NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

March 2023

			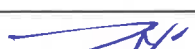		
A	25 April 2023	Hendra WINASTU	Khamsone Xaysomphou	Wanidaporn RODE	Final
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TABLE OF CONTENTS

TABLE OF TABLES

TABLE OF FIGURES

EXECUTIVE SUMMARY

NNP1 EMO received the surveillance audit report for ISO14001:2015 from the SGS on 13 March 2023, the report pointed out a one non-conformity concerning leachate from the food waste storage area at the OSOV1 canteen. However, Immediate corrective actions were taken and the mentioned non-compliance issue was closed. The report also included four general observations and opportunity of improvements (OFIs) that need to be followed up in the next surveillance audit scheduled for February 2024.

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

On 30 March 2023, EMO, ADM and TD conducted jointly inspected six sites (OSOV1, OSOV2, Main Dam, NNP1Landfill, Re-regulation dam, LILAMA10-Hazadious Material Storage) to follow up on the corrective actions regarding waste management, NNP1 landfill operation, hazardous material and waste management and wastewater treatment system operation and maintenance.

The pending water quality analyses of February 2023 for COD, TOC, ammonia nitrogen, total nitrogen, total phosphorus, total dissolved phosphorus, oil & grease, and TKN were included in this report.

At R05 (in the Main Reservoir approx. 0.5 km upstream the Main Dam), the average DO concentration was 7.9 mg/L in the upper 12 m varying between 5.5 mg/L and 8.8 mg/L. Anoxic conditions (less than 0.5 mg/L) were found at depths from 32 m to bottom (09 and 23 March 2023) and from 36 m to bottom (02, 15 and 30 March 2023). At the water intake level, DO concentrations varied between 0.12 mg/L and 1.44 mg/L. In the Re-regulation Reservoir, the mean DO concentrations in the water column of the two monitoring stations were 2.8 mg/L and 3.2 mg/L respectively.

The DO measurements downstream the Re-regulation Dam during turbine discharge was less than 6 mg/L in all stations.

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.

The Bolikhan District Environment Management Unit or EMU has informed NNP1PC that the handover of the communities' solid waste management and the Houay Soup Landfill operation to the local authorities is being considered by the Bolikhan District Governor. It is expected that the hand over will be completed in 2023.

A total of 8.61 m^3 of solid waste was disposed of at the NNP1 Project Landfill, an increase of 1 m^3 compared with February 2023. In March 2023, NNP1 EMO communicated with the Bolikhan District Environment Management Unit or EMU to discuss the process of transferring the management of the communities' general waste collection and the Houay Soup Landfill operation to the local

authorities. However, the EMU later requested a postponement of the meeting and that an update on the matter will be provided after April 2023.

The Bolikhamxay Watershed and Reservoir Protection Office (WRPO) continues with the implementation of the approved AIP2022 including forest patrolling in March 2023. Bolikhamxay WRPO shared an official letter of fund disbursement from the Forest Protection Fund (FPF) office of Department of Forestry (DOF) - Ministry of Agriculture and Forestry (MAF) to NNP1 EMO on 17 March 2023. NNP1 EMO requested FPF DOF-MAF to revise the letter following the Financial Management Manual (FMM). NNP1 EMO received the revised letter on 31 March 2023.

The Head of Xaysomboun WRPO was unable to organize a meeting in March 2023 to discuss the roles and responsibilities for the reservoir fishery co-management due to personal leave and prior commitments with other assignments including the internal Provincial Agriculture and Forestry Office (PAFO) monthly meeting. on 17 March 2023, NNP1 EMO submitted an official letter proposing actions to address outstanding delays from the previous Annual Implementation Plan (AIP) and pending issues related with NNP1 watershed management to Head of Xaysomboun PAFO. However, there was no any feedback from Head of Xaysomboun PAFO until end of March 2023. To follow up on this matter, in early April 2023, the NNP1 EMO will send a following up letter to the Xaysomboun PAFO proposing a discussion of the actions to address outstanding delays. Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS) further reviewed the draft Xaysomboun AIP2023 on 24 March 2023. NNP1 EMO, Xaysomboun WRPO, and BSP-WCS will discuss the revised plan after the Law Enforcement (LE) training in the first week of April 2023.

The Bolikhamxay Biodiversity Offset Management Unit (BOMU) informed that the meeting for the approval of the Nam Chouane-Nam Xang (NC-NX) and its Totally Protected Zone (TPZ) boundary was further postponed to April 2023 due to the unavailability of the Head of Bolikhamxay Province Agriculture and Forestry Office (PAFO) and the Vice Governor of Bolikhamxay Province. BOMU continues with patrolling and training for outreach campaign that were began on 21 and 28 March 2023 respectively. NNP1 EMO, BOMU, and BSP-WCS organized a discussion to finalize the AIP2023 on 16 March 2023. The draft was finalized and submitted to ADB and IAP on 24 March 2023. ADB and IAP confirmed no objection on 28 March 2023. EMO have informed BOMU to process further for their internal approval by the Head of Bolikhamxay PAFO and submission to FPF DOF-MAF.

NNP1 EMO submitted a brief report about FMM as requested by FPF DOF-MAF on 15 March 2023 for approval process.

The fish catch monitoring for February 2023 in Nam Ngiep Watershed was dominated by *Channa striata*, *Clarias batrachus* and *Scaphiodonichthys acanthopterus* and species groups of Poropuntius and Mastacembelus. They are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species. 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)

NNP1 EMO received the surveillance audit report for ISO14001:2015 from the SGS on 13 March 2023, the report pointed out a one non-conformity concerning leachate from the food waste storage area at the OSOV1 canteen. However, immediate corrective actions were taken and the mentioned non-compliance issue was closed. The report also included four general observations and opportunity of improvements (OFIs) that need to be followed up in the next surveillance audit scheduled for February 2024.
The details of one non-conformity and four general observations and OFIs are shown in ***Table 1.1-1*****.**

Table 1.1-1: The Details of one non-conformity and General Observation and Opportunity of Improvement

OFI	Description	Corrective Action
1.	Non-conformity Leachate from the food waste storage area at the OSOV1 canteen	**Closed in February 2023** The corrective actions were completed and an internal NCR level 1 was issued as a reference for the performance monitoring and following up, and relevant training will be provided.
2.	The lubricant oil container at the re-regulation Dam PH and the alcohol spray bottle at the Main Dam PH were found without an SDS label.	**Completed** SDS labels to be attached by the O&M team
3.	The safety period timing of emergency evacuation stated in the rehearsal sessions requires further testing in different situations across various operation sites such as fire, flooding, explosion, etc.	**Ongoing** The emergency evacuation plan will be reviewed, updated and relevant drills will be conducted accordingly
4.	It is necessary to identify and address hazardous waste management in the environmental aspect assessment for transmission line works and emergency case of dam collapse.	**Ongoing** The environmental aspect assessment for transmission line works and emergency case of dam collapse will be reviewed and updated accordingly to cover the management of hazardous waste.
5.	EMP04 of 2023 aims to plant 100 seedlings and ensure that over 50% of them survive. In order to	**Ongoing**

	maximise the effectiveness of the project, it is suggested to review objectives of the program with regards to its potential contribution to the reduction of Greenhouse Gas (GHG) emissions.	The tree planting plan was developed by incorporating the assessment of planting sites, suitable local seedlings, and timeline of planting, monitoring and maintenance.

1.2 COMPLIANCE MANAGEMENT

In March 2023, EMO did not receive any document for review and approval. On 30 March 2023, EMO, ADM and TD conducted a monthly joint site inspection at OSOV1, OSOV2, Main Dam, Re-regulation dam and LILAMA10-Hazadious Material Storage to follow up on the corrective actions regarding waste management, hazardous material and waste management and wastewater treatment system operation and maintenance. The inspection results are shown in ***Table 1.2-1.***

Table 1.2-1: Joint Site Inspection on 30 March 2023

Wetland System of OSOV1:	Observation photo
Findings: • Half of wetland plants dried in the 1st wetland pond, about 70% of weed growth in the 2nd wetland pond. • Livestock presence in the wetland ponds that could damage plants and piping systems and increase coliform bacterial content leading to non-compliant effluent discharge. **Actions:** ADM will implement these corrective actions before the next ADB-IAP-LTA mission in mid-may2023: • Weeding and replacing plants in wetland ponds and; • Fix perimeter fence to prevent cattle intrusion.	 

SOOV1 Fuel Storage	Observation photo
Findings: • Sand drum was exposed to rain, which makes it unavailable in case of an oil spill; • No extra container and tools to handle contaminated waste, such as oily sand. **Actions:** ADM will provide two labeled-drums with proper cover near the fuel storage. One for dry sand and another for containing contaminated waste.	
Re-regulation Powerhouse	**Observation photo**
Findings: • A full oil container with a loose-lid was stored on the floor near the entrance point to Nam Ngiep River *(red arrow),* without being contained in a metal tray. **Actions:** • TD was instructed to remove the oil container to designated hazardous storage (LILAMA10); • Liquid hazardous materials/waste must not be stored near entrance point to the river without a proper secondary containment.	

1.2.1 Site Inspection by the Environment Management Unit (EMU)

There was no monthly site visit by the EMU of Bolikhan District, Bolikhamxay Province. On 28 February 2023, EMO received a draft bi-annual site visit report for 2022 from the EMU of Xaysomboun Province. NNP1 reviewed and returned the report to the EMU for consideration and approval. The final report from the EMU is expected to be available in April 2023.

1.2.2 Site Decommissioning and Rehabilitation

During March 2023, all 31 rehabilitated areas were inspected. The assessment of the vegetation cover will continue during the rainy season of 2023. However, on 13 March 2023, there was an incident of during of bush and bamboo and some trees in the spoil disposal area no.5 and no. 6. The burning areas were located approximately 250 m from the 230 KV transmission line and less than 100m from the community landfill. In response to this occurrence, NNP1 SMO, EMO and TD

teams investigated the sites, extinguished the fire and then, reported the incidence to the BLK District taskforce in PHX village for investigation and following up.

