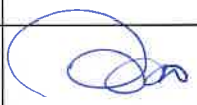
NAM NGIEP1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

July 2023

					
A	25 August 2023	Hendra WINASTU	Khamsone Xaysomphou	Wanidaporn RODE	Final
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EXECUTIVE SUMMARY

During July 2023, activities related to ISO14001:2015 implementation continued such as the implementation of the four (04) Environmental Management Plans (EMPs). The EMPs will be executed from April 2023 to March 2024 including 1) HSE awareness training for NNP1PC staff and contractors, 2) reducing the paper consumption in NNP1 offices, 3) minimizing the quantity of waste disposal at NNP1 project landfill, and 4) planting trees.

On 18 July 2023, the tree planting event under the Environmental Management Plan (EMP04-2023) took place at OSOV1, OSOV2 and at the edge of the football field, with active participation of NNP1PC staff, EGAT O&M and KGS. More than 100 seedlings of both fruit trees and local species were planted, exceeding a goal of planting 100 seedlings for the wet season of 2023.

During this reporting period, no documents were submitted to the Environment Management Office (EMO) for review and approval.

On 20 July 2023, EMO, ADM and TD conducted a joint monthly site inspection of the wastewater treatment system operation and maintenance, waste management and NNP1 landfill operations. Waste compaction process at NNP1 landfill is still on hold waiting for ADM to finalize an arrangement for waste compaction.

On July 25, 2023, the Department of Natural Resources and Environmental Inspection (DREI) conducted a site visit at the NNP1PC site with the participation of PONRE from Bolikhamxay Province and the DONREs of Bolikhan, Thathom, and Hom districts. The visit involved reviewing the environmental and social management and monitoring programs and inspecting the main dam, landfills, hazardous storage facility, rehabilitated sites, and camps.

At R05 (in the Main Reservoir approx. 0.5 km upstream the Main Dam), the average DO concentration was 7.0 mg/L in the upper 8.0 m varying between 4.5 mg/L and 8.9 mg/L. Anoxic conditions (less than 0.5 mg/L) were found at depths from 26 m to bottom (05 July 2023), from 18 m to bottom (12 July 2023), from 12 m to bottom (17 July 2023) and from 22 m to bottom (28 July 2023). At the water intake level, DO concentrations varied between 0.10 mg/L and 5.13 mg/L.

In the Re-regulation Reservoir, the mean DO concentrations in the water column of R06 and R07 were 2.6 mg/L and 3.0 mg/L respectively.

The DO measurements downstream the Re-regulation Dam during turbine discharge was less than 6 mg/L in some stations, except at NNG07 and NNG08.

NNP1PC continues to carefully compile and assess all monitoring data to determine if any additional water aeration measures may be necessary to improve the DO levels in Nam Ngiep River downstream the Re-regulation Dam. Water quality monitoring will be maintained, and the development of the situation in the reservoir and in the downstream area will be closely followed until a satisfactory situation has been reached. In this regard, it should be noted that since the Commercial Operation Date (COD) in September 2019 no dead fish have been observed in Nam Ngiep downstream the Re-regulation Dam.

A total of 7.0 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 1 m^3 compared with June 2023. NNP1 EMO highlighted the efforts made in coordinating with the Bolikhan District Environment Management Unit or EMU for transferring the management of the

communities' solid waste and Houay Soup Landfill to the local authorities. The EMU will initiate discussions involving NNP1, village, and district authorities after receiving the 2022 monitoring fund, which NNP1 transferred to MONRE on 11 May 2023 following the fund disbursement request by MONRE on 20 April 2023.

Bolikhamxay Watershed and Reservoir Protection Office (WRPO) submitted the request for second two-quarter funds disbursement under the approved Bolikhamxay Annual Implementation Plan (AIP) 2023 to the Forest Protection Fund (FPF) office of the Department of Forestry (DOF) – Ministry of Agriculture and Forestry (MAF) at the end of June 2023. However, as of the end of July 2023, NNP1PC has not yet received the official fund disbursement request from FPF DOF-MAF. The Bolikhamxay WRPO conducted forest and reservoir patrolling from 28 June to 7 July 2023. Bolikhamxay WRPO also completed data collection of village land use data at the end of June 2023 but without consultation or participation of NNP1 EMO and the Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS). The reports of patrolling and village land use data collection were not yet shared with NNP1 EMO as of the end of July 2023.

There is still no further progress as per the agreement from the meeting in April 2023 including the follow-up with the Xaysomboun Provincial Department of Energy and Mines related to the mining exploration and hydropower project development in the NNP1 watershed Totally Protected Zone (TPZ), the internal discussion to review the patrol team establishment and the further implementation of fishery co-management, and the follow up with the contractor for the construction of two reservoir checkpoints. NNP1 EMO, Xaysomboun WRPO, and BSP-WCS have discussed the Law Enforcement Strategy (LES) and finalization of the AIP2023 after the response letter from FPF DOF-MAF was issued on 21 July 2023.

Bolikhamxay Biodiversity Offset Management Unit (BOMU) conducted patrolling and snare removal activity during 7-26 July 2023 and 9-21 July 2023 respectively. Bolikhamxay BOMU also progressed with the livestock farmer group establishment under the agreed Community Development Plan (CDP) for 2023 which was scheduled from 25 July to 11 August 2023. Bolikhamxay BOMU also prepared the request for the second two-quarter fund disbursement under their approved AIP2023 and submitted it to FPF DOF-MAF at the end of July 2023.

The fish catch monitoring for June 2023 in Nam Ngiep Watershed was dominated by *Scaphognathops bandanensis* and species groups of *Barbonymus* and *Hypsibarbus*, *Sikukia gudgeri* and *Amblyrhynchichthys truncatus*, Poropuntius, and Hampala. They are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species except *Sikukia gudgeri* is classified as Data deficient (DD) and *Scaphognathops bandanensis* is classified as Vulnerable species (VU). The recorded catch of threatened species includes three Vulnerable species (VU): *Cirrhinus cirrhosus*, *Scaphognathops bandanensis* and *Tor sinensis*.

1. ENVIRONMENTAL MANAGEMENT MONITORING

1.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

During July, activities related to ISO14001:2015 implementation continued such as the implementation of the four (04) Environmental Management Plans (EMPs). The EMPs will be executed from April 2023 to March 2024 including 1) HSE awareness training for NNP1PC staff and contractors, 2) reducing the paper consumption in NNP1 offices, 3) minimizing the quantity of waste disposal at NNP1 project landfill, and 4) planting tree. The details of EMPs 2023 implementation are shown in ***Table 1.1-1***.

Table 1.1-1:The Details of EMPs 2023 implementation

EMP No.	Activity Description	KPI	The EMP Evaluation Schedule	Implementation Progress
01/2023*	Providing HSE awareness training to NNP1PC staff and contractors	80% of NNP1PC staff and the Contractors are trained on Health, Safety and Environmental awareness during April 2023 to March 2024	Oct 2023 – Feb 2024	The training is scheduled to be carried out by October 2023
02/2023*	Reducing the paper consumption in NNP1 offices	Total use of A4 paper for printing in the NNP1PC's offices (VTE, OSOV1, OSOV2) is reduced by 10% during April 2023 to March 2024 compared with the previous 12 months	Oct 2023 – Dec 2024	On going monitoring and gathering data on monthly basis
03/2023*	Reducing the quantity of waste disposal at NNP1 Project Landfill	Total use of A4 paper for printing in the NNP1PC's offices (VTE, OSOV1, OSOV2) is reduced by 10% during April 2023 to March 2024 compared with the previous 12 months	Sept 2023 – Mar 2024	On going monitoring and gathering data on monthly basis
04/2023#	Planting tree	Percentage of plant survival, the potential plantation fields in contributing to the environmentally sustainability objectives (refer to Tree Planting Plan)	Feb 2024	The tree planting event took place in July (see section 1.2 below)

**EMPs implemented in 2022 will continue in 2023 for further success*

 # New EMP suggested by the external ISO Auditor (SGS)

1.2 PROGRESS OF ENVIRONMENTAL MANAGEMENT SYSTEM

EMO is currently gathering data on the HSE awareness training records, A4 paper consumption, and waste quantity from the relevant departments in accordance with the EMP01, EMP02 and EMP03.

On 18 July 2023, the tree planting event took place as part of the Environmental Management Plan (EMP04-2023) at OSOV1, OSOV2 and at the edge of the football field with active participation of NNP1PC staff, EGAT O&M and KGS. More than 100 seedlings of both fruit trees and local species were planted, exceeding a goal of planting 100 seedlings for the wet season of 2023. The plants will be properly cared to ensure that at least 50% of them survive by April 2024 to achieve the EMP:04's KPIs and promote healthy ecosystem, improve air quality, enhance site amenity as a well as contribute to carbon sequestration.

TABLE 1.2-1: TREE PLANTING ACTIVITY IN JULY 2023

1.3 COMPLIANCE MANAGEMENT

In July 2023, no documents were submitted to the Environment Management Office (EMO) for review and approval.

1.3.1 Joint Monthly Site Inspection

On 20 July 2023, EMO, ADM and TD conducted a joint monthly site inspection of the wastewater treatment system operation and maintenance, waste management and NNP1 landfill operations.

Waste compaction at the NNP1 landfill is still on hold waiting for ADM to finalize an arrangement for waste compaction. The key findings are summarized in ***Figure 1.3-1***

Figure 1.3-1: Joint Monthly Inspection in July 2023

	**Finding: ADB ES CAP no. 06:** Site of former batching plant (top platform): two holes to underground structures remain, not secured sufficiently.
	**Corrective Action:** Filling the cavity and securely closing the identified holes are underway and expected to be completed by early August 2023. Once the work is completed, a joint verification of the corrective actions will be organized.

1.3.2 Site Inspection by the DREI

On July 25, 2023, the Department of Natural Resources and Environmental Inspection (DREI) in MONRE conducted a site visit at the NNP1PC site with the participation of PONRE from Bolikhamxay province and the DONREs of Bolikhan, Thathom, and Hom districts. The visit involved reviewing the environmental and social management and monitoring programs and inspecting the main dam, landfills, hazardous storage facility, rehabilitated sites, and camps.

The mission made the following recommendations to NNP1PC:

- Continue implementing the E&S management measures according to the ESMMP-OP.
- Enhance the rehabilitation of sites by planting more local trees, where feasible, before handing over the site to the GOL;
- Maintain the submission of quarterly reports in the Lao language for review by DREI, PONRE, and DONRE.

- Review the existing Watershed Management Plan (WMP) regarding forest rehabilitation activity and include work progress in the quarterly reports.
- Continue conducting livelihood assessments and providing support to the project-affected communities.
- Ensure the timely disbursement of annual environmental monitoring funds to DREI, PONREs, and DONREs.
- Incorporate social monitoring into the EMU's environmental mission.
- NNP1PC proposed to initiate a discussion on the handover of the community solid waste management and Houay soup landfill during the upcoming EMU site visit in 2023.

1.3.3 Site Inspection by the Environment Management Unit (EMU)

The site inspection by the EMU of Bolikhamxay province and Bolikhan, Thathom, and Hom districts is part of the DREI visit, as outlined in section 1.3.2. above.

1.3.4 Site Decommissioning and Rehabilitation

During July 2023, a monthly monitoring of the rehabilitation sites was carried out at the main quarry, RCC plant, CVC plant, spoil disposal sites and camp areas. No evidence of erosion or instability were observed at any of the inspected sites.

1.4 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/.

1.4.1 Effluent Discharge from Camps and Construction Sites

Detailed monitoring results are provided in the *Error! Reference source not found.* of this Report. T he status of implementation of the corrective actions addressing non-compliances at the camps and key project facilities are summarized in ***Table 1.4-1***

Table 1.4-1: Status of Corrective Actions for Non-Compliances at WWTSs in July 2023

Site	Sampling ID	Status	Corrective Actions
OSOV1	EF01	Non-compliance for total coliform (1 out of 2 samplings).	In July 2023, EMO, ADM and TD conducted a monthly joint inspection of the operation and maintenance of the WWTS. The inspection results are outlined in the above section 1.2.1 1) Closely monitor the residual chlorine content and chlorination dosage adjustment for the effluents of OSOV2 and the Main Powerhouse WWTS.;
OSOV2	EF13	Non-compliance for total coliform, fecal coliform, total nitrogen and ammonia-nitrogen.	
Main Powerhouse	EF19	Non-compliance for TSS, COD, total coliform, total nitrogen, ammonia-nitrogen, and total phosphorus.	

