catch excludes the fish catch from the fishing households in Zone 2LR because these households were resettled during Q4-2017.

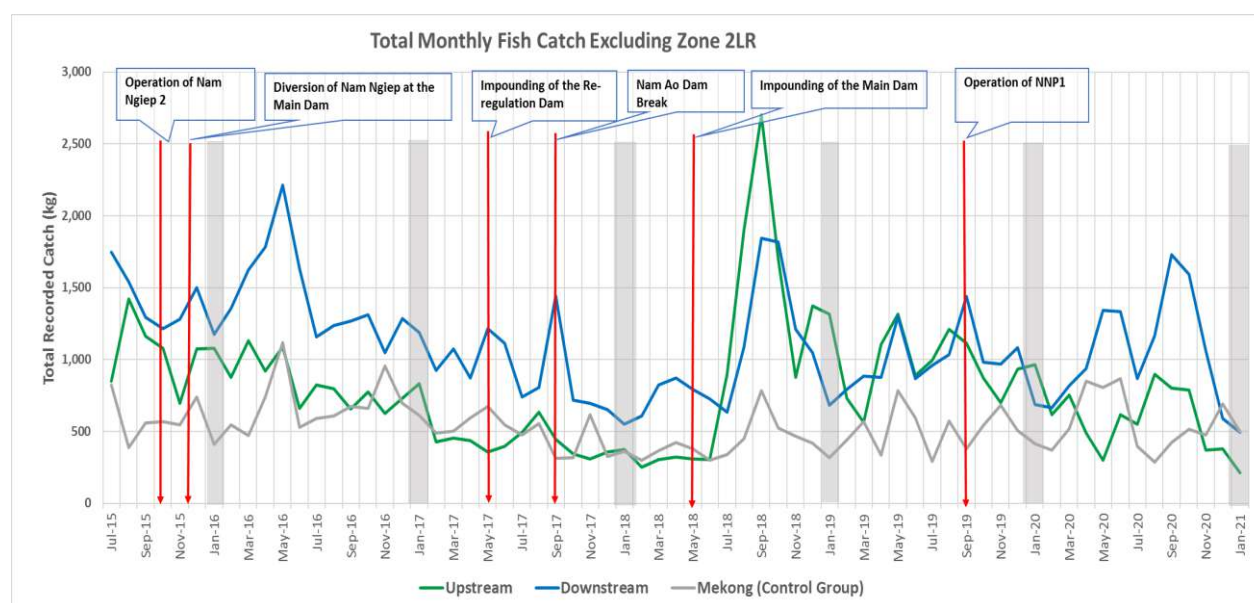
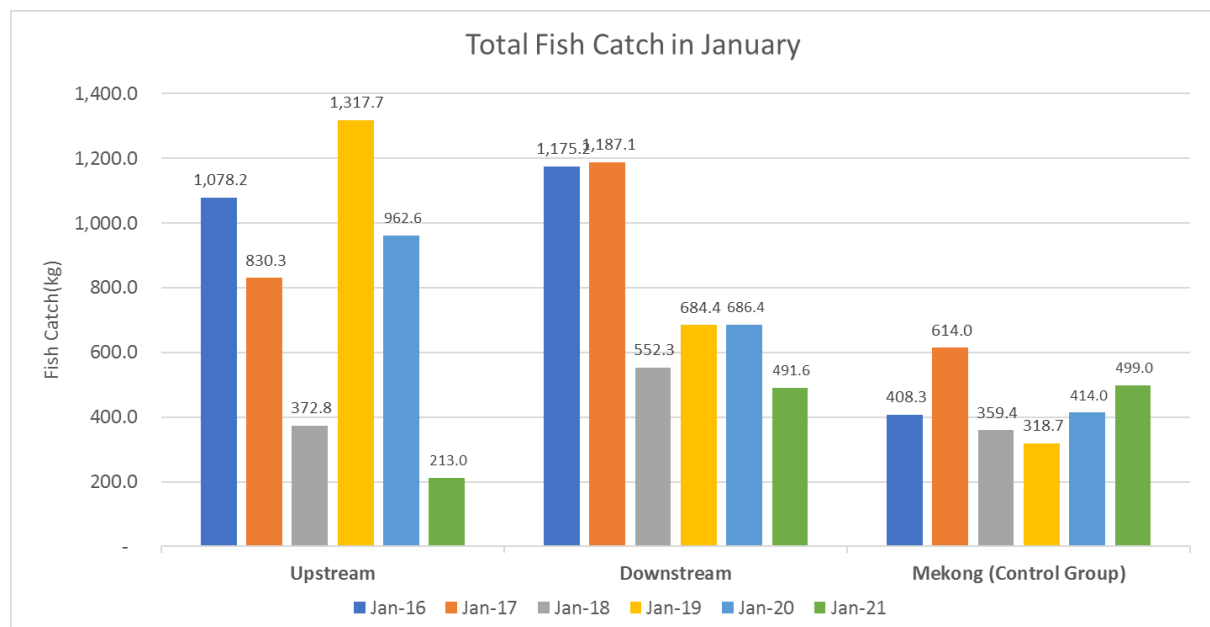
Figure 3-1: Total Monthly Fish Catch July 2015 – January 2021