1.3 WATER QUALITY MONITORING

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

The delay in extending of the contract for UAE lab services had an impact on the water sampling of in February 2023 that could not be completed in time, and thus, the pending water quality analyses for COD, TOC, ammonia nitrogen, total nitrogen, total phosphorus, total dissolved phosphorus, oil & grease and TKN were reported in the March 2023 Report.

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 *Error! Reference source not found.* of this Report. The status of implementation of the corrective actions addressing non-compliances at the camps and key project facilities are summarized in ***Table 1.3-1***

Table 1.3-1: Status of Corrective Actions for Non-Compliances at WWTSs in February and March 2023

Site	Sampling ID	Status	Corrective Actions
OSOV1	EF01	Non-compliance for total coliform (3 out of 4 samplings) and fecal coliform (1 out of 4 samplings).	In March 2023, EMO, ADM and TD conducted a monthly joint inspection for the operation and maintenance of the WWTS: 1) Closely monitor the residual chlorine content and chlorination dosage adjustment for the effluents of OSOV2 and the Main Powerhouse WWTS.; 2) Closely monitor the Influent to compare with the effluent for the specific
OSOV2	EF13	Non-compliance for total coliform and fecal coliform (1 out of 4 samplings),	

Site	Sampling ID	Status	Corrective Actions
		total nitrogen and ammonia-nitrogen.	parameters to check the treatment effectiveness (stopped in Q4 of 2022). 3) The maintenance work will be carried out for the constructed wetland system of OSOV1 including 1) weeding and replacing plants in wetland ponds and 2) fixing perimeter fence to prevent cattle intrusion.
Main Powerhouse	EF19	Non-compliance for total coliform and fecal coliform (1 out of 4 samplings), COD (1 out of 3 sampling), total nitrogen (1 out of 3 samplings), total phosphorus and ammonia-nitrogen.	

1.3.2 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 1.3-1.***

The monitoring results for key parameters (DO, TSS and BOD_5) during March 2023 are presented in ***Table 1.3-2, Table 1.3-3*** and ***Table 1.3-4.*** The full set of data for March 2023 is attached in Annex A. In addition, the DO depth profile timeseries for R05 are shown in ***Figure 1.3-2,*** and the results for DO timeseries are presented as line graphs in ***Figure 1.3-3*** and DO Long Profile graphs ***Figure 1.3-4.***

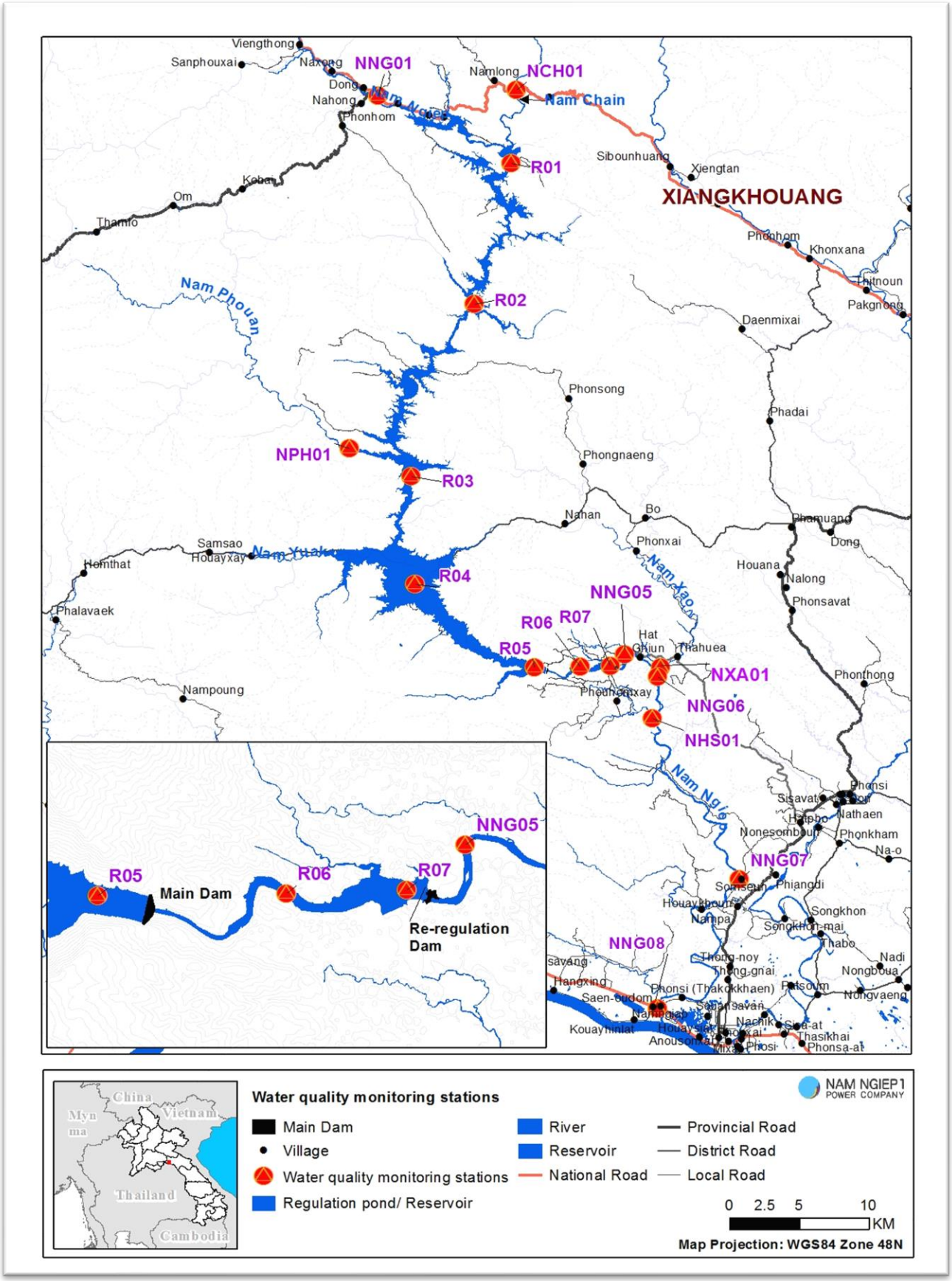

Figure 1.3-1: Surface Water and Re-regulation Reservoir Water Quality Monitoring Stations

Main Reservoir

During March 2023, the water level in the main reservoir decreased from El. 313.51 m asl to El. 310.87 m asl.

At R05 (in the Main Reservoir approx. 0.5 km upstream the Main Dam), the average DO concentration was 7.9 mg/L in the upper 12 m varying between 5.5 mg/L and 8.8 mg/L. From 13 m to 30 m, DO concentrations varied between 1 mg/L and 8 mg/L with an average of 4.4 mg/L. The oxycline were found at depth of 19 m (on 02 March 2023), 20 m (on 09 March 2023), depth of 16 m (on 15 March 2023), depth of 11 m (on 23 March 2023) and depth of 14 m (on 30 March 2023). Anoxic conditions (less than 0.5 mg/L) were found at depths from 32 m to bottom (09 and 23 March 2023) and from 36 m to bottom (02, 15 and 30 March 2023). At the water intake level, DO concentrations varied between 0.12 mg/L and 1.44 mg/L.

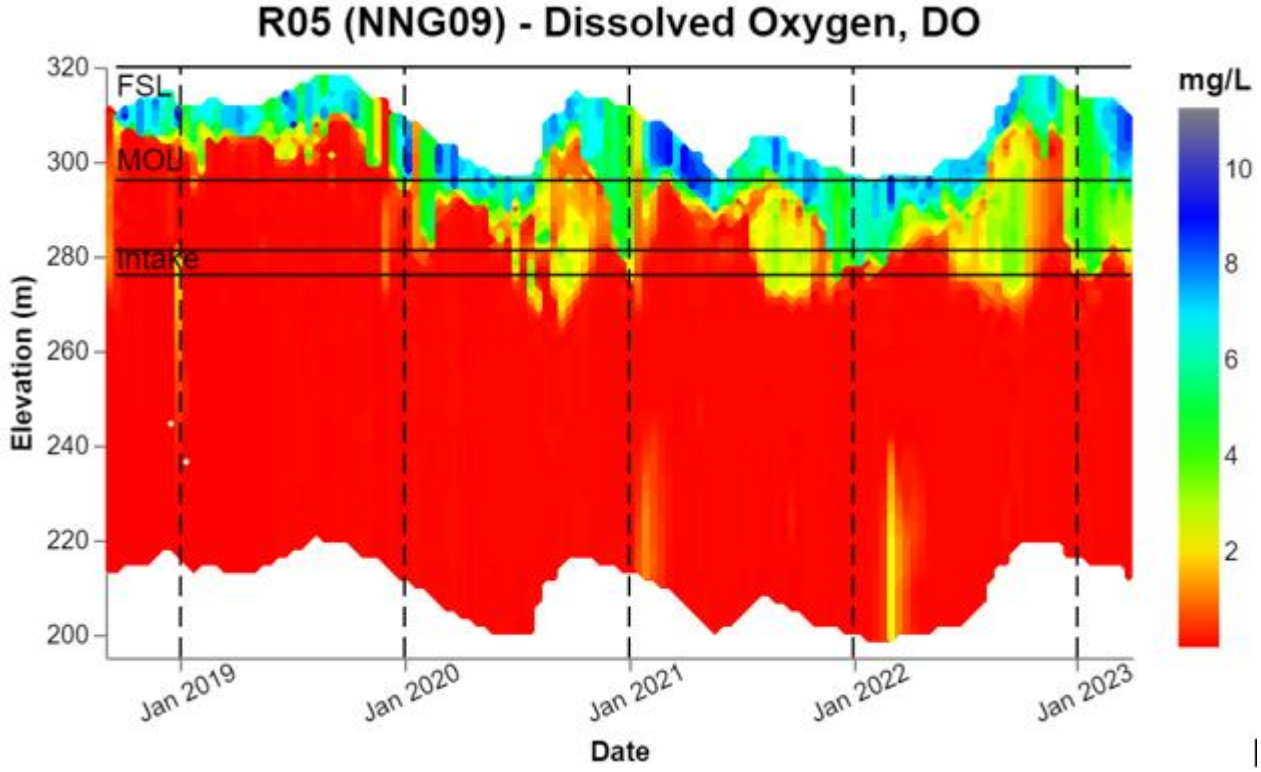

Figure 1.3-2: DO Depth Profiles Time Series in R05 (Since September 2018 to March 2023)

At R04, the average DO concentration was 7.8 mg/L in the upper 11 m varying between 5.4 mg/L and 8.9 mg/L. From 12 m to 30 m, DO concentration varied between 1.9 mg/L and 7.0 mg/L with an average of 3.5 mg/L. The oxycline were found at depths of 13 m (02 March 2023), 12 m (09 March 2023), 10 m (15 March 2023), 8.5 m (23 March 2023) and 7.0 m (30 March 2023). Anoxic conditions (less than 0.5 mg/L) were found at depths from 36 m to bottom (02, 09 and 15 March 2023) and from 34 m to bottom (23 and 30 March 2023).