1.4.2 Ambient Surface Water and Reservoir 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]).

Weekly depth profile monitoring (pH, DO, conductivity and temperature) has been undertaken since 18 September 2018 for stations located in the Re-regulation reservoir and the main reservoir. The locations of the monitoring stations are shown in ***Figure 1.4-1.***

The monitoring results for key parameters (DO, TSS and BOD_5) during July 2023 are presented in ***Table 1.4-2, Table 1.4-3*** and ***Table 1.4-4.*** The full set of data for July 2023 is attached in Annex A. In addition, the DO depth profile timeseries for R05 are shown in ***Figure 1.4-2,*** and the results for DO timeseries are presented as line graphs in ***Figure 1.4-3*** and DO Long Profile graphs ***Figure 1.4-4.***

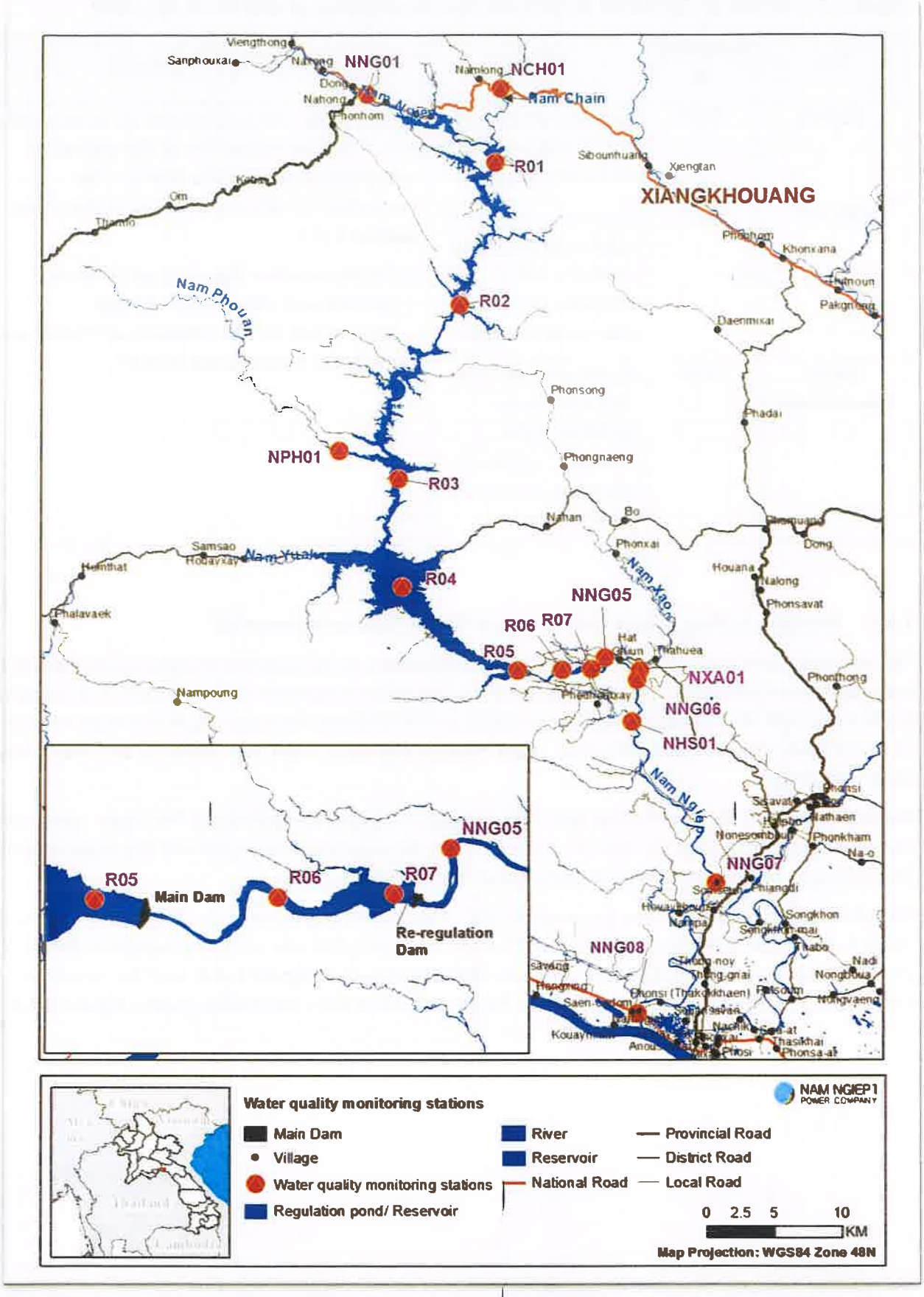

Figure 1.4-1: Surface Water and Re-regulation Reservoir Water Quality Monitoring Stations

Main Reservoir

In July 2023, during the first two weeks, the water level in the main reservoir increased from El. 297.91 m asl to El. 299.40 m asl. And from 11 July 2023, the water level in the main reservoir decreased and reached El. 297.93 m by the end of the month.

At R05 (in the Main Reservoir approx. 0.5 km upstream the Main Dam), the average DO concentration was 7.0 mg/L in the upper 8.0 m varying between 4.5 mg/L and 8.9 mg/L. Over the month the depth to the oxycline gradually decreased from a depth of 10 m on 05 July 2023 to 6.5 m on 28 July 2023. Anoxic conditions (less than 0.5 mg/L) were found at depths from 26 m to bottom (05 July 2023), from 18 m to bottom (12 July 2023), from 12 m to bottom (17 July 2023) and from 22 m to bottom (28 July 2023). At the water intake level, DO concentrations varied between 0.10 mg/L and 5.13 mg/L.

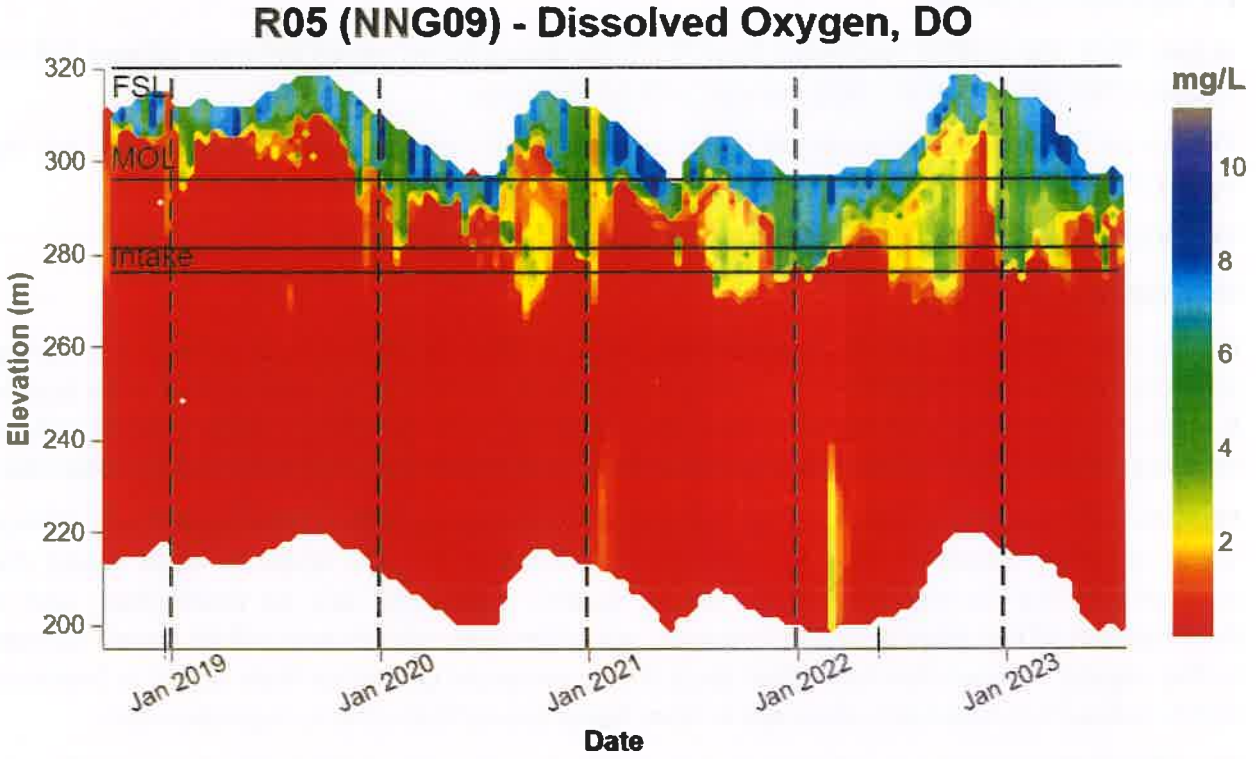

Figure 1.4-2: DO Depth Profiles Time Series in R05 (Since September 2018 to July 2023)

At R04, the average DO concentration was 7.6 mg/L in the upper 6.0 m varying between 6.3 mg/L and 8.7 mg/L. From 6.5 m to the bottom, the DO concentrations varied between 0.1 mg/L and 6.7 mg/L with an average of 1.4 mg/L. Oxyclines were found at depths between 6.5 m and 7.5 m. Anoxic conditions (less than 0.5 mg/L) were found at depths from 18 m to the bottom (on 05 July 2023), at depths from 20 m to bottom (on 12 July 2023), at depths from 22 m to bottom (17 July 2023) and at depths from 24 m to bottom (on 28 July 2023).

At R03, the average DO concentration was 7.8 mg/L in the upper 5.0 m varying between 5.6 mg/L and 9.6 mg/L. Oxyclines were found at depths between 5.0 m and 6.0 m. From 5.5 m to bottom, DO concentrations varied between 0.1 mg/L and 7.2 mg/L with an average of 3.1 mg/L. Anoxic conditions (less than 0.5 mg/L) were found at depths from 22 m to the bottom (04 July 2023) and at the depths 26 m to bottom (11, 18 and 27 July 2023).

At R02, the average DO concentration in entire water column was 6.6 mg/L with variation between 4.1 mg/L and 9.4 mg/L. Oxyclines were found at a depth of 2.5 m (04 – 18 July 2023). No anoxic conditions were detected during the month.

At R01, the DO concentrations at the surface varied between 6.6 mg/L and 8.7 mg/L with an average of 7.4 mg/L.

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 prior to impounding.

The BOD_5 measurements in epilimnion at R01, R03, R04 and R05 were less than 1.0 mg/L and in the hypolimnion at R03, R04 and R05 were 8.6 mg/L, less than 1 mg/L and 9.9 mg/L respectively.

Re-regulation Reservoir

In July 2023, the turbine discharges from the Main Powerhouse varied between 25 and 228 m^3/s usually interrupted by night-time periods with no discharge.

The mean DO concentrations in the water column of R06 and R07 were 2.6 mg/L and 3.0 mg/L respectively.

The BOD_5 concentrations in both R06 and R07 were less than 1.0 mg/L.

Nam Ngiep Downstream

During July 2023, the monthly downstream water quality monitoring was carried out during a period of turbine discharge from the Re-regulation Dam, and the DO concentrations were less than 6 mg/L in the downstream stations, thus not complying with the surface water quality standard, except at NNG07 (25.9 Km from Re-regulation Dam) and NNG08 (47.2 Km from Re-regulation Dam).

NNP1PC continues to carefully compile and assess all monitoring data to determine if any additional water aeration measures may be necessary to improve the DO levels in Nam Ngiep River downstream the Re-regulation Dam. Water quality monitoring will be maintained, and the development of the situation in the reservoir and in the downstream area will be closely followed. In this regard, it should be noted that since the Commercial Operation Date (COD) in September 2019 no dead fish have been observed in Nam Ngiep downstream the re-regulation dam.

The BOD_5 in the downstream stations were less than 1 mg/L and complied with the national surface water quality standard.