Table 3-3 and **Figure 3-2** show the total recorded fish catch for the month of January from 2016 to 2021 in the upstream (excluding Zone 2LR) and downstream communities and the Mekong control group. The total fish catch data represents the total fish supply provided by the involved fishing households.

Table 3-3: Total Fish Catch by Upstream (Excluding Zone 2LR), Downstream and Mekong Control Group Fishing Households for the month of January from 2016 to 2021

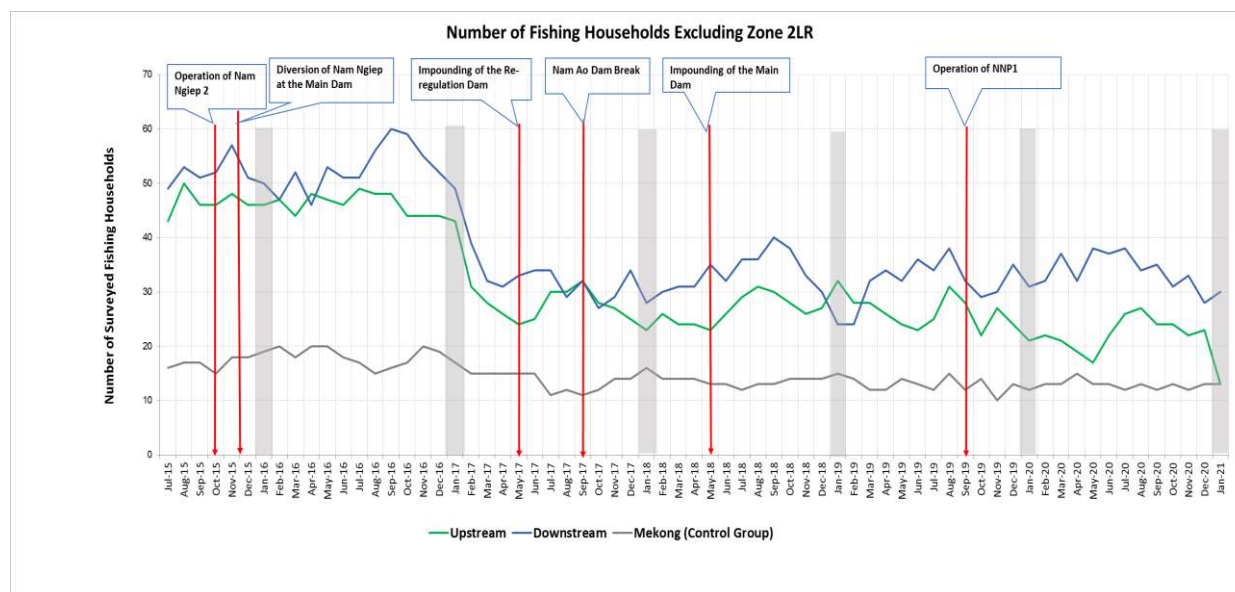
Fishing Zone	January 2016 (kg)	January 2017 (kg)	January 2018 (kg)	January 2019 (kg)	January 2020 (kg)	January 2021 (kg)
Upstream	1,078.2	830.3	372.8	1,317.7	962.6	213.0
Downstream	1,175.2	1,187.1	552.3	684.4	686.4	491.6
Mekong Control Group	408.3	614.0	359.4	318.7	414.0	499.0

Figure 3-2: Total Fish Catch by Upstream (Excluding Zone 2LR), Downstream and Mekong Control Group Fishing Households for the month of January from 2016 to 2021