At R03, the average DO concentration was 8.6 mg/L in the upper 7.5 m varying between 5.6 mg/L and 9.9 mg/L. An oxycline was found at depths between 6.0 m and 8.0 m. From 9 m to bottom, DO concentration varied between 0.1 mg/L and 5.4 mg/L with an average of 2.0 mg/L. Anoxic conditions (less than 0.5 mg/L) were found at 45 m to bottom on 01 and 08 March 2023, at 13 m, 14 m, 32 m, 34 m and 55 m on 22 March 2023 and at 13 m to 18 m and 45 m to bottom on 29 March 2023.

At R02, the average DO concentration was 8.1 mg/L in the upper 5.0 m varying between 5.4 mg/L and 9.4 mg/L. Oxyclines were found at depths between 4.0 m and 7.0 m. The anoxic condition occurred at the depths between 7.5 m and 20.0 m. From 22 m to the bottom, DO concentrations increased to about 5.09 mg/L with an average of 3.5 mg/L.

At R01, the DO levels in the water column varied between 6.8 mg/L and 8.6 mg/L with an average of 7.7 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 hypolimnion at R03 and R04 were less than 1 mg/L and R05 was 5.6 mg/L.

Re-regulation Reservoir

In March 2023, the turbine discharges from the Main Powerhouse varied between 12 and 250 m^3/s usually interrupted by night-time periods with no discharge.

The mean DO concentrations in the water column of the two monitoring stations were 2.8 mg/L and 3.2 mg/L in R06 and R07 respectively.

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

Nam Ngiep Downstream

During March 2023, the monthly downstream water quality monitoring was carried out during a period with turbine discharge from the Re-regulation Dam. The DO concentrations were less than 6 mg/L in all stations, thus, not complied with the surface water quality standard.

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 Nam Chiane (NCH01), Nam Xao (NXA01), Nam Phouan (NPH01) and Nam Houaysoup (NHS01) complied with the standards, except COD in Nam Xao (NXA01), COD and faecal coliform in Nam Houaysoup (NHS01).

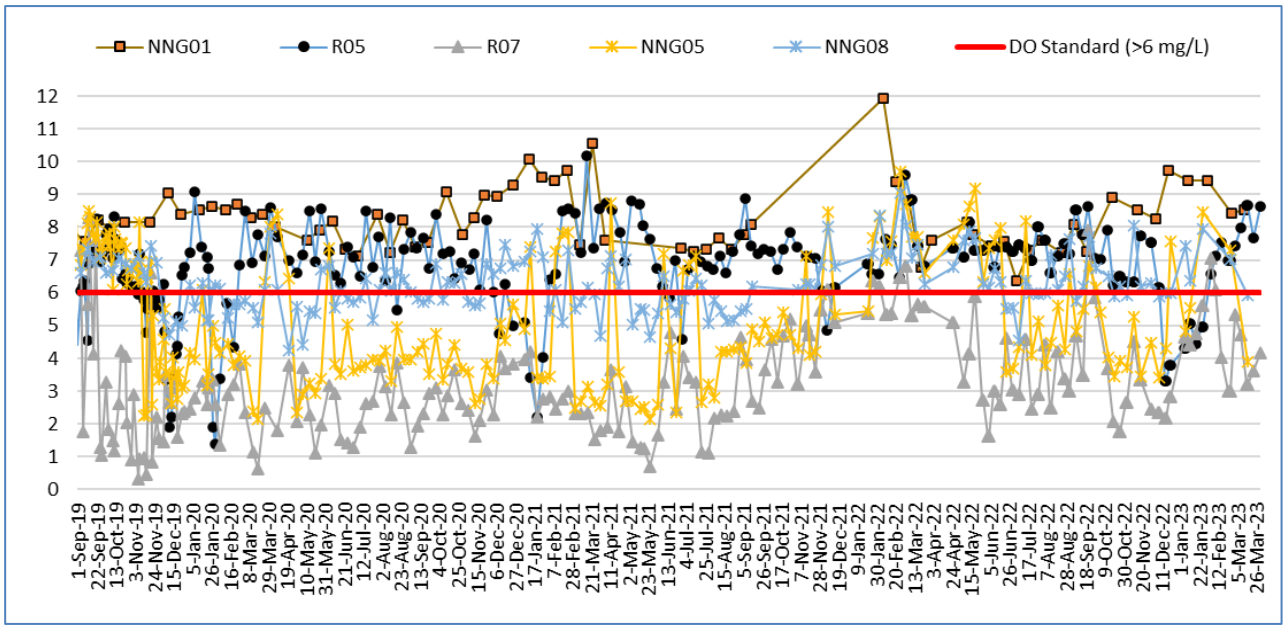

Figure 1.3-3: Concentration of Dissolved Oxygen (mg/L) in the upper 0.2 m since September 2019 to March 2023

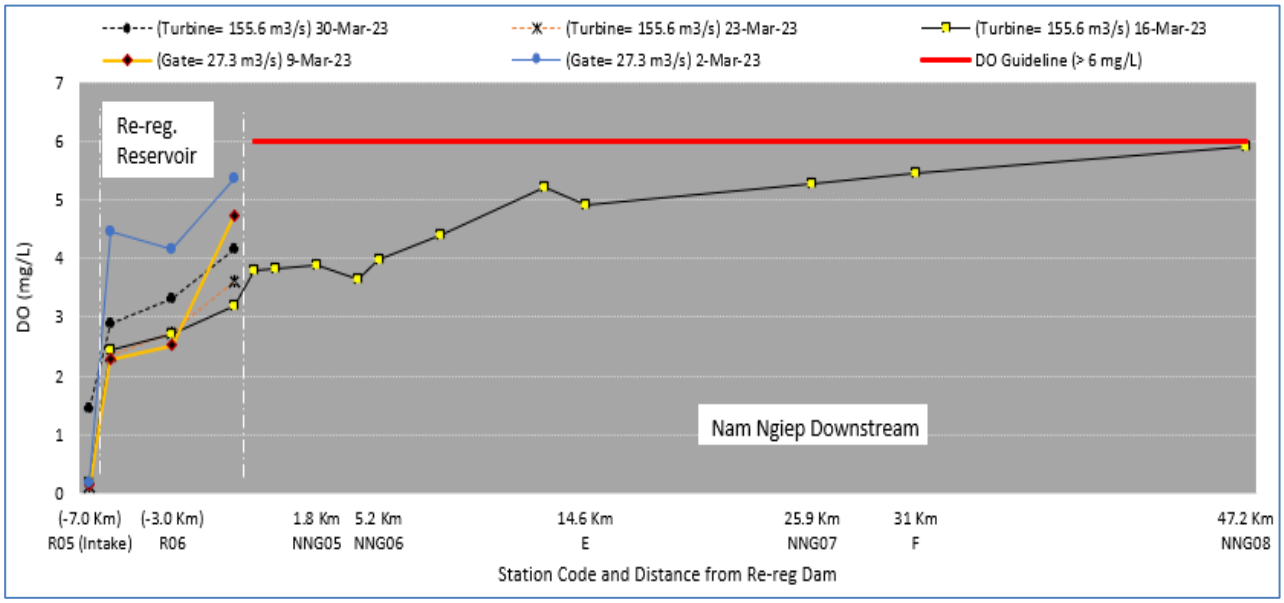

Figure 1.3-4: Dissolved Oxygen (Mg/L) Long Profile in March 2023 (from Immediately Upper Main Dam to Lower Nam Ngiep River)

Table 1.3-2: 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
1-Mar-23		7.76	7.22	8.23										9.24		
2-Mar-23					7.54	7.42	4.16	5.35								
8-Mar-23		7.8	7.83	9.92												
9-Mar-23					8.16	7.99	2.52	4.72								
13-Mar-23	8.54												8.32			
14-Mar-23		7.91	8.42	8.68										8.72		
15-Mar-23					8.63	8.68	2.7	3.2								
16-Mar-23									3.9	3.98	5.27	5.92			6.07	6.13
22-Mar-23		7.91	8.31	8.93												
23-Mar-23					7.67	7.69	2.73	3.62								
29-Mar-23		8.42	9.34	9.55												
30-Mar-23					8.82	8.62	3.32	4.17								

Table 1.3-3: 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
13-Mar-23	<5												<5			
14-Mar-23		<5		<5										<5		
15-Mar-23					<5	<5										
16-Mar-23							<5	<5			<5	11.05			<5	<5

Table 1.3-4: 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
13-Mar-23	<1												<1			
14-Mar-23		<1		<1										<1		
15-Mar-23					<1	<1	<1	<1								
16-Mar-23									<1	<1	<1	<1			<1	<1

1.3.3 Groundwater Quality Monitoring

During February and March 2023, community groundwater quality analyses were carried out for five out of seven wells located in Somseun Village, Nam Pa Village, Thong Noy Village, Pou Village and Phouhomxay Village due to the water pumps in the two wells of Phouhomxay Village were broken. The community groundwater samples were taken from household water taps.