Main Tributaries to Nam Ngiep

The monitored parameters in the main tributaries did not comply with the standards as detailed below:

- Nam Chiane (NCH01): COD
- Nam Phouan (NPH01): faecal coliform.
- Nam Xao (NXA01): COD.
- and Nam Houaysoup (NHS01): COD.

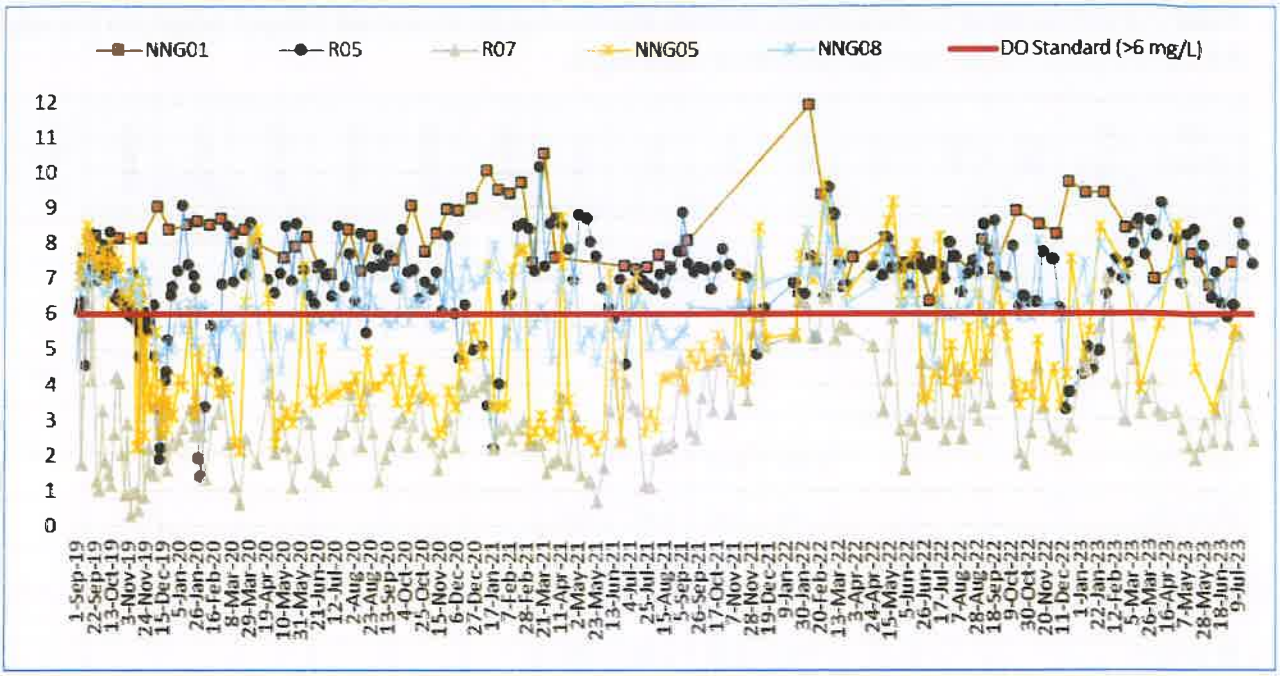

Figure 1.4-3: Concentration of Dissolved Oxygen (mg/L) in the upper 0.2 m since September 2019 to July 2023

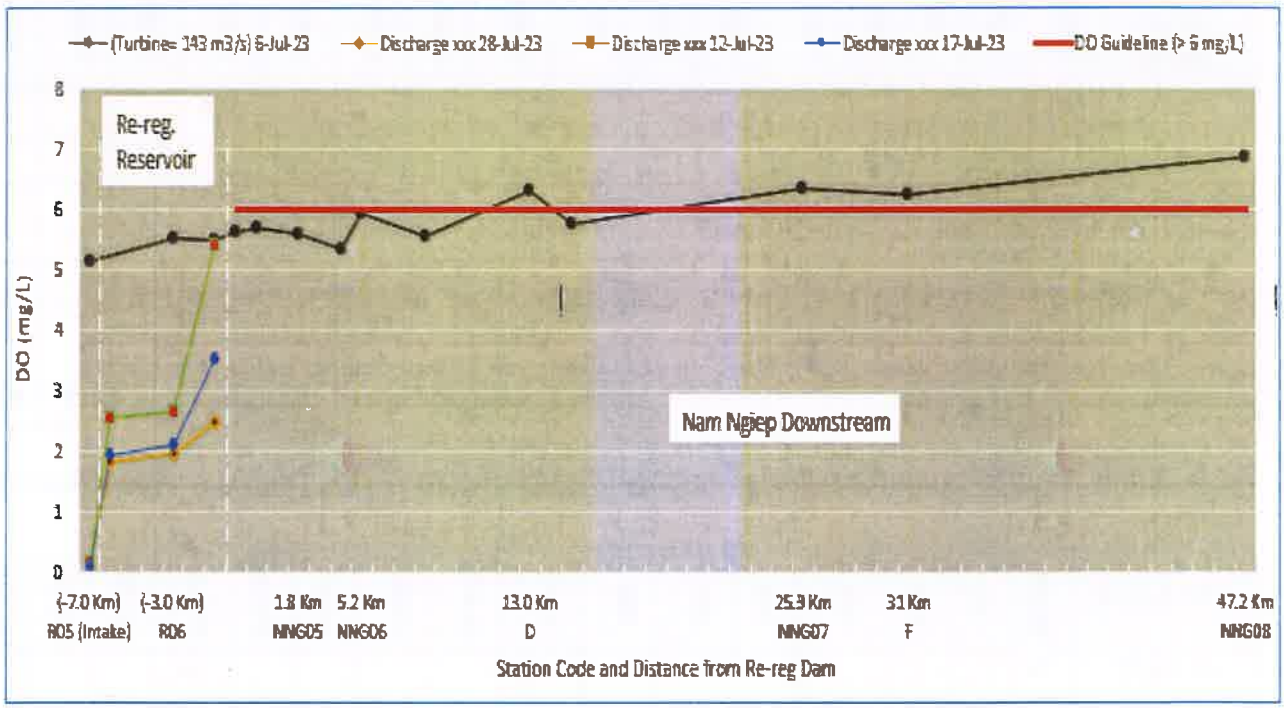

Figure 1.4-4: Dissolved Oxygen (Mg/L) Long Profile in July 2023 (from Immediately Upper Main Dam to Lower Nam Ngiep River)

Table 1.4-2: 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
3-Jul-23	7.45												8.41			
4-Jul-23		7.34	7.49	7.41										7.95		
5-Jul-23					7.02	6.27	5.51	5.47								
6-Jul-23									5.58	5.92	6.33	6.84			7.1	6.81
11-Jul-23		8.7	9.14	9.57												
12-Jul-23					8.32	8.61	2.66	5.42								
17-Jul-23					7.76	7.97	2.11	3.52								
18-Jul-23		7.08	7.54	7.58												
27-Jul-23		6.64	6.67	7.06												
28-Jul-23					7.52	7.42	1.95	2.47								

Table 1.4-3: 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
3-Jul-23	44.1												42.8			
4-Jul-23		86.2		<5										20.4		
4-Jul-23 Bottom				16.9												
5-Jul-23					<5	<5	8.5	<5								
5-Jul-23 Bottom					54.66	7.08										
6-Jul-23									6.6	18.2	42.6	50.2			88	8.64

Table 1.4-4: 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
03-July-23	<1												<1			
04-July-23		<1		<1										<1		
04-July-23 Bottom				8.6												
05-July-23					<1	<1	<1	<1								
05-July-23 Bottom					<1	9.9										
06-July-23									<1	<1	<1	<1			<1	<1

1.4.3 Groundwater Quality Monitoring

During July 2023, community groundwater quality analyses were carried out for all seven wells located in Somseun Village, Nam Pa Village, Thong Noy Village, Pou Village and Phouhomxay Village. The two damaged wells (GPHX01 and GPHX02) in Phouhomxay Village were repaired and have been operational since April 2023). The community groundwater samples were taken from household water taps.

The results indicate that:

- All parameters monitored from the two wells in Phouhomxay Village complied with the Standards.
- The well in Somsuen complied with the Standards, except for faecal coliform bacteriar.
- The wells in Nam Pa and Thong Noy Villages did not comply with the Standard for faecal coliform and *E. Coli* bacteria.
- All parameters monitored in the two wells in Pou Village complied with the Standards.

The community groundwater quality monitoring results are presented in ***Table 1.4-5.***

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 1.4-5: Groundwater Quality Monitoring Results in Phouhomxay, Somsuen, Nam Pa, ThongNoy and Pou Villages

Parameter (Unit)	Site Name	Phouhomxay		Somseun Village	NamPa Village	ThongNoy Village	Pou Village	
	Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01	GPOU02
	Guideline	20-Jul-23	20-Jul-23	20-Jul-23	20-Jul-23	20-Jul-23	03-Jul-23	03-Jul-23
pH	6.5 - 9.2	6.6	6.58	6.58	6.75	6.5	6.62	6.5
Sat. DO (%)		34	28	87.5	80.3	60.1	82.6	87.5
DO (mg/l)		2.68	2.26	6.97	6.29	4.59	6.68	7.12
Conductivity(µS/cm)		462	513	419	449	367	22	434
Temperature (°C)		28.35	26.45	26.93	27.84	28.37	26.19	25.64
Turbidity (NTU)	<20	20.8	6.05	0.61	0.84	2.28	4.56	0.84
Faecal coliform (MPN/100ml)	0	0	0	2	14	170	0	0
E.coli Bacteria (MPN/100ml)	0	0	0	0	4.5	110	0	0

1.4.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

The concentration of Faecal Coliform and *E.coli* did not comply with 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 in 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 in accordance with the Law as mentioned in ***1.3.3*** as well as recommended to carry out the operation and maintenance improvement.

Table 1.4-6: Results of the Gravity Fed Water Supply Quality Monitoring

	Site Name	**Thaheau Village**	**Hat Gnuin Village**	**Phouhomxay**	
	Station	**WTHH02**	**WHGN02**	**WPHX02**	**WPHX03**
Parameter (Unit)	**Guideline**	20-Jul-23	20-Jul-23	20-Jul-23	20-Jul-23
pH	6.5 - 8.5	6.8	6.78	7.1	7.08
Sat. DO (%)		91.4	91.3	88.9	85.6
DO (mg/L)		7.1	7.29	6.98	6.83
Conductivity (µS/cm)	<1,000	56	108	10	11
Temperature (°C)	<35	28.44	27.02	26.81	26.92
Turbidity (NTU)	<10	13.6	4.82	1.77	1.34
Faecal Coliform (MPN/100 mL)	0	350	240	170	240
E.coli Bacteria (MPN/100 mL)	0	220	130	130	130

1.4.5 Landfill Leachate Monitoring

During July 2023, the landfill leachate monitoring was not conducted at NNP1 Project Landfill (Last pond - LL4) because the leachate in the treatment ponds became disconnected from each other in the dry season. However, landfill leachate monitoring was carried out at Houay Soup Solid Waste Landfill (Last pond - LL6).

The results indicate that Houay Soup Landfill Leachate complied with the relevant standards except for total and faecal coliform bacteria which slightly exceeded the standard. The landfill leachate monitoring results for July 2023 can be found ***Table 1.4-7***.

Table 1.4-7: Results of the Landfill Leachate Monitoring

		Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharge Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline							
13-Jul-23	pH	6.0 - 9.0				7.1		7.03	
13-Jul-23	Sat. DO (%)					105.2		78	
13-Jul-23	DO (mg/L)					7.8		5.84	
13-Jul-23	Conductivity (µS/cm)					88		139	
13-Jul-23	Temperature (°C)					31.03		30.34	
13-Jul-23	Turbidity (NTU)					10.2		3.21	
13-Jul-23	BOD_5 (mg/L)	<30				<6		<6	
13-Jul-23	COD (mg/L)	<125				30.2		<25	
13-Jul-23	Faecal Coliform (MPN/100 mL)	<400				240		540	
13-Jul-23	Total Coliform (MPN/100 mL)	<400				350		540	
13-Jul-23	Total Nitrogen (mg/L)	<10				0.46		0.49	
13-Jul-23	Ammonia nitrogen (mg/L)	<10				<2		<2	
13-Jul-23	Oil & Grease (mg/L)	<10				<1		<1	

1.5 DISCHARGE MONITORING

1.5.1 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 1.5-1*** and ***Figure 1.5-2*** presents the values recorded since January 2020.