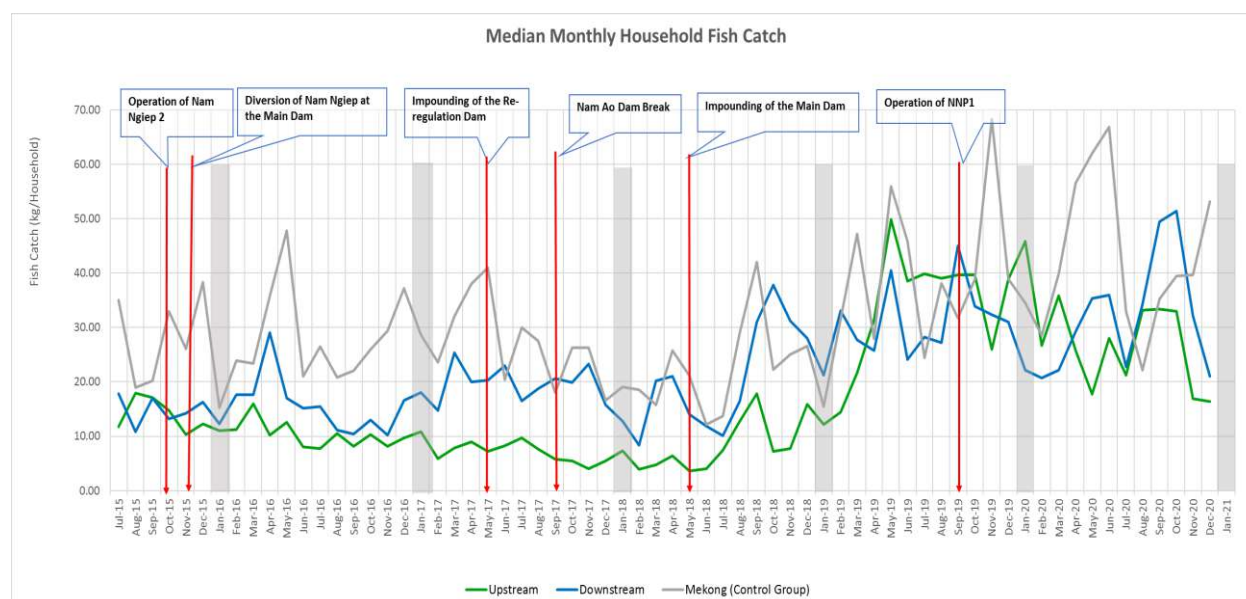


The numbers of fishing households involved in the fish catch monitoring programme are displayed in **Figure 3-3**.

Figure 3-3: Number of Fishing Households Involved in the Fish Catch Monitoring Programme



The median monthly household fish catch from July 2015 to January 2021 for the upstream (excluding Zone 2LR) and downstream communities, and the Mekong control group are presented in **Figure 3-4**.

Figure 3-4: Median Monthly Household Fish Catch without Zone 2LR

The median household fish catch for the month of January from 2016 to 2021 in the upstream (excluding Zone 2LR) and downstream communities and the Mekong control group are displayed in **Table 3-4**.

Table 3-4: Median Monthly Household Fish Catch in the Upstream and Downstream Communities Excluding Zone 2LR for the month of January from 2016 to 2021

Fishing Zone	January 2016 (kg)	January 2017 (kg)	January 2018 (kg)	January 2019 (kg)	January 2020 (kg)	January 2021 (kg)
Upstream	11.0	10.8	7.3	12.2	45.8	16.4
Downstream	12.3	18.0	12.8	21.2	22.1	16.4
Mekong Control Group	15.3	28.6	19.1	15.5	34.5	38.4

The median daily fish catch per household are displayed in **Figure 3-5**, and the median fish catch per household per fishing day for the month of January from 2016 to 2021 are shown in **Table 3-5**.