The results indicate that:

- The well in Somsuen Village fully complied with the Standards, except faecal coliform and *E. Coli* bacteria in March 2023.
- The well in Thong Noy and Nam Pa Villages did not comply with the Standard for faecal coliform and *E. Coli* bacteria.
- The monitored parameters from two wells in Pou Village complied with the Standards, except faecal coliform and *E. Coli bacteria* in March 2023 at Borehole GPOU02.

The community groundwater quality monitoring results are presented in *Error! Reference source not found.***.**

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 1.3-5: Groundwater Quality Monitoring Results in Somsuen, Nam Pa, ThongNoy and Pou Villages

	Site Name	**Somseun Village**		**NamPa Village**		**ThongNoy Village**		**Pou Village**			
Parameter (Unit)	**Station**	**GSXN01**		**GNPA01**		**GTHN01**		**GPOU01**		**GPOU02**	
	Guideline	13-Feb-23	21-Mar-23	13-Feb-23	21-Mar-23	13-Feb-23	21-Mar-23	20-Feb-23	13-Mar-23	20-Feb-23	13-Mar-23
pH	6.5 - 9.2	6.5	6.8	6.8	6.77	7.05	6.56	6.6	6.6	6.51	6.52
Sat. DO (%)		80	98.5	93.1	109.5	72.2	99.6	81	76.8	95.4	75.2
DO (mg/l)		6.09	7.67	7.38	8.63	5.74	7.79	6.93	6.3	7.79	6.17
Conductivity (µS/cm)		360	339	423	396	425	390	28	25	239	227
Temperature (°C)		29.54	28.22	27.3	27.63	27.07	27.93	23.2	25.51	25.52	25.23
Turbidity (NTU)	<20	1.25	0.44	0.91	0.28	0.71	0.91	2.65	3.89	1.27	0.76
Faecal coliform (MPN/100ml)	0	0	1.8	22	2	130	49	0	0	0	2

Parameter (Unit)	Site Name	Somseun Village		NamPa Village		ThongNoy Village		Pou Village			
	Station	GSXN01		GNPA01		GTHN01		GPOU01		GPOU02	
	Guideline	13-Feb-23	21-Mar-23	13-Feb-23	21-Mar-23	13-Feb-23	21-Mar-23	20-Feb-23	13-Mar-23	20-Feb-23	13-Mar-23
E.coli Bacteria (MPN/100ml)	0	0	1.8	22	2	79	49	0	0	0	2
Arsenic (mg/)	<0.05	0.0008		0.0008		0.0024		<0.0003		0.0017	
Cadmium (mg/l)	<0.01	<0.003		<0.003		<0.003		0.002		0.002	
Total Iron (mg/l)	<1	0.006		0.008		0.013		0.038		0.013	
Mercury (mg/l)	<0.01	<0.0002		<0.0002		<0.0002		<0.0002		<0.0002	
Lead (mg/l)	<0.05	<0.003		<0.003		<0.003		<0.003		<0.003	

In March 2023, NNP1PC carried out landfill groundwater monitoring at NNP1 Solid Waste Landfill (only three monitoring wells due to water sampling equipment was stuck in monitoring well MW2) and at Houay Soup Solids Waste Landfill (one monitoring well). The lead concentration exceeded the groundwater quality standard in monitoring wells MW1, MW3, MW4 and MW5. However, this is likely due to the natural background level. Lead has been detected in both upstream and downstream wells, and leachate from the treatment ponds did not contain lead. The landfills are HDPE lined to prevent leachate and the boreholes are over 50 m deep and not accessible to staff or villagers.

Table 1.3-6: Landfill Groundwater Observation Monitoring Results

Date	Parameter (Unit)	Site Name	NNP1 Landfill				Houay Soup Landfill
		Station	MW1	MW2	MW3	MW4	MW5
		Guideline					
20-Mar-23	pH		6.92		6.89	7.00	7.05
20-Mar-23	Sat. DO (%)		63.1		25.6	18	44.6
20-Mar-23	DO (mg/L)		5.02		2.05	2.2	3.48
20-Mar-23	Conductivity (µS/cm)		184		124	51	98
20-Mar-23	Temperature (°C)		27.08		26.9	27.57	28.21
20-Mar-23	Turbidity		26.9		6.5	7.2	21.6
20-Mar-23	Lead (mg/L)	<0.01	0.6		0.64	0.315	0.406

		Site Name	NNP1 Landfill				Houay Soup Landfill
		Station	MW1	MW2	MW3	MW4	MW5
Date	Parameter (Unit)	Guideline					
20-Mar-23	Faecal Coliform (MPN/100ml)		1,600		11	0	0
20-Mar-23	E. coli (MPN/100ml)		1,600		11	0	0
20-Mar-23	NH_3-N (mg/L)		<2		<2	<2	<2
20-Mar-23	Total Nitrogen (mg/L)		0.91		0.43	0.4	0.83
20-Mar-23	Copper (mg/L)	<1	0.006		0.004	<0.003	<0.003
20-Mar-23	Total Petroleum (mg/L)		<3		<3	<3	<3
20-Mar-23	Water level (m)		29.5	-	26.7	25.1	14.9

1.3.4 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). In addition, non-compliance with pH were found in Phouhomxay's water supply system.

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 1.3-7: 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	26-Feb-23	21-Mar-23	26-Feb-23	21-Mar-23	26-Feb-23	24-Mar-23	26-Feb-23	24-Mar-23
pH	6.5 - 8.5	6.51	6.63	6.6	6.94	5.56	6.2	5.5	6.1
Sat. DO (%)		87.8	114.9	81.4	109.8	81.7	90.8	75	85
DO (mg/L)		7.38	9.1	7.1	8.38	7.09	7.45	6.58	6.92
Conductivity (µS/cm)	<1,000	73	390	129	109	23	22	21	22
Temperature (°C)	<35	24.52	27.3	22.1	29.41	22.69	25.3	21.64	25.83
Turbidity (NTU)	<10	1.15	2.01	1.11	1.7	0.83	1.9	0.7	1.37

	Site Name	Thaheua Village		Hat Gnuin Village		Phouhomxay Village			
	Station	WTHH02		WHGN02		WPHX02		WPHX03	
Parameter (Unit)	Guideline	26-Feb-23	21-Mar-23	26-Feb-23	21-Mar-23	26-Feb-23	24-Mar-23	26-Feb-23	24-Mar-23
Faecal Coliform (MPN/100 mL)	0	7.8	17	49	21	33	130	40	70
E.coli Bacteria (MPN/100 mL)	0	4.5	13	49	17	49	79	33	49
Arsenic (mg/L)	<0.05	<0.0003		<0.0003		<0.0003		<0.0003	
Cadmium (mg/L)	<0.003	<0.003		<0.003		<0.003		<0.003	
Iron (mg/L)		<0.05		<0.05		0.117		0.129	
Lead (mg/L)	<0.10	<0.01		<0.01		0.003		0.008	
Total hardness (mg/L)	<300	32.7		62.1		14.3		11.9	
Mercury (mg/L)	<0.001	<0.0002		<0.0002		<0.0002		<0.0002	

1.3.5 Landfill Leachate Monitoring

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

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 1.4-1*** and ***Figure 1.4-2*** presents the values recorded since January 2020.

During March 2023, the mean inflow to the main reservoir was 47 m^3/s. The minimum and maximum inflows were 27 m^3/s (on 04 March 2023) and 67 m^3/s (on 22 March 2023) respectively.

In March 2023, the water level in the main reservoir decreased from El. 313.51 m asl to El. 310.87 m asl.

During March 2023, the hourly turbine discharges from the Main Powerhouse varied between 12 m^3/s and 250 m^3/s usually interrupted by night-time periods with no discharge.