During July 2023, the mean inflow to the main reservoir was 148 m^3/s. The minimum and maximum inflows were 107 m^3/s (on 24 July 2023) and 311 m^3/s (on 06 July 2023) respectively.

In July 2023, during the first two weeks, the water level in the main reservoir increased from El. 297.91 m asl to El. 299.40 m asl. And from 11 July 2023, the water level in the main reservoir decreased and reached El. 297.93 m by the end of the month.

During July 2023, the hourly turbine discharges from the Main Powerhouse varied between 25 m^3/s and 228 m^3/s usually interrupted by night-time periods with no discharge.

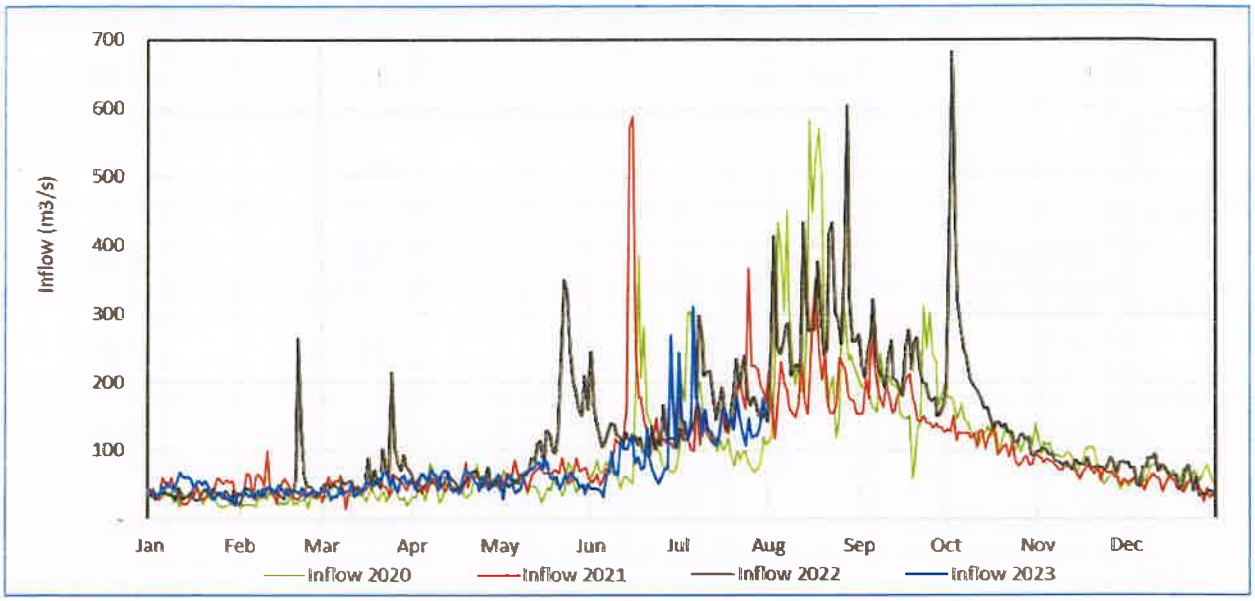

Figure 1.5-1: Inflow for the Main Reservoir during January 2020 to July 2023

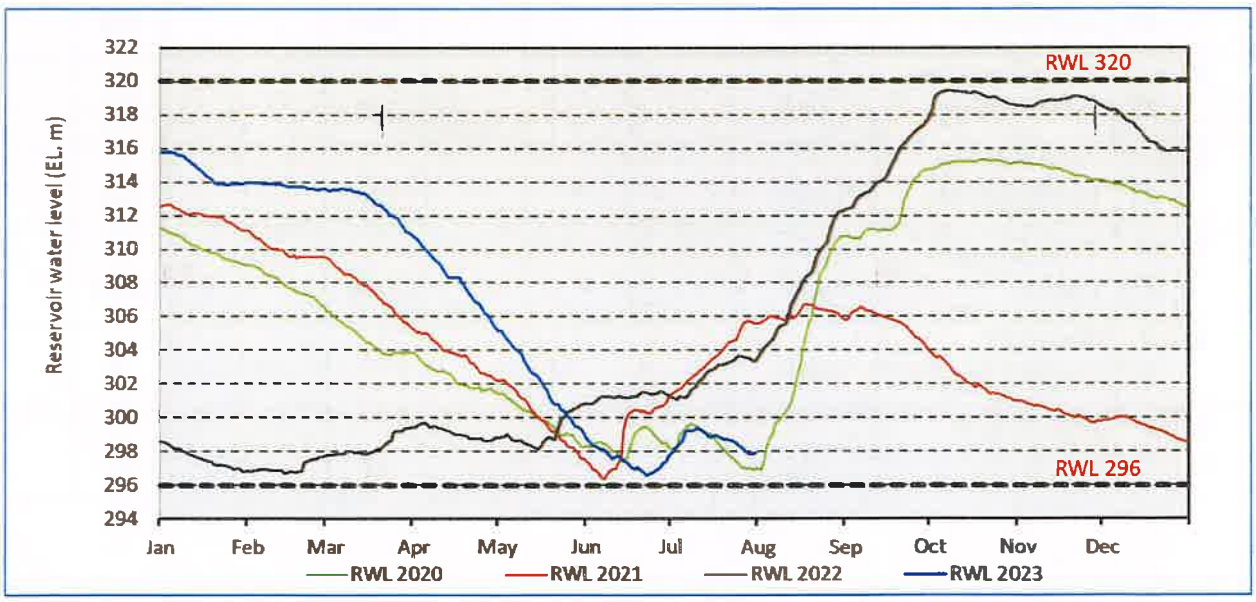

Figure 1.5-2: Water Level for the Main Reservoir during January 2020 to July 2023

1.5.2 Re-regulation Reservoir – Discharge

The daily discharge monitoring data for the Re-regulation Dam during May to July 2023 is presented in ***Figure 1.5-3***.

During July 2023, the mean daily discharge from the Re-regulation Dam was about 132 m^3/s, with hourly gate discharge varying between 27 m^3/s and 29 m^3/s, and hourly turbine discharge varying between 48 m^3/s and 163 m^3/s. The hourly combined gate and turbine discharges varied between 45 m^3/s and 238 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.

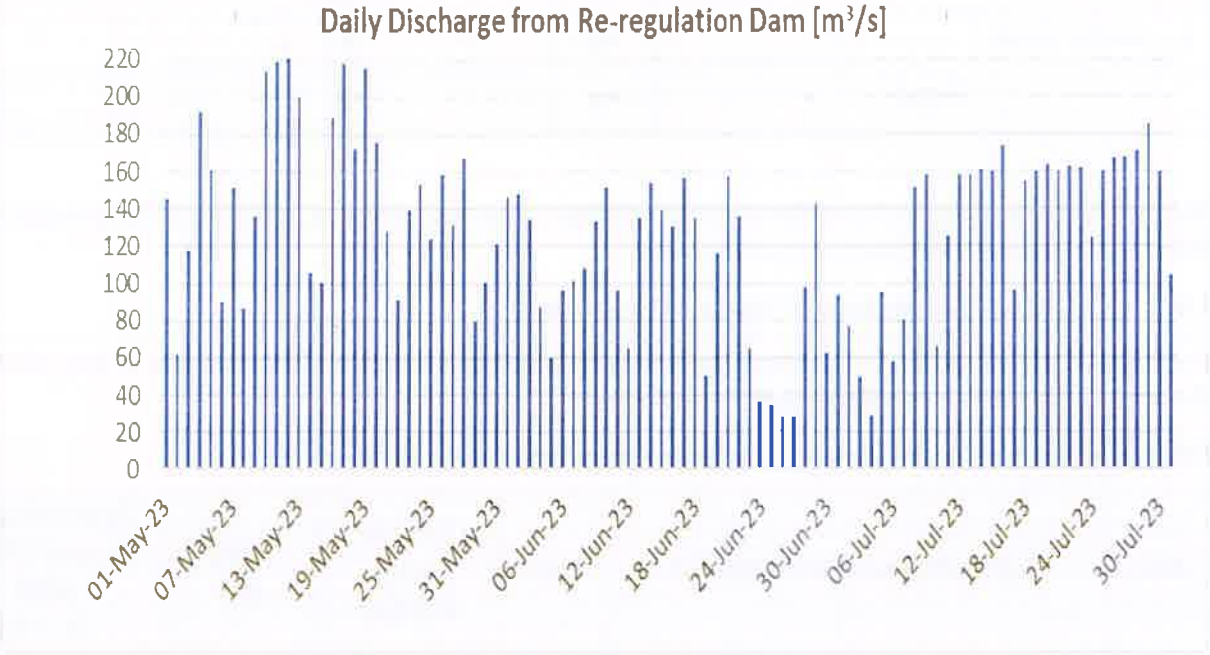

Figure 1.5-3: Discharge Monitoring at the Re-regulation Dam in May to July 2023

1.5.3 Nam Ngiep Downstream Water Depth Monitoring

In July 2023, due to the discharge from Re-regulation Dam was greater than 30 m^3/s, EMO did not carry out any boat missions to monitor the water depth in the Nam Ngiep downstream of the Re-regulation Dam.

1.6 PROJECT WASTE MANAGEMENT

1.6.1 Solid Waste Management

A total of 7 m^3 of solid waste was disposed of at the NNP1 Project Landfill, a decrease of 1 m^3 compared with June 2023. The Contractor continued the regular waste collection from the NNP1PC's operation sites and operated the project landfill for three days per week. The work includes waste segregation and disposal, grass cutting and repairing of the perimeter fences. The waste compaction at NNP1 landfill is still on hold, waiting for ADM to finalize an arrangement for waste compaction.

The total amount of recyclable waste sold and collected this month is summarized in ***Table 1.6-1***.

Table 1.6-1: Amounts of Recyclable Waste Sold and collection in July 2023

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total By July 2023
1	Plastic bottles	kg	0	75
2	Aluminium can	kg	0	0
3	Paper/Cardboard	kg	0	73
4	Glass	kg	0	86
5	Scrap Metal	Kg	0	0
Total		**kg**	**0**	**234**

In July 2023, the villagers from Phouhomxay Village collected a total of 167.3 kg of food waste from the OSOV1 canteen for feeding their animals.

1.6.2 Hazardous Materials and Waste Management

The types and amounts of hazardous materials and hazardous waste stored on site in July 2023 are shown in ***Table 1.6-2*** and ***Table 1.6-3*** respectively.

Table 1.6-2: Record of Hazardous Material Inventory in July 2023

No.	Type of Hazardous Material	Unit	Total in July 2023(A)	Used (B)	Remaining at the end of July 2023 (A – B)
1	Diesel	Litre	430	0	430
2	Gasoline	Litre	961	730	231
3	Lubricant (Turbine oil)	Litre	83	13	72
4	Colour Paint	Litre	39	0	39
5	Thinner	Litre	1	0	1
6	Grease Oil	Litre	785	0	785
7	Gear Oil	Litre	17,25	0.75	16,5
8	Chlorine Liquid	Litre	90	90	0
09	HA Cut AF	Litre	3,925	0	3,925.0
10	HA Cut Cat AF	Litre	372.5	0	372.5

Table 1.6-3: Record of Hazardous Waste Inventory

No.	Hazardous Waste Type	Unit	Total in July 2023 (A)	Disposed (B)	Remaining at the end of July 2023 (A - B)
1	Used Oil (Hydraulic + Engine)	Litre	335.3	0	335.3
2	Empty used oil drum/container (drum 200L)	Unit	53	0	**53**
3	Contaminated soil, sawdust and textile material	m^3	0.8	0	**0.8**
4	Used tyre	Drum	5	0	**5**
5	Empty used chemical drum/container (drum 20L)	Unit	23	0	**23**
6	Lead acid batteries	Unit	6	0	**6**
7	Empty paint and spray cans	Unit	45	0	**45**
8	Halogen/fluorescent bulbs	kg	385	0	**385**
9	Empty cartridge (Ink)	Unit	91	0	**91**
10	Clinic Waste	Kg	9.9	8.6	**1.3**
11	Expired Chlorine Powder	Kg	65	0	**65**

1.7 COMMUNITY WASTE MANAGEMENT

1.7.1 Community Solid Waste Management and Recycling Programmes

NNP1 EMO has coordinated with the Bolikhan District Environment Management Unit or EMU for transferring the management of the communities' solid waste and Houay Soup Landfill to the local authorities. The EMU will initiate discussions involving NNP1, village, and district authorities after receiving the 2022 monitoring funds, which NNP1 transferred to MONRE on 11 May 2023 following the fund disbursement request by MONRE on 20 April 2023.