Figure 3-5: Median Daily Fish Catch per Household

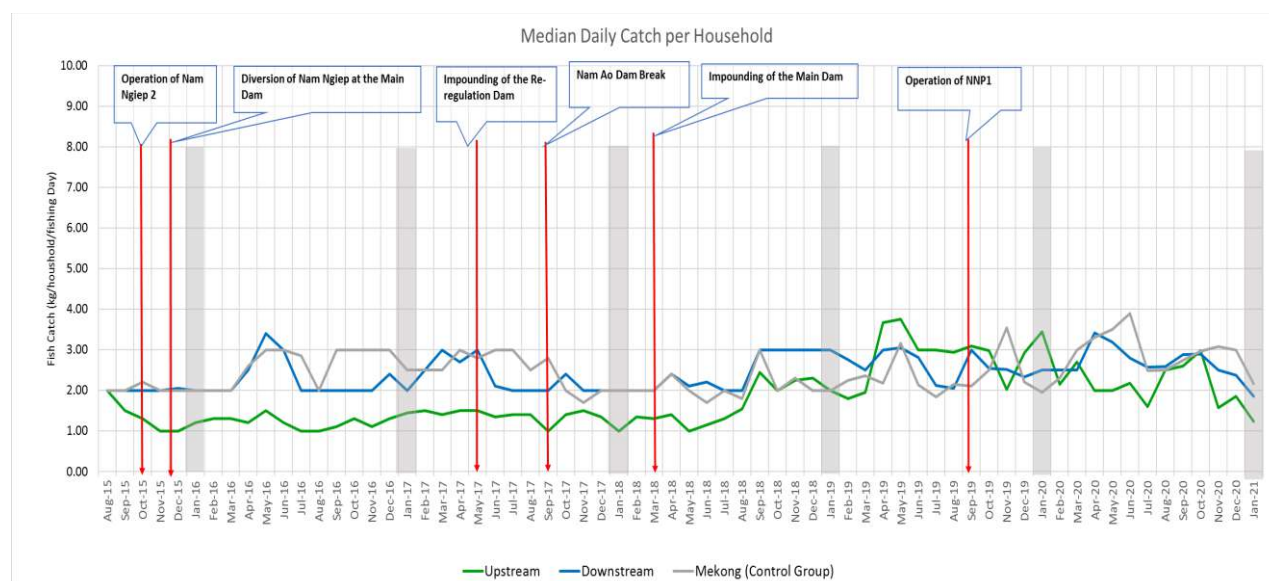


Table 3-5: Median Daily Fish Catch per Household for the month of January from 2016 to 2021

Fishing Zone	January 2016 (kg)	January 2017 (kg)	January 2018 (kg)	January 2019 (kg)	January 2020 (kg)	January 2021 (kg)
Upstream	1.20	1.45	1.00	2.00	3.45	1.23
Downstream	2.00	2.00	2.00	3.00	2.50	1.85
Mekong Control Group	2.00	2.50	2.00	2.00	1.95	2.17

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						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
2-Feb-21	pH	5.0 - 9.0		7.05	6.75	6.84	6.9							
3-Feb-21	pH	5.0 - 9.0						6.65	6.88	6.95	6.95	7.28	7.4	7.46
8-Feb-21	pH	5.0 - 9.0	7.22											
9-Feb-21	pH	5.0 - 9.0		6.94	6.81	6.68	6.55							
10-Feb-21	pH	5.0 - 9.0						6.71	6.87	7.05	7.02	7.19	6.97	7.28
16-Feb-21	pH	5.0 - 9.0		7.33	7.05	6.97	7.15							
17-Feb-21	pH	5.0 - 9.0						6.68	6.83	6.92	7.02	7.13	7.1	7.3
22-Feb-21	pH	5.0 - 9.0	7.41											
23-Feb-21	pH	5.0 - 9.0		7.11	6.95	6.79	6.88							
24-Feb-21	pH	5.0 - 9.0						6.69	5.51	7.14	6.84	7.16	7.16	7.13
2-Feb-21	Sat. DO (%)			105.2	81.7	94.7	77.8							
3-Feb-21	Sat. DO (%)							75.4	28.4	32.7	40.5	42.4	56.9	64.8
8-Feb-21	Sat. DO (%)		119.6											
9-Feb-21	Sat. DO (%)			107.1	121.3	120.8	111.6							
10-Feb-21	Sat. DO (%)							76.9	36.4	28.4	85	78.8	66.2	71.2
16-Feb-21	Sat. DO (%)			140.8	125.9	119.8	112.2							
17-Feb-21	Sat. DO (%)							101.5	33.3	31.6	91.7	78.9	61.3	61.1
22-Feb-21	Sat. DO (%)		123.4											
23-Feb-21	Sat. DO (%)			134.2	118.5	113.8	108.6							
24-Feb-21	Sat. DO (%)							102.2	32.9	35.6	93.5	87.5	90.6	91
2-Feb-21	DO (mg/L)	>6.0		8.63	6.86	7.95	6.59							
3-Feb-21	DO (mg/L)	>6.0						6.41	2.45	2.82	3.45	3.59	4.78	5.43
8-Feb-21	DO (mg/L)	>6.0	9.44											
9-Feb-21	DO (mg/L)	>6.0		9	10.19	10.12	9.38							
10-Feb-21	DO (mg/L)	>6.0						6.56	3.12	2.44	7.25	6.72	5.57	6.08
16-Feb-21	DO (mg/L)	>6.0		11.3	10.34	9.89	9.38							
17-Feb-21	DO (mg/L)	>6.0						8.51	2.87	2.75	7.8	6.7	5.13	5.1
22-Feb-21	DO (mg/L)	>6.0	9.72											
23-Feb-21	DO (mg/L)	>6.0		10.62	9.75	9.37	9.01							
24-Feb-21	DO (mg/L)	>6.0						8.57	2.81	3.01	7.86	7.36	7.44	7.28
2-Feb-21	Conductivity (µs/cm)			77	73	67	67							
3-Feb-21	Conductivity (µs/cm)							68	82	81	79	79	76	75
8-Feb-21	Conductivity (µs/cm)		84											
9-Feb-21	Conductivity (µs/cm)			96	73	67	66							