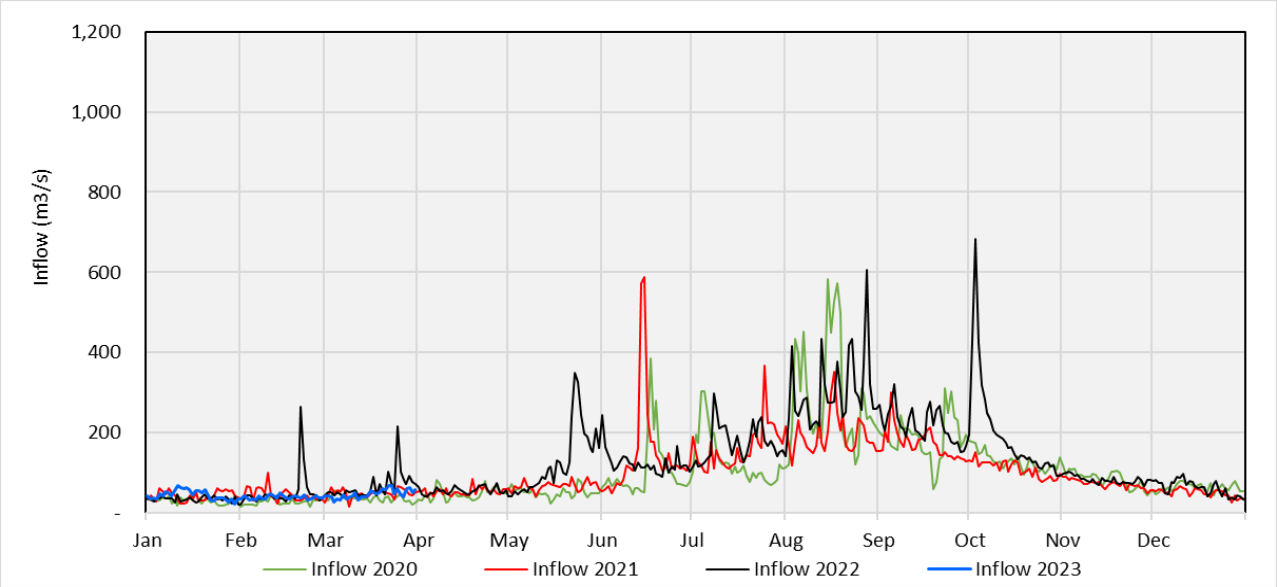

Figure 1.4-1: Inflow for the Main Reservoir during January 2020 to March 2023

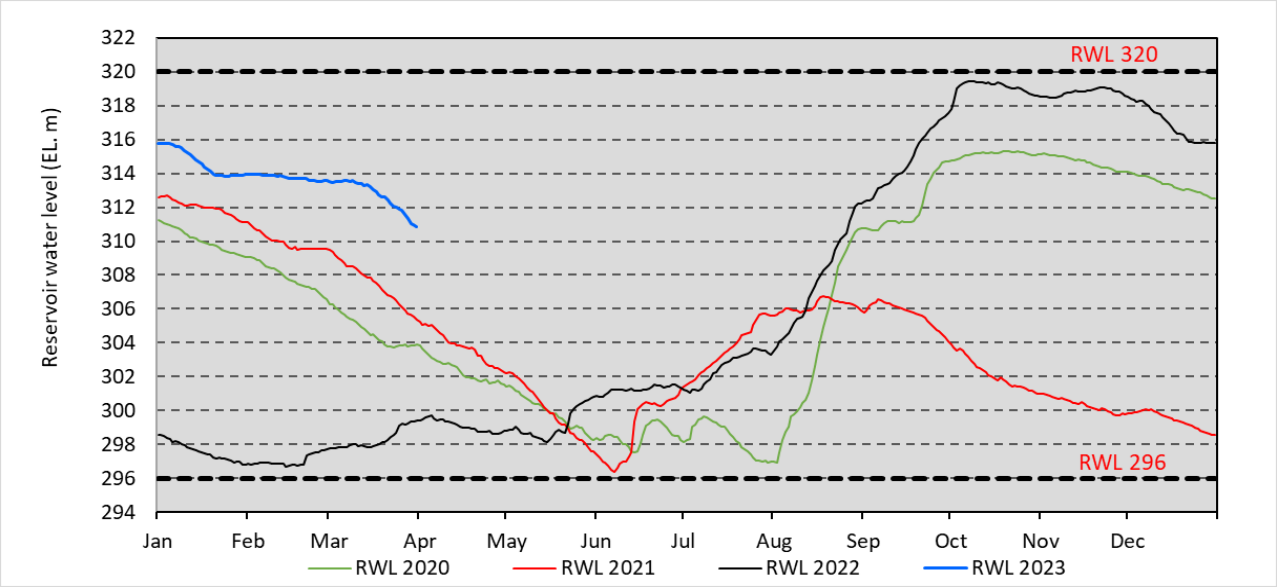

Figure 1.4-2: Water Level for the Main Reservoir during January 2020 to March 2023

1.4.2 Re-regulation Reservoir – Discharge

The daily discharge monitoring data for the Re-regulation Dam during January to March 2023 is presented in ***Figure 1.4-3***.

During March 2023, the mean daily discharge from the Re-regulation Dam was about 92 m^3/s, hourly gate discharge varied between 27 m^3/s and 122 m^3/s, hourly turbine discharge varied between 47 m^3/s and 161 m^3/s, and combination discharges of gate and turbine varied between 91 m^3/s and 237 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.

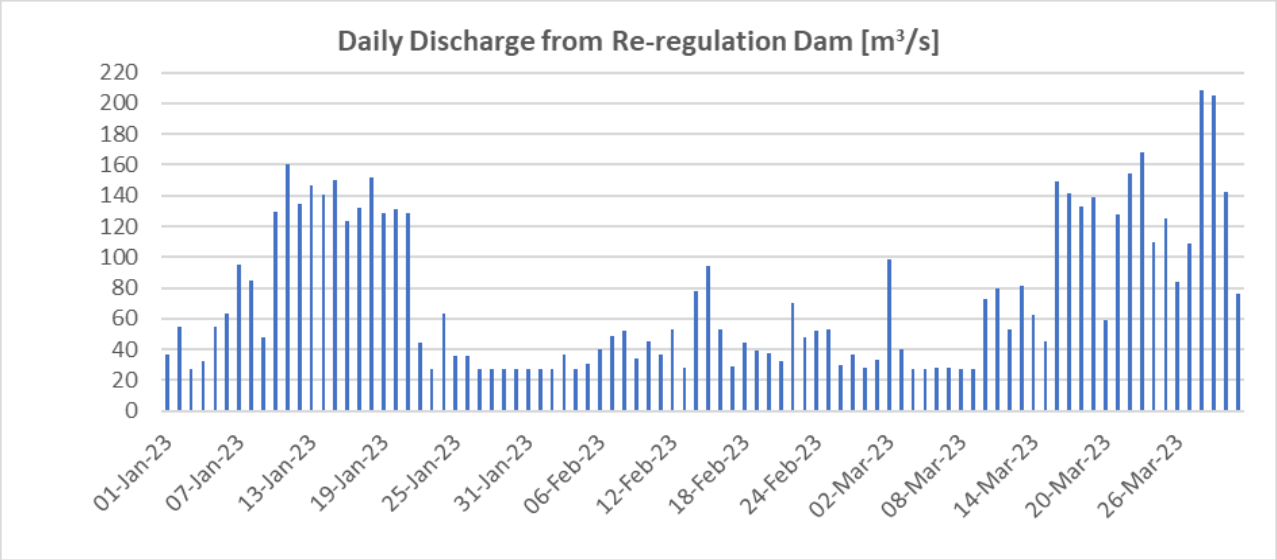

Figure 1.4-3: Discharge Monitoring at the Re-regulation Dam in January to March 2023

1.4.3 Nam Ngiep Downstream Water Depth Monitoring

In March 2023, EMO carried out a monthly boat mission to monitor the water depth in the Nam Ngiep downstream of the Re-regulation Dam. A total of 19 sites have been identified with potential shallow water depths and during the boat missions, there is no thalweg water depth measurement carried out due to the Re-regulation Dam discharge greater than 30 m^3/s.

1.5 PROJECT WASTE MANAGEMENT

1.5.1 Solid Waste Management

A total of 8.61 m^3 of solid waste was disposed of at the NNP1 Project Landfill, an increase of 1 m^3 compared with February 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.

On 30 March 2023, EMO and ADM conducted jointly inspected the operation and maintenance of the NNP1 Landfill. The inspection results are shown in ***Table 1.5-1.***

Table 1.5-1: Joint Site Inspection on 30 March 2023

NNP1 Landfill	Observation photo
Findings: • The weekly waste cover has not been performed by the local contractor; • Waste compaction using machinery is necessary in preparation of the upcoming wet season.	

Actions: ADM has made an arrangement with the local contractor (PKCC) for waste compaction. However, the contractor's machinery is currently being maintained and will be ready for waste compaction shortly before the start of the wet season.	 

The total amount of recyclable waste sold and collected this month is summarized in ***Table 1.5-2***.

Table 1.5-2: Amounts of Recyclable Waste Sold and collection in March 2023

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by March 2023
1	Plastic bottles	kg	181	69
2	Aluminium can	kg	0	0
3	Paper/Cardboard	kg	0	87
4	Glass	kg	388	87
5	Scrap Metal	Kg	10	0
Total		**kg**	**579**	**243**

In March 2023, the villagers from Phouhomxay Village collected a total of 427 kg of food waste from the OSOV1 canteen for feeding their animals.

1.5.2 Hazardous Materials and Waste Management

The types and amounts of hazardous materials and hazardous waste stored on site in March 2023 are shown in ***Table 1.5-3*** and ***Table 1.5-4*** respectively.

Table 1.5-3: Record of Hazardous Material Inventory in March 2023

No.	Type of Hazardous Material	Unit	Total in March 2023(A)	Used (B)	Remaining at the end of March 2023 (A – B)
1	Diesel	Litre	5,807	4,820	987
2	Gasoline	Litre	880	505	375
3	Lubricant (Turbine oil)	Litre	91	0	91
4	Colour Paint	Litre	299	0	299
5	Thinner	Litre	10	0	10
6	Grease Oil	Litre	785	0	785
7	Gear Oil	Litre	17,25	0	17,25
8	Chlorine Liquid	Litre	38	20	18
09	HA Cut AF	Litre	3,925	0	3,925.0
10	HA Cut Cat AF	Litre	372.5	0	372.5

Table 1.5-4: Record of Hazardous Waste Inventory

No.	Hazardous Waste Type	Unit	Total in March 2023 (A)	Disposed (B)	Remaining at the end of March 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	8	0	**8**
4	Used tyre	Unit	5	0	**5**
5	Empty used chemical drum/container (drum 20L)	Unit	34	43	**0**
6	Lead acid batteries	Unit	10	0	**10**
7	Empty paint and spray cans	Unit	61	0	**61**
8	Halogen/fluorescent bulbs	kg	346	0	**346**
9	Empty cartridge (Ink)	Unit	108	0	**108**
10	Clinic Waste	Kg	7,4	0	**7,4**
11	Expired Chlorine Powder	Kg	65	0	**65**

1.6 COMMUNITY WASTE MANAGEMENT

1.6.1 Community Solid Waste Management and Recycling Programmes

In March 2023, NNP1 EMO communicated with the Bolikhan District Environment Management Unit or EMU to discuss the process of transferring the management of the communities' general waste collection and the Houay Soup Landfill operation to the local authorities. However, the EMU later requested a postponement of the meeting and that an update on the matter will be provided after April 2023.