2. WATERSHED AND BIODIVERSITY MANAGEMENT

2.1 WATERSHED MANAGEMENT

2.1.1 Implementation of Annual Implementation Plan (AIP)

2.1.1.1 Xaysomboun Watershed and Reservoir Protection Office (WRPO)

The progress of the actions that were discussed and agreed upon during the meeting with the Head of Xaysomboun Province Agriculture and Forestry Office (PAFO) on 26 April 2023 are summarized below:

- The Xaysomboun PAFO agreed to provide updates about the mining exploration and Nam Phouan Hydropower Project development in the NNP1 watershed Totally Protected Zone (TPZ) 15 working days after the meeting. The Head of Xaysomboun WRPO informed NNP1 EMO on 12 July 2023 that the Xaysomboun Provincial Department of Planning and Investment (PDPI) has requested the Xaysomboun WRPO to provide comments on the draft MOU for the extension of mining exploration activity by the Boulaiy Mangkhone Thong. NNP1 EMO advised Xaysomboun WRPO to refer to the CA between NNP1PC and GOL about Biodiversity Offset and No Net Loss (NNL) requirement as well as the Xaysomboun Provincial Governor agreement on the NNP1 watershed management. There were no updates from Xaysomboun WRPO about this as of the end of July 2023. In addition, the Xaysomboun WRPO still had not received any further information from the Xaysomboun Provincial Department of Energy and Mines as inquired in May 2023.
- The Xaysomboun PAFO agreed to update the NNP1 EMO team 15 working days after the meeting about the Fishery Co-Management Plan (FCMP). The Head of Xaysomboun WRPO did not share a meeting agenda and confirmation of district availability as of the end of July 2023. He confirmed his unavailability because of other assignments within the forestry section of Xaysomboun PAFO.
- The Head of Xaysomboun PAFO agreed to review the patrol team establishment to have the district military personnel engaged in the patrolling work. A meeting among the NNP1 EMO, Xaysomboun WRPO, and Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS) on the Law Enforcement Strategy (LES) was organized on 24 July 2023. NNP1 EMO requested Xaysomboun WRPO to submit an official letter on the new patrol team establishment including the assignment of staff to be based in the Xaysomboun WRPO sub-office before implementing the patrolling work, once the WRPO has received the AIP2022 funds.
- The Head of Xaysomboun WRPO informed NNP1 EMO that he will share the report of the site visit to the Xaysomboun WRPO sub-office and submit the plan including the schedule and budget on 14 July 2023 as per the MOM of the site inspection signed on 23 June 2023. But NNP1 EMO did not receive any report or plan as of the end of July 2023.
- The Head of Xaysomboun WRPO informed NNP1 EMO that he had a discussion with the Contractor for the construction of two reservoir check points but there was no official MOM for this discussion. He informed the NNP1 EMO on 24 July 2023 that the construction will start in August 2023. NNP1 EMO will continue to follow up with the Head of Xaysomboun WRPO on the start and progress of the construction work to help prevent it from being further delayed.

2.1.1.2 Bolikhamxay Watershed and Reservoir Protection Office (WRPO)

Bolikhamxay WRPO conducted forest and reservoir patrolling from 28 June to 7 July 2023. Bolikhamxay WRPO also completed collection of village land use data at the end of June 2023 but without consultation or participation of NNP1 EMO and Biodiversity Service Provider (BSP)-

Wildlife Conservation Society (WCS). The reports of patrolling and village land use data collection was shared with NNP1 EMO on 21 July 2023. NNP1 EMO and BSP-WCS expect to discuss the results during the upcoming monthly meeting in early August 2023.

NNP1PC EMO

NNP1 EMO discussed with the selected farmers and head/deputy head of each producer group of orange, pineapple, and cattle fattening at Ban PhouNgou and Ban Houayxai of Hom District on 18 and 19 July 2023 respectively under the 5 years action plan for strengthening capacity of local producers and market linkages of Hom and Thathom District (Activity 6.1 of the approved NNP1 WMP). The results of the discussion are as follows:

- Most of the producer group farmers discontinued to produce and use the bioinsecticide powder, wood vinegar, and plant immunity for their plantation after training. They have monitored the plantations and they found that the organic materials are not suitable for long-term crop plantation. They decided not to continue to produce these organic materials for their farming and they also confirmed that they are not interested to continue training about this. However, they also informed EMO that this is suitable for the greenhouse vegetables.
- The selected farmer for the demonstration of orange farming and the head/deputy head of orange and pineapple groups reported that they used these organic for their plantation from 2022 until March 2023 but they feel not satisfied with the output. Then they decided not to continue to produce more and use another organic instead of these.
- The head of the orange and pineapple producer group proposed NNP1 to produce a set of guidelines for maintaining and improving the quality and quantity of their agriculture products such as guidelines for water requirements, branch cutting, and water system structure. They requested NNP1 to provide support on the sharing or knowledge exchange activity with the successful farmers in another village.
- They also requested NNP1 to further coordinate with the related district level to review and develop regulations for each group because the farmers of each group did not understand clearly about roles of the groups and their members.
- On the cattle fattening program, the selected farmers have continued to rear and feed their cattle. They requested NNP1 to provide nails and zinc for the cattle fattening house and Chongxern grass for feeding, to regularly monitor the program, as well as to develop the specific regulations for the cattle farmer group.

Referring to the result of the discussion and producer group request, NNP1 EMO will coordinate and discuss with the Hom District Agriculture and Forestry Office (DAFO) in August 2023 on organizing sharing or knowledge as well as on developing regulations and work plans for each farmer group.

NNP1 EMO also discussed with three selected households for the greenhouse vegetable at Ban Phonhom on 20 July 2023 under the agriculture extension service (Activity 6.2 of the approved NNP1 WMP). The results of the discussion are as follows:

- Two households have continued the activity since last year and one household stopped the activity in November 2022 because the plastic cover was broken in October 2022.
- They are interested in continuing the activity and there are additional three households interested in participating in this activity.

- They requested NNP1 to continue to provide support including materials for greenhouse structure and crop species because this activity increases their income and supports their domestic consumption.

Referring to the result of the discussion, the NNP1 EMO will coordinate and work with Thathom DAFO in the second or third week of August 2023 to develop a detailed work plan for the continuation of this activity.

An official letter seeking urgent support from the Department of Energy and Business (DEB) of the Ministry of Energy and Mine to address the risk and challenges for achieving the No Net Loss (NNL) was submitted to DEB-MEM with carbon copies to DOF-MAF, Department of Environmental and Social Impact Assessment (DESIA) of Ministry of Natural Resource and Environment (MONRE), and Xaysomboun Provincial Governor Office on 27 Jun 2023. The ADB Lao Residence Mission (LRM) representatives met with the Deputy Director General (DDG) of DEB-MEM on 7 July 2023. The DDG recommended that NNP1PC organize a meeting with all parties about the matter. NNP1PC Management met with the DDG of DEB-MEM on 19 July 2023. The key discussions could be summarized as follow:

- The DDG DEB-MEM informed that the Nam Phouan Hydropower Project should no longer be an issue as he has heard that the Project Developer informed the government that they planned not to continue the Project. The Project is at MOU stage, and the CA has not yet been signed. In addition, the DDG DEB-MEM also pointed out that the government policy also intends not to support the mining project, including the Project from Boualay Mongkone Thong in NNP1 watershed TPZ1, which is currently in the exploration stage as they realized that the mining Project have an adverse environmental impact.
- The DDG DEB-MEM proposed to organize a meeting in early August 2023 with participants from the relevant GOL parties at all levels (approx. 20 persons) with financial support from the NNP1PC. He proposed a venue for the NNP1 Project site and to have a site visit before the meeting. NNP1PC suggested the site visit should be carried out by the NNP1 EMO team instead and will share the findings during the meeting. The DEB will present the obligation of the GOL under the CA to emphasize to all GOL parties.

2.1.2 Preparation of Annual Implementation Plan (AIP) 2022

2.1.2.1 Xaysomboun WRPO

The Xaysomboun WRPO re-submitted the revised official request for fund disbursement to FPF DOF-MAF in July 2023. NNP1 EMO noted from the follow-up with FPF DOF-MAF that all the coordination and communication work of the Project development within DOF-MAF are under the responsibility of the Department of Planning and Investment (DPI)-MAF and the FPF DOF-MAF is only responsible for fund management. Both DPI-MAF and FPF DOF-MAF are also responsible for all the projects within the country. Therefore, in the absence of official assignment for the FPF DOF-MAF staff to specifically manage the NNP1PC Project then the documentation process might be delayed as currently experienced.

2.1.3 Preparation of Annual Implementation Plan (AIP) 2023

2.1.3.1 Xaysomboun WRPO

The Head of Xaysomboun WRPO agreed to discuss with the NNP1 EMO and BSP-WCS after the Xaysomboun PAFO received the response letter from FPF DOF-MAF on 21 July 2023 for them to follow up with the MOM of Financial Management Manual (FMM) finalization workshop in Jan 2023 as well as the approved FMM in May 2023. He assigned his deputy for this because he has to attend

the training for the other project that he was assigned at the other province at the end of July 2023. NNP1 EMO, the deputy head of Xaysomboun WRPO and BSP-WCS had further discussions on 25 July 2023. The final draft AIP2023 is expected to be shared with ADB and IAP for approval in the first week of August 2023.

2.1.3.2 Bolikhamxay WRPO

Bolikhamxay WRPO submitted the request for the second two-quarter funds of the approved AIP2023 to FPF DOF-MAF in early July 2023. NNP1PC did not receive the official fund disbursement request as of the end of July 2023. Please refer to section 2.1.2.1. above on the reason for the long documentation process.

2.2 Biodiversity Offset Management

2.2.1 Implementation of BOMP Annual Implementation Plan (AIP)

The progress on the implementation of key activities by Component in July 2023 is described below:

a. Component 1 - Spatial Planning and Regulation

BSP-WCS is still reviewing and analyzing the information collected from Participatory Land Use Planning (PLUP). The results will be further discussed among BOMU, NNP EMO, and BSP-WCS when they are ready. The results will be presented, discussed, and agreed upon with the communities in September 2023 and the dissemination of the updated PLUP is scheduled for October 2023.

b. Component 2 – Law Enforcement

Bolikhamxay BOMU has resumed the patrolling activity. The July 2023 patrolling was conducted from 7 to 26 July 2023 and focused on the TPZ's highest and high-priority area including the north mountain ridges of Nam San, Nam Sone, Nam Chang, Nam San, Nam Phai, Nam Pang, and Nam Ma. The July 2023 patrolling will be reported in August 2023.

c. Component 3 – Conservation Outreach

BSP-WCS is in the progress of preparing the report for the outreach activity that was conducted in April 2023.

d. Component 4 – Conservation linked livelihood development

Bolikhamxay BOMU with the participation of the relevant district office, the NNP1 EMO, and BSP-WCS engaged on the establishment of livestock farmer groups at Viengthong and Xaychamphone District as the Community Development Plan (CDP) activity of the approved AIP2023. The activity was scheduled from 25 July to 11 August 2023.

The snare removal activity was resumed. The activity in July 2023 was conducted from 9 to 21 July 2023 and focused on the TPZ's highest priority area in Nam San and the southern mountain ridges of Nam San. The results will be discussed during the monthly meeting in August 2023.

2.2.2 Preparation of Annual Implementation Plan (AIP) 2023

Bolikhamxay BOMU also prepared the request for the second two-quarter fund under their approved AIP2023 and submitted it to FPF DOF-MAF at the end of July 2023.