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
10-Feb-21	Conductivity (µs/cm)						67	83	79	76	83	79	77	
16-Feb-21	Conductivity (µs/cm)			96	72	67	67							
17-Feb-21	Conductivity (µs/cm)						67	86	83	78	80	78	78	
22-Feb-21	Conductivity (µs/cm)		73.7											
23-Feb-21	Conductivity (µs/cm)			83	72	68	67							
24-Feb-21	Conductivity (µs/cm)						67	81	77	77	78	80	79	
2-Feb-21	Temperature (°C)			25.38	24.17	24.06	23.62							
3-Feb-21	Temperature (°C)							23.5	22.94	23.03	23.24	25.53	24.04	24.31
8-Feb-21	Temperature (°C)		25											
9-Feb-21	Temperature (°C)			24.11	24.06	24.3	24.02							
10-Feb-21	Temperature (°C)							23.25	22.92	22.9	23.49	23.32	24.03	24.16
16-Feb-21	Temperature (°C)			26.19	25.3	24.99	24.35							
17-Feb-21	Temperature (°C)							24.17	22.92	23.02	23.5	23.49	24.31	24.5
22-Feb-21	Temperature (°C)		25.1											
23-Feb-21	Temperature (°C)			27.33	25.25	25.2	24.67							
24-Feb-21	Temperature (°C)							24.19	23.34	24.44	24.06	24.02	25.36	26.81
2-Feb-21	Turbidity (NTU)			3.12	2.32	2.34	2.43							
3-Feb-21	Turbidity (NTU)							2.69	4.19	5.16	4.74	7.5	5.27	6.15
8-Feb-21	Turbidity (NTU)		4.35											
9-Feb-21	Turbidity (NTU)			6.34	2.68	4.03	2.86							
9-Feb-21	Turbidity (NTU)-hypolimnion					3.63	3.76							
10-Feb-21	Turbidity (NTU)							3.38	5.21	5.87	4.34	5.04	4.4	5.31
10-Feb-21	Turbidity (NTU)-hypolimnion							3.61						

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
16-Feb-21	Turbidity (NTU)			3.71	2.29	2.52	2.39							
17-Feb-21	Turbidity (NTU)							2	2.89	3.98	4.95	5.46	4.53	6.23
22-Feb-21	Turbidity (NTU)		2.52											
8-Feb-21	TSS (mg/L)		<5											
9-Feb-21	TSS (mg/L)			5.12		<5	<5							
9-Feb-21	TSS (mg/L)-hypolimnion					<5	<5							
8-Feb-21	BOD ₅ (mg/L)	<1.5	<1											
9-Feb-21	BOD ₅ (mg/L)	<1.5		<1		<1	<1							
9-Feb-21	BOD ₅ (mg/L)-hypolimnion					<1	<1							
8-Feb-21	COD (mg/L)	<5.0	<5											
9-Feb-21	COD (mg/L)	<5.0												
10-Feb-21	COD (mg/L)	<5.0							<5	<5	<5	<5	<5	7.9
9-Feb-21	NH ₃ -N (mg/L)	<0.2		<0.2		<0.2	<0.2							
9-Feb-21	NH ₃ -N (mg/L)-hypolimnion					<0.2	<0.2							
8-Feb-21	NO ₃ -N (mg/L)	<5.0	<0.02											
9-Feb-21	NO ₃ -N (mg/L)	<5.0		<0.02		<0.02	0.07							
9-Feb-21	NO ₃ -N (mg/L)-hypolimnion					0.08	<0.02							
8-Feb-21	Faecal coliform (MPN/100 mL)	<1,000	350											
9-Feb-21	Faecal coliform (MPN/100 mL)	<1,000		130		0	0							
9-Feb-21	Faecal coliform (MPN/100 mL)-hypolimnion					0	0							
8-Feb-21	Total Coliform (MPN/100 mL)	<5,000	1,600											
9-Feb-21	Total Coliform (MPN/100 mL)	<5,000		240		33	33							
9-Feb-21	Total Coliform (MPN/100 mL)-hypolimnion					11	13							