There were no recyclable waste trade activities in the community recyclable waste bank in February 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 in the previous monthly meetings as well as the follow up discussions are summarized below:

- BSP-WCS met with Xaysomboun WRPO on 14 March 2023 to discuss the preparation of Law Enforcement Strategy (LES) in the NNP1 watershed. The preparation of the LES preparation is expected to take at least three months from April to June 2023, followed by a higher-level validation workshop as part of the approval process will be organized in July 2023 as soonest. The discussion also emphasized that the Totally Protected Zone (TPZ) patrolling shall be started as soon as AIP2022 disbursement is completed and not to wait for finalization of the LES. Xaysomboun WRPO agreed with the approach and BSP-WCS will continue the process for the LES preparation in close collaboration with EMO and WRPOs.
- The staff of Hom District Mine and Energy office informed the NNP1 EMO on 7 March 2023 that mining company plans to expand the existing access road from Ban Homthat to Nam Phouan Noy to reach the mining site in the NNP1 watershed TPZ1. The staff informed the NNP1 EMO on 29 March 2023 that that the mining company currently focuses their activity in the Phouthat area at Homthat village and will return to the site within NNP1 TPZ1 area for exploring mining after. He does not have detail information about the new road alignment from the Phouthat area to Nam Phouan Noy.
- The NNP1 EMO learned from the Head of Phou Ngou Village on 7 March 2023 that there is only one excavator parked in Phou Ngou Village and the Nam Phouan Hydropower Company is considering a new access road to reach their site in the NNP1 TPZ1 area because of difficulties in mobilizing heavy equipment on the existing access road that is also used for mining exploration. The Company is in discussion with the villagers on the road alignment and compensation related with it. The staff of the Hom District ME office informed the NNP1 EMO on 29 March 2023 that the contractor of Nam Phouan HHP has cleared and modified some sections of the existing access road from Phou Ngou village to Houay Pasong for 4-5 days. The contractor will construct a new road alignment around 2 Km from Houay Pasong to the Nam Phouan project site. The NNP1 EMO noted that the current situation is different from the information provided by the Head of Phou Ngou Village on 7 March 2023. In addition, the staff

of the Hom District ME office also informed that the XSB Provincial ME office issued an urgent notification to the Hom District ME office to ask the Nam Phouan HPP to discontinue the construction of a new access road and construction until the project obtains the agreement and approval from the provincial level.

- The Head of Xaysomboun WRPO informed NNP1 EMO that a meeting on the roles and responsibilities of the NNP1 reservoir fishery management still could not be organized due to his personal leave and prior commitments with other assignments including the internal PAFO monthly meeting.
- The NNP1 EMO submitted an official letter to Head of Xaysomboun PAFO on 17 March 2023 proposing actions to address the long delays of Xaysomboun WRPO activities. The NNP1 EMO followed up with the Head of Xaysomboun PAFO on 29 March 2023 and learned that he had not received the letter and he will review the letter in the first week of April 2023 after being from other assignments.

2.1.1.2 Bolikhamxay Watershed and Reservoir Protection Office (WRPO)

Bolikhamxay WRPO organized a monthly meeting on 13 March 2023 at Bolikhamxay WRPO office in Bolikhan District. The main objectives of the meeting were to present the results of forestry and reservoir patrol work in February 2023 and the plan for March 2023 patrolling.

The patrolling results identified some villagers accessing the compensated rubber trees that has already been compensated by NNP1PC before the Project Commercial Operation Date (COD) in the Nahan village area, but there are no details about these villagers from the patrol team or hotline operation. Bolikhamxay WRPO requested NNP1 EMO to communicate with provincial resettlement committees to address the issue. Bolikhamxay WRPO requested NNP1 to consider improving the access from Nahan village to NNP1 reservoir area. NNP1 EMO expressed concerns over potential threats to NNP1 watershed and its reservoir. Bolikhamxay WRPO agreed with the recommendation from NNP1 EMO and BSP-WCS to focus on patrolling efforts within NNP1 watershed. Reservoir patrol of March 2023 is subject to boat engine repairing. Bolikhamxay WRPO will further discuss with NNP1 EMO if there are no feasible options to repair the broken boat engine.

2.1.1.3 NNP1PC EMO

There was no activity implemented under the NNP1 EMO watershed livelihood program this month. The team is fully occupied with other assignments including the internal recruitment process, discussion and finalization of the proposed actions to address delays in Xaysomboun WRPO, preparation of Law Enforcement (LE) training for Xaysomboun WRPO and the review of Xaysomboun AIP2023.

2.1.2 Preparation of Annual Implementation Plan (AIP) 2022

2.1.2.1 Xaysomboun WRPO

NNP1 EMO received the official fund disbursement request from Forest Protection Fund (FPF) office of Department of Forestry (DOF) - Ministry of Agriculture and Forestry (MAF) on 20 January 2023. NNP1PC completed the fund disbursement to FPF on 31 January 2023. Xaysomboun WRPO re-submitted the original document to FPF DOF-MAF on 13 February 2023 for further fund transfer process to Xaysomboun WRPO account. The fund transfer is not completed until the end of March 2023 despite their close follow-up with FPF DOF-MAF.

2.1.2.2 Bolikhamxay WRPO

Bolikhamxay WRPO informed that their AIP2022 fund for Q42022 was transferred by DOF-MAF on 2 November 2022 was completed.

2.1.3 Preparation of Annual Implementation Plan (AIP) 2023

2.1.3.1 Xaysomboun WRPO

The Head of Xaysomboun WRPO submitted the draft AIP2023 to NNP1 EMO on 1 February 2023. NNP1 EMO reviewed the draft and shared it to BSP-WCS on 9 February 2023. BSP-WCS further reviewed the draft Xaysomboun AIP2023 on 24 March 2023. NNP1 EMO, Xaysomboun WRPO, and BSP-WCS will discuss the revised plan after the Law Enforcement (LE) training in the first week of April 2023.

2.1.3.2 Bolikhamxay WRPO

Bolikhamxay WRPO shared an official letter of fund disbursement from the FPF DOF-MAF to NNP1 EMO on 17 March 2023. NNP1 EMO requested FPF DOF-MAF to revise the letter following the Financial Management Manual (FMM). NNP1 EMO received the revised letter on 31 March 2023. EMO will process the request and closely follow-up with FPF DOF-MAF so that the fund could reach Bolikhamxay WRPO in the last week of April 2023 as soonest.

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 March 2023 is described below:

a. Component 1 - Spatial Planning and Regulation

The official approval of the Nam Chouan-Nam Xang (NC-NX) and its Totally Protected Zone (TPZ) boundary was postponed to April 2023 due to the unavailability of the Head of Bolikhamxay Province Agriculture and Forestry Office (PAFO) and the Vice Governor of Bolikhamxay Province. Head of BOMU informed NNP1 EMO on 27 February 2023 that the Deputy Head of Bolikhamxay PAFO agreed for the Participatory Land Use Planning (PLUP) review and update to be conducted according to the plan and advised the BOMU team to ensure that there is no grievance addressed by villagers about their land assets. The training is scheduled from 24-26 April 2023 followed by fieldwork.

b. Component 2 – Law Enforcement

The March 2023 patrolling was scheduled from 21 March to 9 April 2023 and the sub-station safeguarding by villagers is scheduled during Lao New Year, from 14 to 18 April 2023. The patrolling will focus on TPZ highest priority area, including Nam Xi and surroundings, Nam San and mountain ridges, Nam Sone and Nam Chang as well as TPZ higher priority area including, Nam Ma and its tributary. The March 2023 patrolling will be reported in April 2023.

The results of patrolling activity in February 2023 are as follows:

Team	Patrolling Area/distance	Observations/Actions Taken
1	Patrolling and safeguarding the temporary sub-station at the	No threats observed and recorded.

Team	Patrolling Area/distance	Observations/Actions Taken
	northwest edge of the TPZ highest priority area (Nam Xi) (17 days covering a distance of 58 km on forest patrolling)	
2	TPZ highest priority area including Nam Chouan and west mountain ridges of Nam Chouan (16 days covering a distance of 62 km on forest patrolling)	No threats observed and recorded.
3	TPZ highest priority area including the upstream of Nam San and mountain ridges (16 days – total distance cover is unknown because of GPS broken during the field work)	No threats observed and recorded.
4	TPZ high priority area including Nam Houng, Nam Somfad, Nam Lak, Houay Bon and Houay Kasae (16 days covering a distance of 70 km on forest patrolling)	The team discovered and destroyed one recent fishing camp and one old fishing camp at Nam Houng, a hunting camp at Houay Kasae and observed an inactive fishing fireplace at Nam Houng.