The FMM books are still in the printing process by the NNP1 procurement department. It will be circulated to relevant offices afterward.

2.3 FISHERY MONITORING

The fishery monitoring is based on the 7-day reported catch from the Daily Catch Logbook (DCL) survey of the month by covering the upstream, upper reservoir, lower reservoir, downstream and Mekong areas.

The fish species dominating the fish catch by weight in June 2023 as listed in ***Table 2.3-1.*** All species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species[1] , except *Sikukia gudgeri* is classified as Data deficient (DD) and *Scaphognathops bandanensis* is classified as Vulnerable species (VU).

Table 2.3-1: Fish Species dominating the Fish Catch in June 2023

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Barbonymus gonionotus, Hypsibarbus malcolmi, Hypsibarbus vernayi, Hypsibarbus wetmorei	ปาปาก	139.4	LC
Sikukia gudgeri, Amblyrhynchichthys truncatus	ปาຂาวຊาย	134.4	DD, LC
Poropuntius normani, Poropuntius laoensis, Poropuntius carinatus	ปาจาด	113.8	LC
Scaphognathops bandanensis	ปาป่ຽม/ปาอຽมไฟ	98.9	VU
Hampala dispar, Hampala macrolepidota	ปาสูด	72.2	LC

The recorded catch of Threatened species (IUCN Red List classification) in June 2023 are presented in ***Table 2.3-2.*** The list includes three species that are classified as Vulnerable species (VU).

Table 2.3-2: Threatened Species of June 2023 Fish Catch

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Cirrhinus cirrhosus	ปาแกง/ปามอมจัม	5.9	VU
Scaphognathops bandanensis	ปาป่ຽม/ปาอຽมไฟ	98.9	VU
Tor sinensis	ปาแดง	7.8	VU

Species abundance and occurrence is based on the 7-day reported catch from the Daily Catch Logbook (DCL) survey in June 2023. The catch is divided in three areas including above the main

[1] The IUCN Red List of Threatened Species is the world's most comprehensive inventory and classification of threatened species. The Red List classifies species into nine groups: Extinct (EX), Extinct in the wild (EW), Critically endangered (CR), Endangered (EN), Vulnerable (VU), Near threatened (NT), Least concern (LC), Data deficient (DD), and Not Evaluated (NE). The term "Threatened" includes Critically Endangered, Endangered, and Vulnerable.

dam, below the main dam and Mekong area. Main biodiversity indicators in June 2023 for above dam, below dam and Mekong area are presented in ***Table 2.3-3.***

Table 2.3-3: Main Biodiversity Indicators for June 2023

Biodiversity Indicators	Mekong	Below dam	Above dam
Total number of species and groups recorded	26	33	33
Single species	19	22	22
Species groups	7	11	11
Top 15 species (% total catch weight)	96.11%	89.43%	89.81%
Proportion for species groups	25.38%	58.15%	54.53%
Diversity index (Shannon)	2.3766	2.5265	2.7647

Figure 2.3-1 shows fish diversity index (Shannon) for above dam, below dam and Mekong area from July 2015 to June 2023. Note that high values in the index (Shannon) mean high biodiversity.

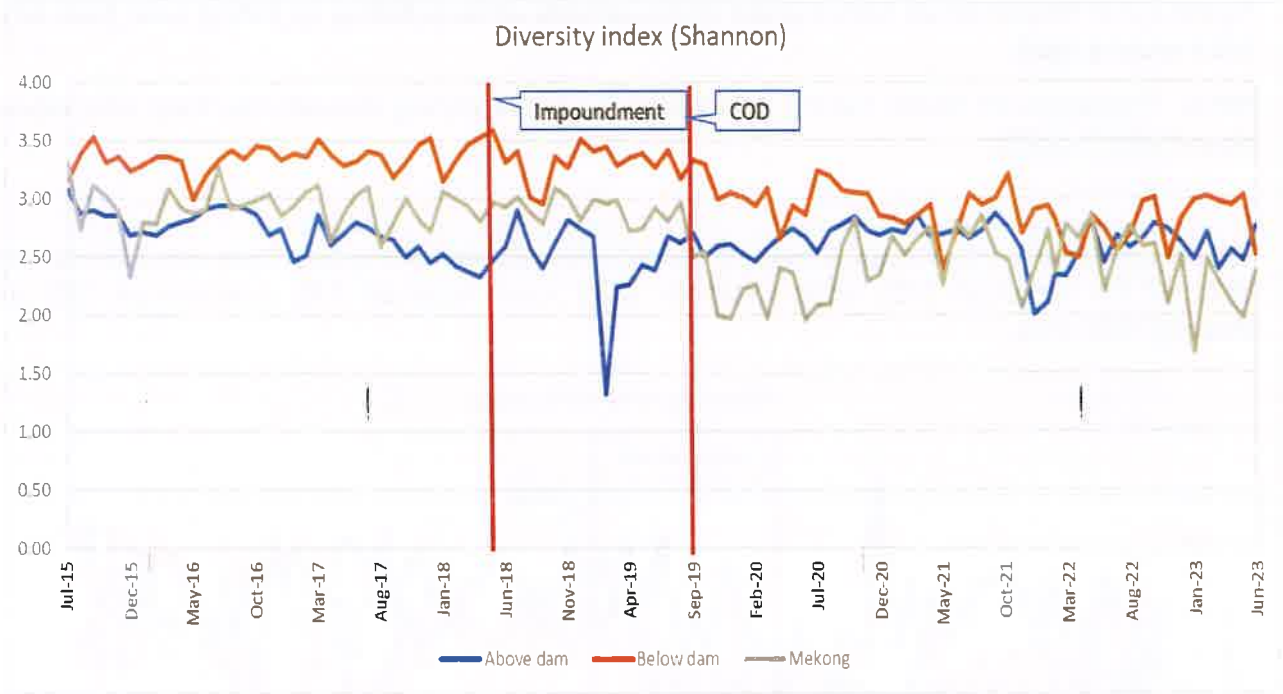

Figure 2.3-1: Fish diversity index (Shannon) by fishing zone from July 2015 to June 2023

Figure 2.3-2 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 36% and 86% of active fishing households for all fishing zones in June 2023.

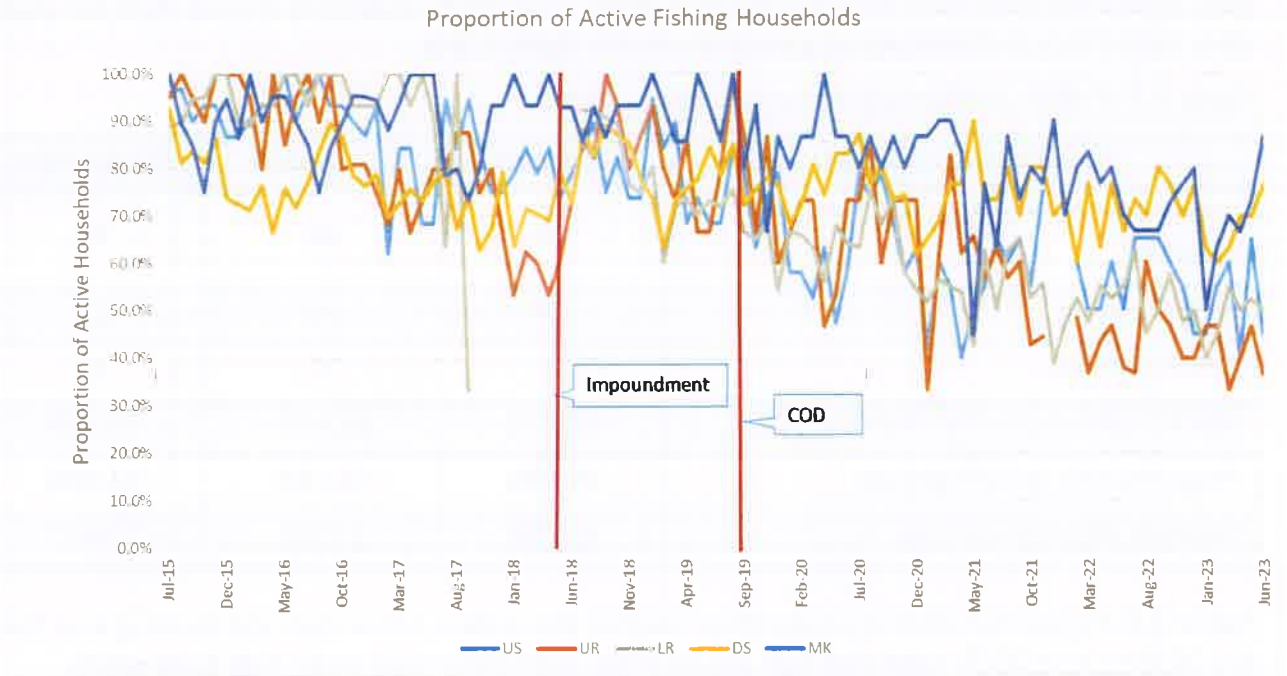

Figure 2.3-2: Proportion of total number of households actively fishing by fishing zone from July 2015 to June 2023

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

Figure 2.3-3 shows the average (mean) of monthly household fishing days from July 2015 to June 2023 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area.

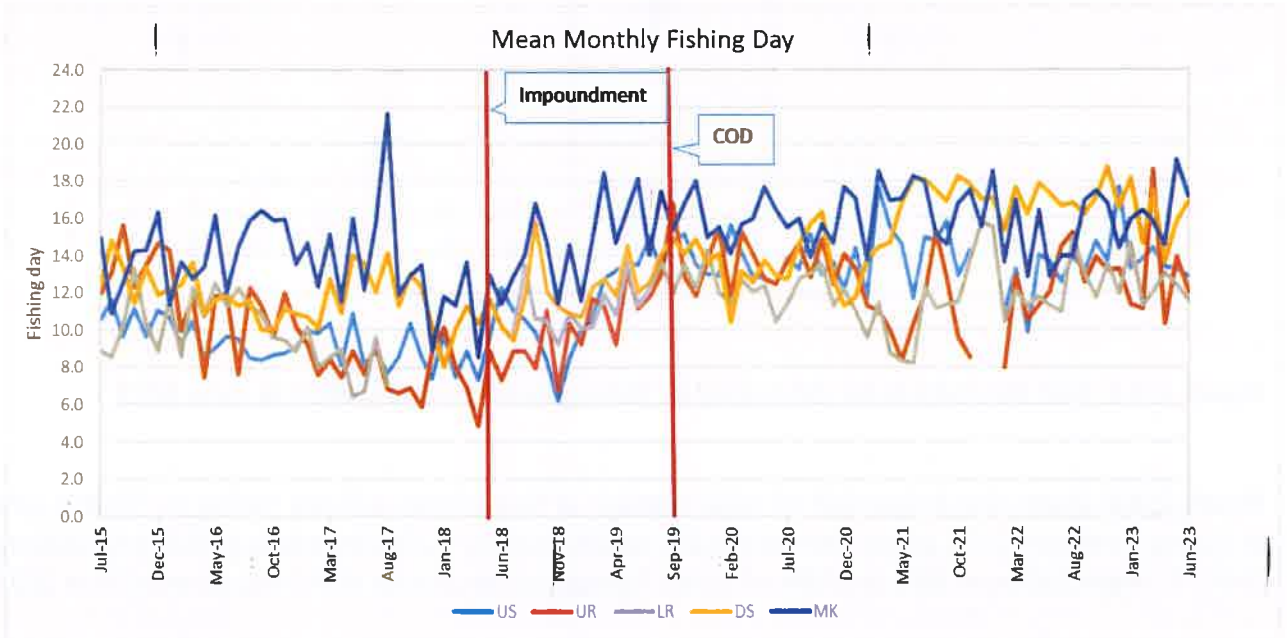

Figure 2.3-3: Mean of monthly fishing day from July 2015 to June 2023

The mean monthly number of fishing days for the month of June from 2016 to 2023 for the upstream, upper reservoir, lower reservoir, downstream and Mekong area are displayed in ***Table 2.3-4.***

Table 2.3-4: Mean reported number of fishing days by fishing zone for the month of June from 2016 to 2023