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
8-Feb-21	TKN		<1.5											
9-Feb-21	TKN			<1.5		<1.5	<1.5							
9-Feb-21	TKN-hypolimnion					<1.5	<1.5							
8-Feb-21	TOC (mg/L)		0.85											
9-Feb-21	TOC (mg/L)													
10-Feb-21	TOC (mg/L)							1.36	1.3	1.53	1.64	1.48	1.46	
9-Feb-21	Phytoplankton Biomass (g dry wt/m³)			6.8		1.8	1.2							
9-Feb-21	Phytoplankton Biomass (g dry wt/m³)-hypolimnion					1.6	1.4							
8-Feb-21	Total Phosphorus (mg/L)		<0.01											
9-Feb-21	Total Phosphorus (mg/L)			<0.01		<0.01	<0.01							
9-Feb-21	Total Phosphorus (mg/L)-hypolimnion					<0.01	<0.01							
8-Feb-21	Total Dissolved Phosphorus (mg/L)		<0.01											
9-Feb-21	Total Dissolved Phosphorus (mg/L)			<0.01		<0.01	<0.01							
9-Feb-21	Total Dissolved Phosphorus (mg/L)-hypolimnion					<0.01	<0.01							
9-Feb-21	Hydrogen Sulfide (mg/L)			<0.02		<0.02	<0.02							
9-Feb-21	Hydrogen Sulfide (mg/L)-hypolimnion					<0.02	0.05							
23-Feb-21	Turbidity (NTU)			3.33	2.36	1.6	2.28							
24-Feb-21	Turbidity (NTU)							1.41	5.51	5.16	5.22	6.17	4.29	5.5
10-Feb-21	TSS (mg/L)							<5	<5	<5	<5	<5	<5	7.7

			Nam Ngiep											
			Location Refer to Construction Sites											
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream				Station Code
			NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
10-Feb-21	TSS (mg/L)-hypolimnion							<5						
10-Feb-21	BOD ₅ (mg/L)	<1.5						<1	3.06	2.56	<1	<1	<1	<1
10-Feb-21	BOD ₅ (mg/L)-hypolimnion							2.92						
10-Feb-21	Total Coliform (MPN/100 mL)	<5,000						2	33	130	350	920	540	920
10-Feb-21	Total Coliform (MPN/100 mL)-hypolimnion							4						
10-Feb-21	Faecal coliform (MPN/100 mL)	<1,000						0	2	0	22	27	79	79
10-Feb-21	Faecal coliform (MPN/100 mL)-hypolimnion							1.8						
10-Feb-21	NH ₃ -N (mg/L)	<0.2						<0.2	<0.2	<0.2				
10-Feb-21	NH ₃ -N (mg/L)-hypolimnion							0.74						
10-Feb-21	NO ₃ -N (mg/L)	<5.0						0.07						
10-Feb-21	NO ₃ -N (mg/L)-hypolimnion							0.14						
10-Feb-21	TKN (mg/L)							<1.5						
10-Feb-21	TKN (mg/L)-hypolimnion							<1.5						
10-Feb-21	Total Dissolved Phosphorus (mg/L)							<0.01						
10-Feb-21	Total Dissolved Phosphorus (mg/L)-hypolimnion							<0.01						
10-Feb-21	Total Phosphorus (mg/L)							<0.01						
10-Feb-21	Total Phosphorus (mg/L)-hypolimnion							<0.01						
10-Feb-21	Hydrogen Sulfide (mg/L)							<0.02						