FIGURE 2.2-1: MAP OF THREATS RECORDED BY PATROLLING TEAMS IN FEBRUARY 2023

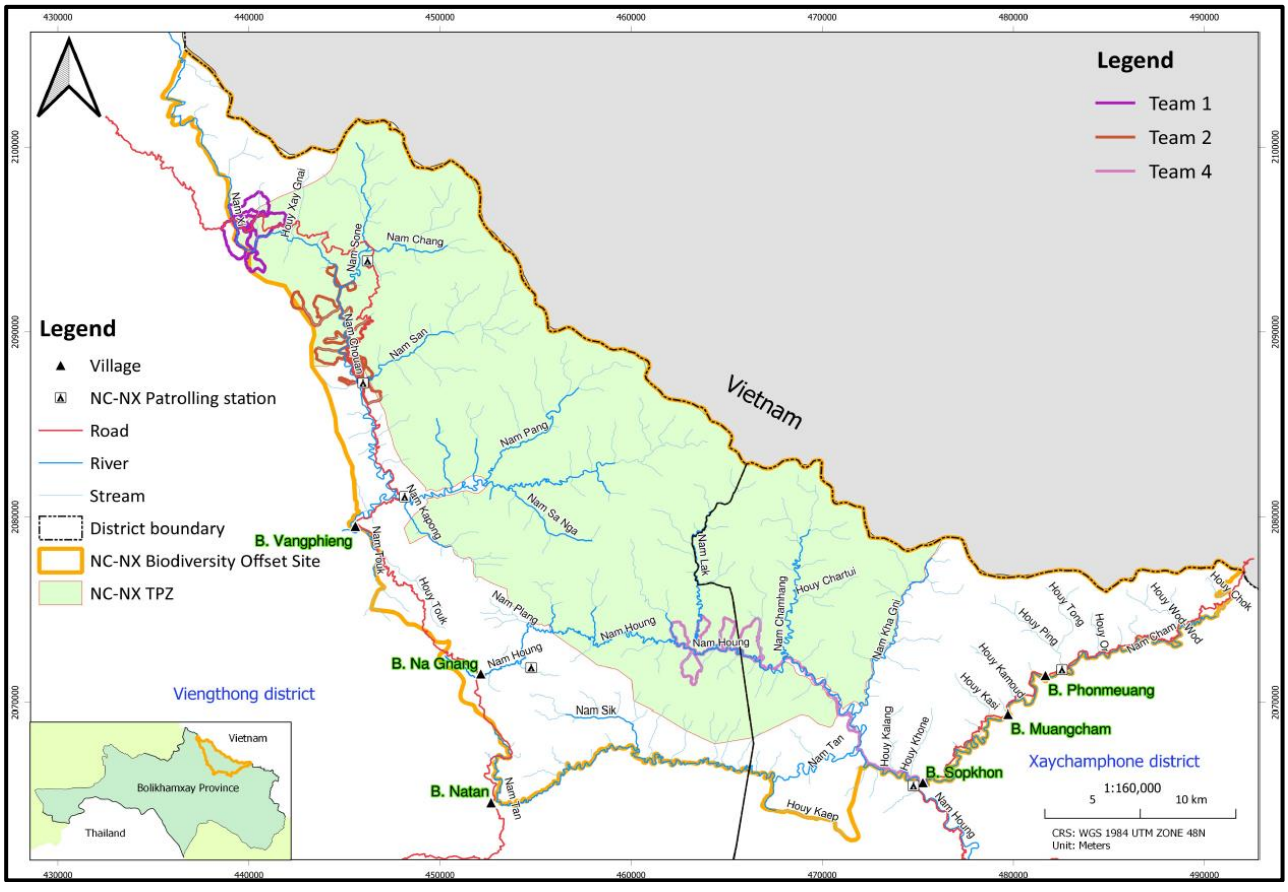

FIGURE 2.2-2: REPRESENTATIVE PHOTOS FOR MONTHLY PATROLLING IN FEBRUARY 2023

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Recent fishing camp found by team 4 at Nam Houng</td><td>Fishing fireplace found by team 4 at Nam Houng</td></tr>
<tr><td colspan="2">  </td></tr>
<tr><td colspan="2">Recent hunting camp found by team 4 at Houay Kasae</td></tr>
</table>

c. Component 3 – Conservation Outreach

The training for the District Team was organized from 28 to 30 March 2023 in Xaychamphone District. The outreach activities in Xaychamphone and Viengthong districts are scheduled for 2-7 April and 24-17 April 2023, respectively.

FIGURE 2.2-3: REPRESENTATIVE PHOTOS OF OUTREACH TRAINING AT XAYCHAMPHONE DISTRICT DURING 28-30 MARCH 2023

d. Component 4 – Conservation linked livelihood development

The March 2023 snare removal planned to focus on TPZ highest priority area including Nam Sone and mountain ridges. However, the snare remove team submitted an official letter to BOMU on 27 March 2023 to postpone the activity to the following month because of the unavailability of the village team members related with farming activity together with their families.

2.2.2 Preparation of Annual Implementation Plan (AIP) 2023

The Head of Bolikhamxay BOMU submitted the draft AIP2023 on 15 February 2023. NNP1 EMO reviewed the draft and shared it to BOMU and BSP-WCS on 21 February 2023. BSP-WCS reviewed and provided their comments and shared it to BOMU on 22 February 2023. NNP1 EMO, BOMU, and BSP-WCS organized a discussion to finalize the AIP2023 on 16 March 2023. The draft was finalized and submitted to ADB and IAP on 24 March 2023. ADB and IAP confirmed no objection on 28 March 2023. EMO have informed BOMU to process further for their internal approval by the Head of Bolikhamxay PAFO and submission to FPF DOF-MAF.

NNP1 EMO submitted a brief report about FMM as requested by FPF DOF-MAF on 15 March 2023 for approval process. FPF DOF-MAF informed EMO at the end of March 2023 that they are still reviewing the document.

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 February 2023 as listed in ***Table 2.3-1.*** A All species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species[1].

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

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Poropuntius normani, Poropuntius laoensis, Poropuntius carinatus	ปาจาด	99.6	LC
Channa striata	ปาຕໍ່	68	LC
Clarias batrachus	ปาดุก	52	LC
Scaphiodonichthys acanthopterus	ปาม้อม	47.6	LC
Mastacembelus armatus, Mastacembelus favus	ปาหูาด	46.8	LC

The recorded catch of Threatened species (IUCN Red List classification) in February 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 February 2023 Fish Catch

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Cirrhinus cirrhosus	ปาแกง/ปามอนจัม	0.6	VU
Scaphognathops bandanensis	ปาอวนไฝ/ปาป่วน	13.6	VU
Tor sinensis	ปาแดง	7.7	VU

Species abundance and occurrence is based on the 7-day reported catch from the Daily Catch Logbook (DCL) survey in February 2023. The catch is divided in three areas including above the main dam, below the main dam and Mekong area. Main biodiversity indicators in February 2023 for above dam, below dam and Mekong area are presented in ***Table 2.3-3.***

[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.

Table 2.3-3: Main Biodiversity Indicators for February 2023

Biodiversity Indicators	Mekong	Below dam	Above dam
Total number of species and groups recorded	19	33	32
Single species	17	21	22
Species groups	2	12	10
Top 15 species (% total catch weight)	96.08%	81.66%	93.26%
Proportion for species groups	3.60%	44.88%	48.22%
Diversity index (Shannon)	2.4762	3.0295	2.7160

Figure 2.3-1 shows the proportion of total number of households actively fishing by fishing zone including upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK). It ranges between 45% and 63% of active fishing households for all fishing zones in February 2023.

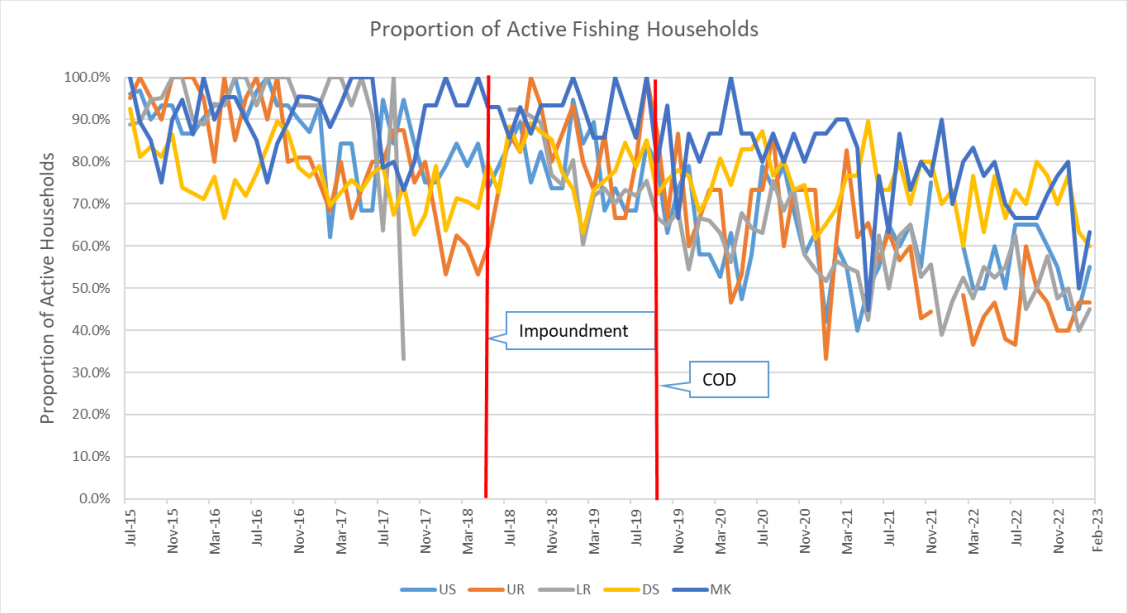

Figure 2.3-1: Proportion of total number of households actively fishing by fishing zone from July 2015 to February 2023

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

Figure 2.3-2 shows the average (mean) of monthly household fishing days from July 2015 to January 2023 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area.