Fishing Zone	June 2016 (day)	June 2017 (day)	June 2018 (day)	June 2019 (day)	June 2020 (day)	June 2021 (day)	June 2022 (day)	June 2023 (day)
Upstream	9.64	8.14	12.24	14.99	12.47	11.69	13.71	12.86
Upper reservoir	11.90	7.62	7.35	11.81	12.47	10.34	12.08	12.08
Lower reservoir	11.33	6.73	NA	12.21	10.48	8.23	11.30	11.57
Downstream	11.87	13.60	10.22	12.57	12.97	18.12	17.36	16.96
Mekong	12.00	12.14	11.43	14.02	16.48	18.26	12.86	17.14

The mean monthly household fish catch from July 2015 to June 2023 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area are presented in ***Figure 2.3-4.***

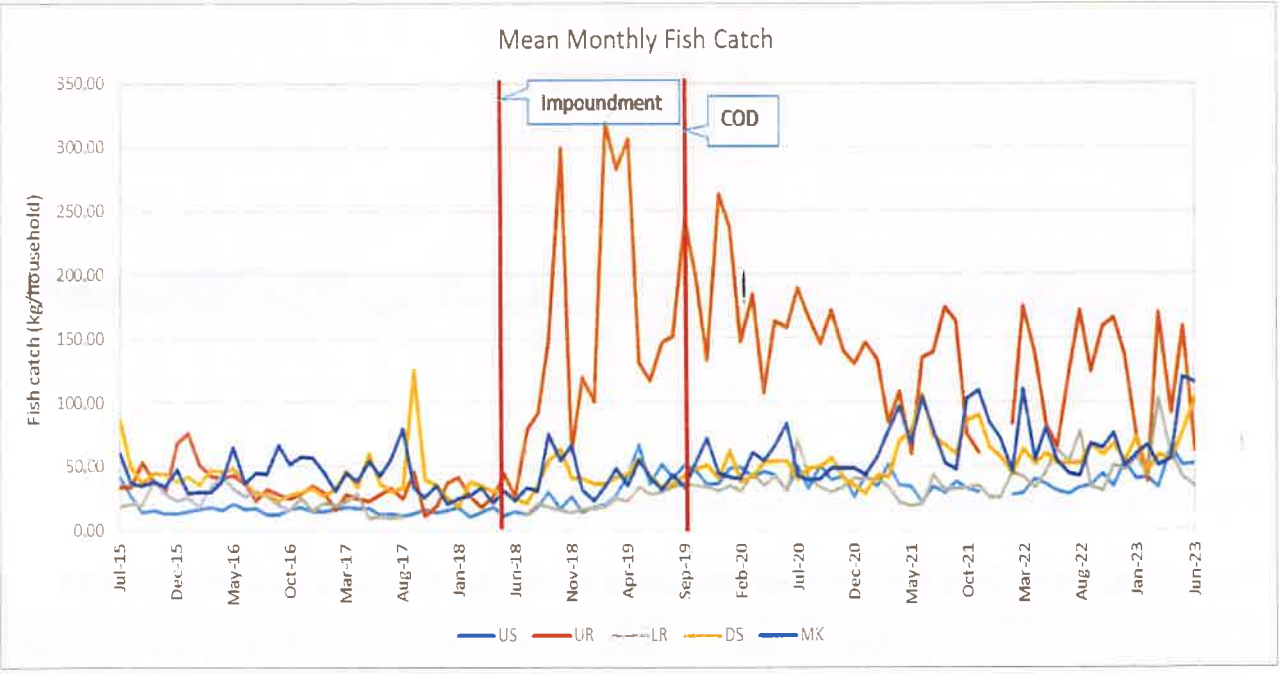

Figure 2.3-4: Mean Monthly Household Fish Catch from July 2015 to June 2023

The mean household fish catch for the month of June from 2016 to 2023 in the upstream, upper reservoir, lower reservoir, downstream and Mekong area are displayed in ***Table 2.3-5.***

Table 2.3-5: Mean Monthly Household Fish Catch for the month of June from 2016 to 2023

Fishing Zone	June 2016 (kg)	June 2017 (kg)	June 2018 (kg)	June 2019 (kg)	June 2020 (kg)	June 2021 (kg)	June 2022 (kg)	June 2023 (kg)
Upstream	16.53	12.34	14.57	35.47	30.62	21.66	30.30	51.19
Upper reservoir	36.57	28.43	26.51	116.40	158.49	134.87	65.30	62.34
Lower reservoir	26.66	10.16	NA	28.39	30.44	20.59	62.98	34.35
Downstream	38.16	36.61	24.45	41.97	54.11	105.99	51.99	103.68
Mekong	36.29	42.50	23.43	41.60	83.64	104.22	53.84	115.30

The mean daily fish catch per household from July 2015 to June 2023 are displayed in ***Figure 2.3-5*** and the mean fish catch per household per fishing day for the month of June from 2016 to 2023 are shown in ***Table 2.3-6.***

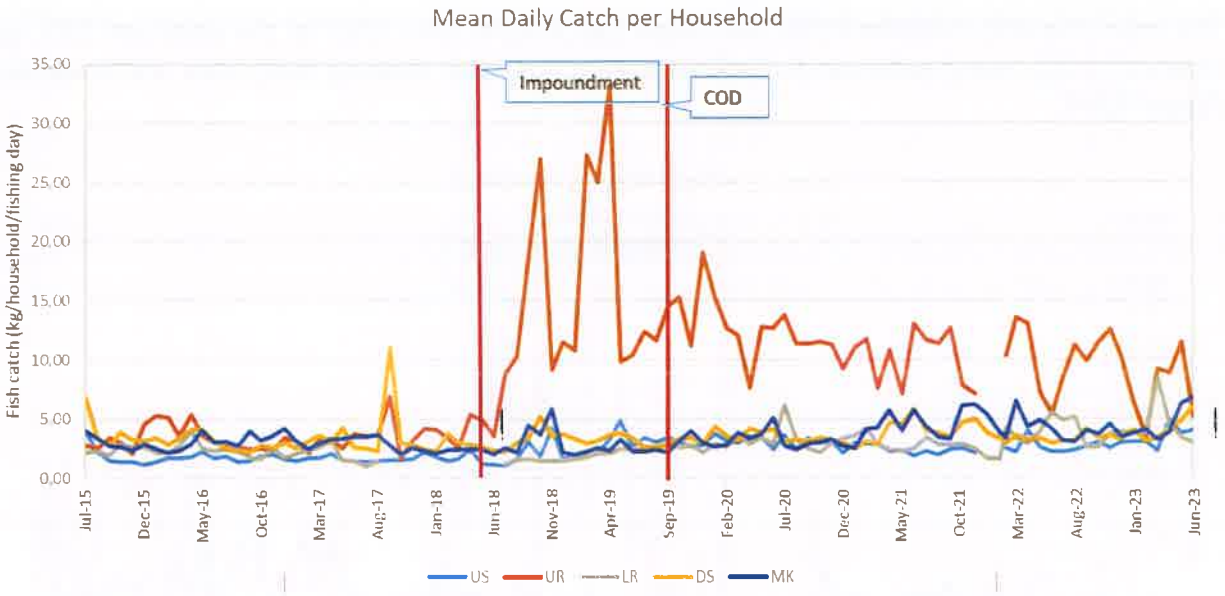

Figure 2.3-5: Mean Daily Fish Catch per Household from July 2015 to June 2023

Table 2.3-6: Mean Daily Fish Catch per Household for the month of June from 2016 to 2023

Fishing Zone	June 2016 (kg)	June 2017 (kg)	June 2018 (kg)	June 2019 (kg)	June 2020 (kg)	June 2021 (kg)	June 2022 (kg)	June 2023 (kg)
Upstream	1.71	1.52	1.19	2.62	2.46	1.85	2.21	3.98
Upper reservoir	3.07	3.73	3.61	10.45	12.71	13.05	5.41	5.16
Lower reservoir	2.35	1.51	NA	2.51	2.91	2.50	5.57	2.97

Fishing Zone	June 2016 (kg)	June 2017 (kg)	June 2018 (kg)	June 2019 (kg)	June 2020 (kg)	June 2021 (kg)	June 2022 (kg)	June 2023 (kg)
Downstream	3.22	2.69	2.39	3.48	4.17	5.85	3.00	6.11
Mekong	3.02	3.50	2.05	2.29	5.07	5.71	4.19	6.73

The survey results in June 2023 indicate that Nam Ngiep is the main fishing habitat for the upstream and downstream zone, while the main fishing habitat for the upper reservoir, lower reservoir and Mekong zones are reservoir, tributaries and streams, and Mekong respectively. The proportion of fishing habitats in June 2023 are displayed in ***Table 2.3-7.***

Table 2.3-7: Proportion of the catch reported by main habitats (%) in June 2023

Habitats	US	UR	LR	DS	MK
Mekong	0.0%	0.0%	0.0%	5.2%	97.4%
Nam Ngiep	38.3%	25.9%	0.0%	59.0%	0.0%
Nam Xan	0.0%	0.0%	0.0%	0.0%	0.0%
Reservoir	32.6%	63.1%	12.7%	0.0%	0.0%
Tributaries and streams	27.3%	8.4%	77.3%	31.1%	0.0%
Wetlands	1.8%	2.5%	10.0%	4.7%	2.6%
Others	0.0%	0.0%	0.0%	0.0%	0.0%

Total proportion of other aquatic animals (OAA) in the total reported catch of fish and OAA for the same 7-day period from July 2015 to June 2023 are presented in ***Figure 2.3-6*** and the proportion of OAA catch for the month of June from 2016 to 2023 are shown in ***Table 2.3-8.***

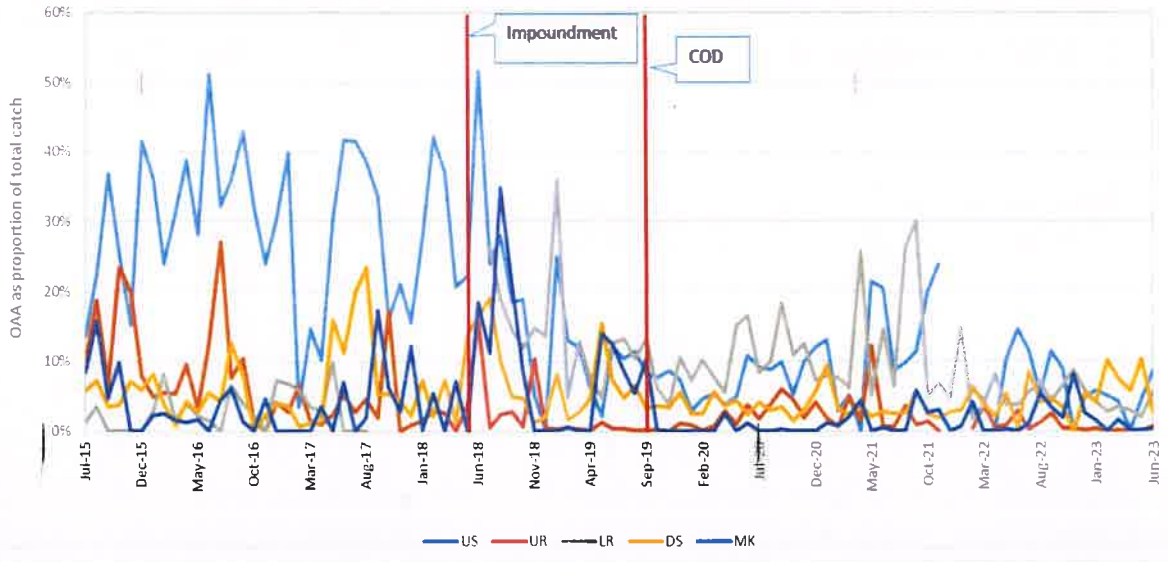

Figure 2.3-6: Proportion of OAA to the total reported number of fish and OAA for a 7-day period by fishing zone from July 2015 to June 2023

Table 2.3-8: Proportion of OAA to the total reported number of fish and OAA for the month of June from 2016 to 2023

Fishing Zone	June 2016	June 2017	June 2018	June 2019	June 2020	June 2021	June 2022	June 2023
Upstream	51.23%	41.70%	51.63%	12.09%	10.78%	20.46%	14.61%	8.59%
Upper reservoir	12.73%	5.24%	15.76%	0.37%	3.74%	0.59%	2.90%	0.62%
Lower reservoir	1.47%	0.00%	NA	12.70%	16.52%	14.58%	3.75%	5.48%
Downstream	5.52%	11.31%	16.40%	7.30%	2.40%	2.82%	0.41%	2.61%
Mekong	0.00%	7.03%	18.51%	12.48%	1.17%	0.53%	0.00%	0.21%

3 EXTERNAL MISSIONS AND VISITS

There are no external missions and visits in June 2023.