		River Name	Nam Ngiep											
		Zone	Location Refer to Construction Sites											
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream			
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08
Date	Parameters (Unit)	Guideline												
10-Feb-21	Hydrogen Sulfide (mg/L)-hypolimnion						0.05							
10-Feb-21	Phytoplankton Biomass (g dry wt/m³)						1.2							
10-Feb-21	Phytoplankton Biomass (g dry wt/m³)-hypolimnion						0.8							

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				
2-Feb-21	pH	5.0 - 9.0		6.7		
3-Feb-21	pH	5.0 - 9.0			7.66	7.5
8-Feb-21	pH	5.0 - 9.0	8.09			
9-Feb-21	pH	5.0 - 9.0		7.11		
10-Feb-21	pH	5.0 - 9.0			7.8	7.24
16-Feb-21	pH	5.0 - 9.0		7.12		
17-Feb-21	pH	5.0 - 9.0			7.42	7.55
22-Feb-21	pH	5.0 - 9.0	8.52			
23-Feb-21	pH	5.0 - 9.0		7.04		
24-Feb-21	pH	5.0 - 9.0			7.55	7.62
2-Feb-21	Sat. DO (%)			93.7		
3-Feb-21	Sat. DO (%)				87.9	69.4
8-Feb-21	Sat. DO (%)		112.4			
9-Feb-21	Sat. DO (%)			117.9		
10-Feb-21	Sat. DO (%)				78.6	78.6
16-Feb-21	Sat. DO (%)			113.9		
17-Feb-21	Sat. DO (%)				92.7	84.2
22-Feb-21	Sat. DO (%)		109.4			
23-Feb-21	Sat. DO (%)			106.6		
24-Feb-21	Sat. DO (%)				91.8	89.1
2-Feb-21	DO (mg/L)	>6.0		8.55		
3-Feb-21	DO (mg/L)	>6.0			7.17	6.04
8-Feb-21	DO (mg/L)	>6.0	9.58			
9-Feb-21	DO (mg/L)	>6.0		11.04		
10-Feb-21	DO (mg/L)	>6.0			6.9	6.98
16-Feb-21	DO (mg/L)	>6.0		10.26		
17-Feb-21	DO (mg/L)	>6.0			7.71	7.27
22-Feb-21	DO (mg/L)	>6.0	9.15			
23-Feb-21	DO (mg/L)	>6.0		9.29		
24-Feb-21	DO (mg/L)	>6.0			7.43	7.61
2-Feb-21	Conductivity (µs/cm)			65		
3-Feb-21	Conductivity (µs/cm)				135	57
8-Feb-21	Conductivity (µs/cm)		27.1			
9-Feb-21	Conductivity (µs/cm)			57		
10-Feb-21	Conductivity (µs/cm)				133	51
16-Feb-21	Conductivity (µs/cm)			68		
17-Feb-21	Conductivity (µs/cm)				137	52
22-Feb-21	Conductivity (µs/cm)		24			
23-Feb-21	Conductivity (µs/cm)			66		
24-Feb-21	Conductivity (µs/cm)				145	49
2-Feb-21	Temperature (°C)			19.92		
3-Feb-21	Temperature (°C)				25.56	23.49
8-Feb-21	Temperature (°C)		20.8			
9-Feb-21	Temperature (°C)			18.59		