ANNEXES

ANNEX A: RESULTS OF WATER QUALITY MONITORING

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

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXAO 1	NHS01
Date	Parameters (Unit)	Guideline																
3-Jul-23	pH	5.0 - 9.0	6.7												6.85			
4-Jul-23	pH	5.0 - 9.0		6.92	6.85	6.77										7.1		
5-Jul-23	pH	5.0 - 9.0					6.64	6.5	6.66	6.74								
6-Jul-23	pH	5.0 - 9.0									6.63	6.91	6.97	7.18			7.08	7.01
11-Jul-23	pH	5.0 - 9.0		6.88	6.78	6.7												
12-Jul-23	pH	5.0 - 9.0					6.55	6.61	6.78	6.85								
17-Jul-23	pH	5.0 - 9.0					6.81	6.84	6.53	6.58								
18-Jul-23	pH	5.0 - 9.0		6.95	6.82	6.7												
27-Jul-23	pH	5.0 - 9.0		6.95	6.81	6.78												
28-Jul-23	pH	5.0 - 9.0					6.75	6.74	6.64	6.6								
3-Jul-23	Sat. DO (%)		91.3												100.2			
4-Jul-23	Sat. DO (%)			89	97.8	98.3										95.4		
5-Jul-23	Sat. DO (%)						92.5	81.2	73.4	72.7								
6-Jul-23	Sat. DO (%)										69.6	73.8	79.7	85.8			90.7	84.3
11-Jul-23	Sat. DO (%)			107.7	122.1	129.3												
12-Jul-23	Sat. DO (%)						112.1	114.4	32.6	67.1								
17-Jul-23	Sat. DO (%)						105.4	107.8	26.2	43.8								
18-Jul-23	Sat. DO (%)			87.5	101.4	102.4												
27-Jul-23	Sat. DO (%)			84.6	91.1	97.3												
28-Jul-23	Sat. DO (%)						102.9	101.8	24.2	31								
3-Jul-23	DO (mg/L)	>6.0	7.45												8.41			
4-Jul-23	DO (mg/L)	>6.0		7.34	7.49	7.41										7.95		

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
5-Jul-23	DO (mg/L)	>6.0					7.02	6.27	5.51	5.47								
6-Jul-23	DO (mg/L)	>6.0									5.58	5.92	6.33	6.84			7.1	6.81
11-Jul-23	DO (mg/L)	>6.0		8.7	9.14	9.57												
12-Jul-23	DO (mg/L)	>6.0					8.32	8.61	2.66	5.42								
17-Jul-23	DO (mg/L)	>6.0					7.76	7.97	2.11	3.52								
18-Jul-23	DO (mg/L)	>6.0		7.08	7.54	7.58												
27-Jul-23	DO (mg/L)	>6.0		6.64	6.67	7.06												
28-Jul-23	DO (mg/L)	>6.0					7.52	7.42	1.95	2.47								
3-Jul-23	Conductivity (µs/cm)		121												31			
4-Jul-23	Conductivity (µs/cm)			71	98	83										74		
5-Jul-23	Conductivity (µs/cm)						81	83	72	73								
6-Jul-23	Conductivity (µs/cm)										69	76	67	66			136	23
11-Jul-23	Conductivity (µs/cm)			79	92	85												
12-Jul-23	Conductivity (µs/cm)						81	81	84	83								
17-Jul-23	Conductivity (µs/cm)						81	81	90	89								
18-Jul-23	Conductivity (µs/cm)			99	91	86												
27-Jul-23	Conductivity (µs/cm)			88	92	88												
28-Jul-23	Conductivity (µs/cm)						81	79	90	88								
3-Jul-23	Temperature (°C)		25.7												24.03			
4-Jul-23	Temperature (°C)			25.21	29.53	30.16										24.59		
5-Jul-23	Temperature (°C)						29.76	28.78	30.29	30.36								
6-Jul-23	Temperature (°C)										26.51	26.57	27.28	27.09			28.02	26.2
11-Jul-23	Temperature (°C)			26.27	30.47	31.15												
12-Jul-23	Temperature (°C)						31.02	29.94	26.26	26.55								
17-Jul-23	Temperature (°C)						31.35	31.28	26.39	26.64								
18-Jul-23	Temperature (°C)			26.23	30.58	31.11												
27-Jul-23	Temperature (°C)			28	31.74	32.3												

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXAO 1	NHS01
Date	Parameters (Unit)	Guideline																
28-Jul-23	Temperature (°C)						31.86	31.76	26.5	27.12								
3-Jul-23	Turbidity (NTU)		54.9												56.5			
4-Jul-23	Turbidity (NTU)			69.1	4.8	2.18										21.6		
5-Jul-23	Turbidity (NTU)						3.04	2.36	16.6	8.38								
6-Jul-23	Turbidity (NTU)										14.1	40.8	51.7	54.3			136	15
11-Jul-23	Turbidity (NTU)			58.8	9.35	2.45												
12-Jul-23	Turbidity (NTU)						2.8	2.29	3.87	7.36								
17-Jul-23	Turbidity (NTU)						1.96	1.7	3.65	5.4								
18-Jul-23	Turbidity (NTU)			421	5.63	2.05												
27-Jul-23	Turbidity (NTU)			45.1	4.23	1.65												
28-Jul-23	Turbidity (NTU)						2.26	1.54	3.87	3.74								
3-Jul-23	TSS (mg/L)		44.16												42.82			
4-Jul-23	TSS (mg/L)			86.22		<5										20.48		
5-Jul-23	TSS (mg/L)						<5	<5	8.57	<5								
6-Jul-23	TSS (mg/L)										6.6	18.24	42.68	50.21			88	8.64
3-Jul-23	BOD_5 (mg/L)	<1.5	<1												<1			
4-Jul-23	BOD_5 (mg/L)	<1.5		<1		<1										<1		
5-Jul-23	BOD_5 (mg/L)	<1.5					<1	<1	<1	<1								
6-Jul-23	BOD_5 (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
3-Jul-23	COD (mg/L)	<5.0	6.4												6.4			
4-Jul-23	COD (mg/L)	<5.0														<5		
5-Jul-23	COD (mg/L)	<5.0							9.6	19.2								
6-Jul-23	COD (mg/L)	<5.0									6.4	<5	<5	6.4			12.8	9.6
3-Jul-23	NH_3-N (mg/L)	<0.2	<0.2												<0.2			
4-Jul-23	NH_3-N (mg/L)	<0.2		<0.2		<0.2										<0.2		
5-Jul-23	NH_3-N (mg/L)	<0.2					<0.2	<0.2										
3-Jul-23	NO_3-N (mg/L)	<5.0	0.24												0.08			

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA0 1	NHS01
Date	Parameters (Unit)	Guideline																
4-Jul-23	NO_3-N (mg/L)	<5.0		0.09		0.06										0.08		
5-Jul-23	NO_3-N (mg/L)	<5.0					0.06	0.08										
3-Jul-23	Faecal coliform (MPN/100 mL)	<1,000	280												350			
4-Jul-23	Faecal coliform (MPN/100 mL)	<1,000														1,600		
6-Jul-23	Faecal coliform (MPN/100 mL)	<1,000									130	350	540	920			920	110
3-Jul-23	Total Coliform (MPN/100 mL)	<5,000	350												1,600			
4-Jul-23	Total Coliform (MPN/100 mL)	<5,000														1,600		
6-Jul-23	Total Coliform (MPN/100 mL)	<5,000									920	1,600	1,600	1,600			1,600	920
3-Jul-23	TKN		<1.5												<1.5			
4-Jul-23	TKN			<1.5		<1.5										<1.5		
5-Jul-23	TKN						<1.5	<1.5										
3-Jul-23	TOC (mg/L)		5.67												7.62			
5-Jul-23	TOC (mg/L)								5.19	4.57						5.12		
6-Jul-23	TOC (mg/L)										6.04	5.72	8.05	8.39			10.2	9.32
3-Jul-23	Total Phosphorus (mg/L)		0.03												0.05			
4-Jul-23	Total Phosphorus (mg/L)			0.03		0.03										0.03		
5-Jul-23	Total Phosphorus (mg/L)						0.02	0.03										
3-Jul-23	Total Dissolved Phosphorus (mg/L)		0.01												0.02			
4-Jul-23	Total Dissolved Phosphorus (mg/L)			0.01		0.01										<0.01		
5-Jul-23	Total Dissolved Phosphorus (mg/L)						<0.01	0.02										
4-Jul-23	TSS (mg/L)-bottom					16.87												
5-Jul-23	TSS (mg/L)-bottom						54.66	7.08										

	River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
	Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
		Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
	Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA01	NHS01
Date	Parameters (Unit)	Guideline															
4-Jul-23	BOD_5 (mg/L)-bottom					8.66											
5-Jul-23	BOD_5 (mg/L)-bottom						<1	9.98									
4-Jul-23	NH_3-N (mg/L)-bottom					0.6											
5-Jul-23	NH_3-N (mg/L)-bottom						<0.2	0.4									
4-Jul-23	NO_3-N (mg/L)-bottom					0.06											
5-Jul-23	NO_3-N (mg/L)-bottom						0.08	0.08									
4-Jul-23	TKN-bottom					<1.5											
5-Jul-23	TKN-bottom						<1.5	<1.5									
4-Jul-23	Total Dissolved Phosphorus (mg/L)-bottom					0.03											
5-Jul-23	Total Dissolved Phosphorus (mg/L)-bottom						0.05	0.06									
4-Jul-23	Total Phosphorus (mg/L)-bottom					0.04											
5-Jul-23	Total Phosphorus (mg/L)-bottom						0.09	0.08									
4-Jul-23	Chlorophyll-A-bottom					1.3											
5-Jul-23	Chlorophyll-A-bottom						0.41	0.88									
4-Jul-23	Chlorophyll-A			1.77		5.91											
5-Jul-23	Chlorophyll-A						3.06	2.24									

TABLE A-2: RESULTS OF CAMP EFFLUENTS IN JULY 2023

	Site Name	OSOV1 (Owner's Site Office and Village)		OSOV2 (ESD Camp)		Main Powerhouse	
	Station Code	EF01		EF13		EF19	
	Date	13-Jul-23	26-Jul-23	17-Jul-23	26-Jul-23	13-Jul-23	26-Jul-23
Parameters (Unit)	**Guideline**						
pH	6.0 - 9.0	6.88	6.56	6.8	6.77	6.65	6.7
Sat. DO (%)		56.5	64.2	90	93	63.8	85.1
DO (mg/L)		4.42	4.96	6.79	6.95	4.79	6.24
Conductivity (µs/cm)		340	374	552	481	1,126	1,252
Temperature (°C)		27.98	28.62	30.04	30.54	30.2	31.04
Turbidity (NTU)		1.67	0.47	26.8	6.99	104.0	88.7
TSS (mg/L)	<50	<5	<5	30.51	6.8	71.2	117.0
BOD_5 (mg/L)	<30	<6	<6	21.54	22.02	<6	<6
COD (mg/L)	<125	<25		48.2		152	
NH_3-N (mg/L)	<10.0	<2		17.1		12.8	
Total Nitrogen (mg/L)	<10.0	0.98		19.2		14.4	
Total Phosphorus (mg/L)	<2	0.97		1.5		7.7	
Oil & Grease (mg/L)	<10.0	<1		1		2	
Total coliform (MPN/100 mL)	<400	540	94	16,000	16,000	240	0
Faecal Coliform (MPN/100 mL)	<400	350	70	3,500	16,000	130	0
Residual Chlorine (mg/L)	<1.0	N/A	N/A	0.07	0.06	0.54	0.17