		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				
10-Feb-21	Temperature (°C)				21.8	21.17
16-Feb-21	Temperature (°C)			20.44		
17-Feb-21	Temperature (°C)				24.64	22.62
22-Feb-21	Temperature (°C)		21.7			
23-Feb-21	Temperature (°C)			21.85		
24-Feb-21	Temperature (°C)				26.13	23.22
2-Feb-21	Turbidity (NTU)			2.88		
3-Feb-21	Turbidity (NTU)				3.68	4.82
8-Feb-21	Turbidity (NTU)		3.21			
9-Feb-21	Turbidity (NTU)			28.4		
10-Feb-21	Turbidity (NTU)				8.22	16.8
16-Feb-21	Turbidity (NTU)			2.86		
17-Feb-21	Turbidity (NTU)				4.32	3.68
22-Feb-21	Turbidity (NTU)		3.6			
8-Feb-21	TSS (mg/L)		<5			
9-Feb-21	TSS (mg/L)			144		
8-Feb-21	BOD ₅ (mg/L)	<1.5	<1			
9-Feb-21	BOD ₅ (mg/L)	<1.5		3.3		
8-Feb-21	COD (mg/L)	<5.0	<5			
9-Feb-21	COD (mg/L)	<5.0		<5		
10-Feb-21	COD (mg/L)	<5.0			6.8	16.2
9-Feb-21	NH ₃ -N (mg/L)	<0.2	<0.2			
8-Feb-21	NO ₃ -N (mg/L)	<5.0	0.08			
9-Feb-21	NO ₃ -N (mg/L)	<5.0		0.49		
8-Feb-21	Faecal coliform (MPN/100 mL)	<1,000	79			
9-Feb-21	Faecal coliform (MPN/100 mL)	<1,000		1,600		
8-Feb-21	Total Coliform (MPN/100 mL)	<5,000	130			
9-Feb-21	Total Coliform (MPN/100 mL)	<5,000		1,600		
8-Feb-21	TKN (mg/L)		<1.5			
9-Feb-21	TKN (mg/L)			<1.5		
8-Feb-21	TOC (mg/L)		0.66			
9-Feb-21	TOC (mg/L)			14.37		
10-Feb-21	TOC (mg/L)				3.23	6.58
9-Feb-21	Phytoplankton Biomass (g dry wt/m³)					
8-Feb-21	Total Phosphorus (mg/L)		<0.01			
9-Feb-21	Total Phosphorus (mg/L)			<0.01		
8-Feb-21	Total Dissolved Phosphorus (mg/L)		<0.01			
9-Feb-21	Total Dissolved Phosphorus (mg/L)			<0.01		
9-Feb-21	Hydrogen Sulfide (mg/L)					
23-Feb-21	Turbidity (NTU)			2.38		
24-Feb-21	Turbidity (NTU)				4.77	4.1
10-Feb-21	TSS (mg/L)				10.56	20.6
10-Feb-21	BOD ₅ (mg/L)	<1.5			1.26	2.28
10-Feb-21	Total Coliform (MPN/100 mL)	<5,000			1,600	1,600

		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				
10-Feb-21	Faecal coliform (MPN/100 mL)	<1,000			1,600	1,600
10-Feb-21	NH ₃ -N (mg/L)	<0.2		<0.2		
10-Feb-21	TKN (mg/L)			<1.5		

ANNEX B: RESULTS OF EFFLUENT ANALYSES**TABLE B-1: RESULTS OF CAMP EFFLUENTS IN FEBRUARY 2021**

	Site Name	OSOV1 (Owner's Site Office and Village)		OSOV2 (ESD Camp)		Main Powerhouse	
	Station Code	EF01		EF13		EF19	
	Date	04-Feb-21	15-Feb-21	04-Feb-21	15-Feb-21	04-Feb-21	15-Feb-21
Parameters (Unit)	Guideline						
pH	6.0 - 9.0	6.81	7.18	7.16	7.21		7.33
Sat. DO (%)		48.4	47.6	60.2	47.2	No	142.6
DO (mg/L)		4.01	3.83	4.93	3.79	Discharge	10.29
Conductivity (µs/cm)		316	276	489	348		823
TDS (mg/L)		158	138	244.5	174		411.5
Temperature (°C)		23.7	24.9	24.5	25.1		30.8
Turbidity (NTU)		2.67	2.71	20.13	10.62		10.99
TSS (mg/L)	<50	<5	<5	38.8	11.3		29.5
BOD ₅ (mg/L)	<30	<6	<6	<6	<6		<6
COD (mg/L)	<125	<25	<25	75	69		33.8
NH ₃ -N (mg/L)	<10.0	3	6	25	8.9		9.4
Total Nitrogen (mg/L)	<10.0	11	10.7	35	12.7		13.7
Total Phosphorus (mg/L)	<2	1	2	1.88	1.18		3.8
Oil & Grease (mg/L)	<10.0	<1		<1			
Total coliform (MPN/100 mL)	<400	540	240	0	0		0
Faecal Coliform (MPN/100 mL)	<400	5	240	0	0		0
Effluent Discharge Volume (L/mn)		6	7.5	4	6		2000
Chlorination Dosing Rate (mL/mn)		n/a	n/a	0.30	0.30		50
Residual Chlorine (mg/L)	<1.0	n/a	n/a	1.09	0.57		1.52