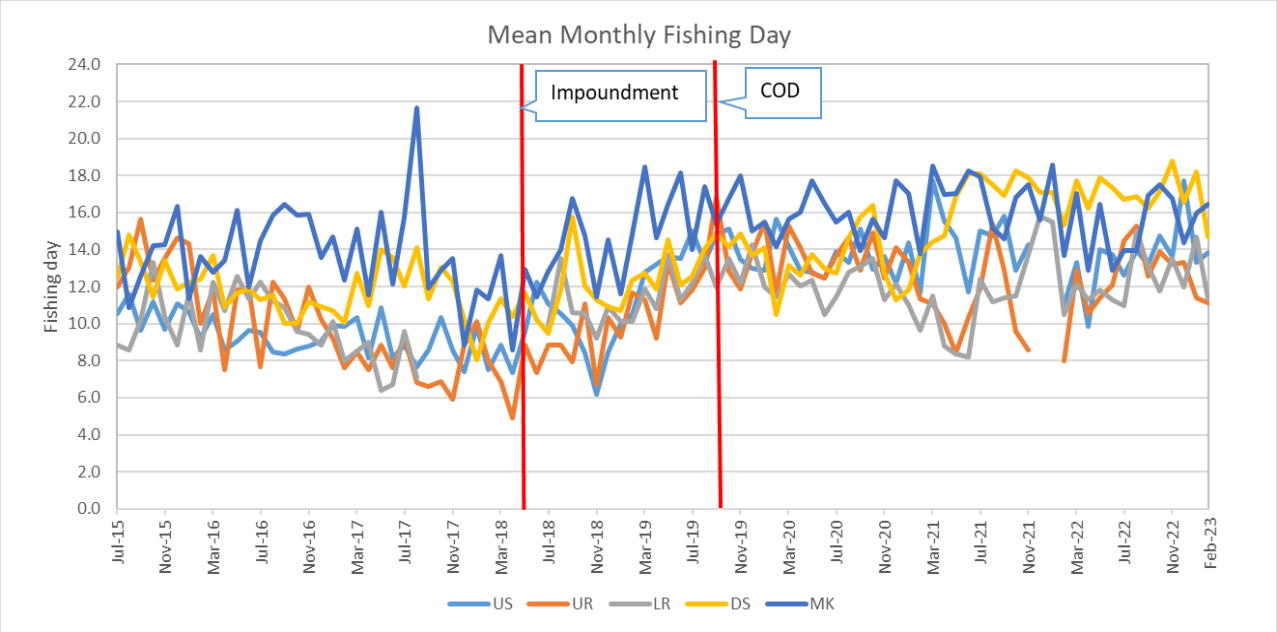

Figure 2.3-2: Mean of monthly fishing day from July 2015 to February 2023

The mean monthly number of fishing days for the month of February 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 February from 2016 to 2023

Fishing Zone	February 2016 (day)	February 2017 (day)	February 2018 (day)	February 2019 (day)	February 2020 (day)	February 2021 (day)	February 2022 (day)	February 2023 (day)
Upstream	9.23	9.85	7.50	10.50	15.64	11.67	11.00	13.82
Upper reservoir	9.99	7.60	8.00	11.67	11.64	11.33	8.00	11.14
Lower reservoir	8.58	8.00	NA	10.13	11.46	9.64	10.48	11.33
Downstream	12.43	10.06	10.09	12.33	10.47	13.80	15.33	14.67
Mekong	13.65	12.33	11.33	14.86	14.15	13.78	13.67	16.42

The mean monthly household fish catch from July 2015 to February 2023 for the upstream (US), upper reservoir (UR), lower reservoir (LR), downstream (DS) and Mekong (MK) area are presented in ***Figure 2.3-3.***

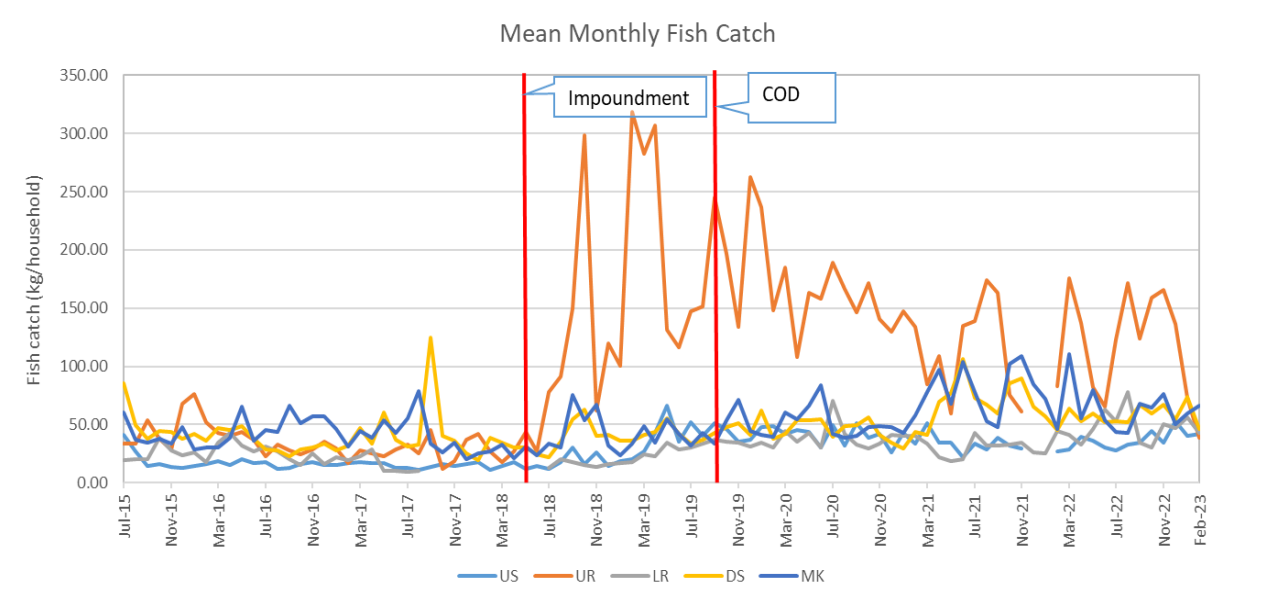

Figure 2.3-3: Mean Monthly Household Fish Catch from July 2015 to February 2023

The mean household fish catch for the month of February 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 February from 2016 to 2023

Fishing Zone	February 2016 (kg)	February 2017 (kg)	February 2018 (kg)	February 2019 (kg)	February 2020 (kg)	February 2021 (kg)	February 2022 (kg)	February 2023 (kg)
Upstream	16.06	16.62	10.95	19.90	49.05	34.00	27.33	41.67
Upper reservoir	51.66	16.60	26.80	318.73	147.85	133.64	82.86	38.31
Lower reservoir	17.93	19.35	NA	18.13	30.61	40.20	44.80	43.11
Downstream	35.79	32.34	38.38	36.50	38.08	43.38	45.20	46.04
Mekong	29.90	30.73	27.33	33.83	39.57	57.57	45.83	66.29

The mean daily fish catch per household from July 2015 to February 2023 are displayed in ***Figure 2.3-4*** and the mean fish catch per household per fishing day for the month of February from 2016 to 2023 are shown in ***Table 2.3-6.***

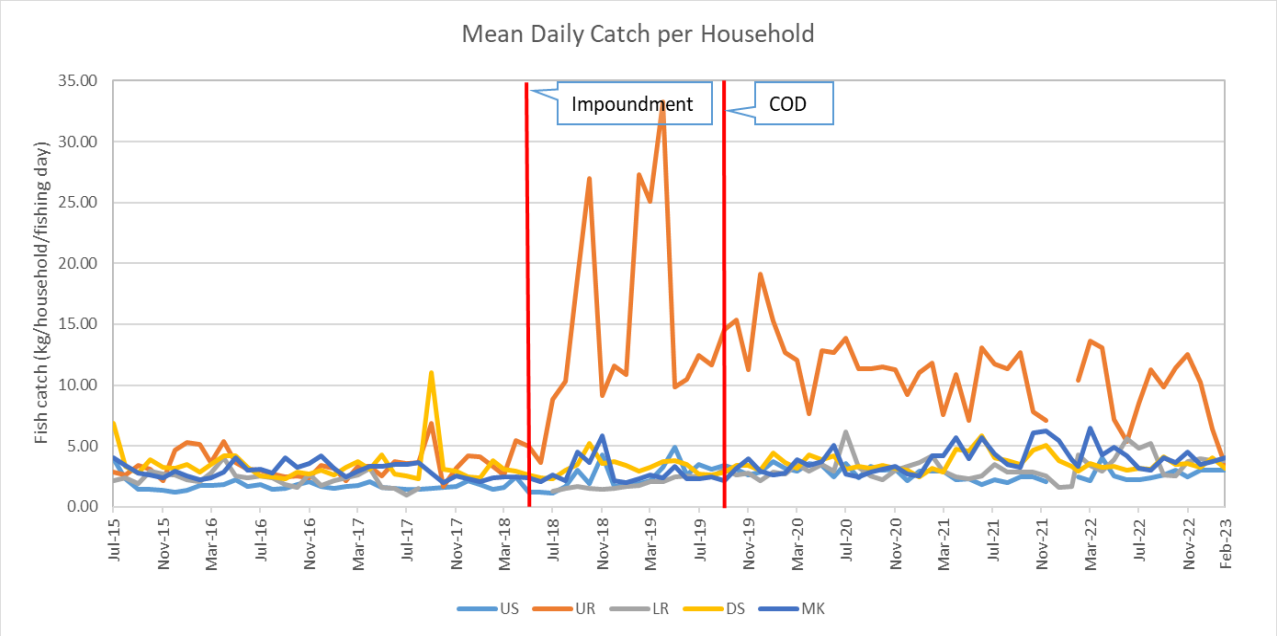

Figure 2.3-4: Mean Daily Fish Catch per Household from July 2015 to February 2023

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

Fishing Zone	February 2016 (kg)	February 2017 (kg)	February 2018 (kg)	February 2019 (kg)	February 2020 (kg)	February 2021 (kg)	February 2022 (kg)	February 2023 (kg)
Upstream	1.74	1.69	1.46	1.90	3.14	2.91	2.48	3.02
Upper reservoir	5.17	2.18	3.35	27.32	12.71	11.79	10.36	3.44
Lower reservoir	2.09	2.42	NA	1.79	2.67	4.17	4.28	3.80
Downstream	2.88	3.21	3.81	2.96	3.64	3.14	2.95	3.14
Mekong	2.19	2.49	2.41	2.28	2.80	4.18	3.35	4.04

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

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

Habitats	US	UR	LR	DS	MK
Mekong	0.0%	0.0%	0.0%	0.0%	69.2%
Nam Ngiep	53.3%	42.9%	0.0%	37.5%	0.3%
Nam Xan	0.0%	0.0%	0.0%	0.0%	0.0%
Reservoir	0.0%	52.4%	33.5%	0.0%	0.0%

Habitats	US	UR	LR	DS	MK
Tributaries and streams	46.7%	4.7%	66.5%	51.9%	0.0%
Wetlands	0.0%	0.0%	0.0%	10.6%	30.5%
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 February 2023 are presented in ***Figure 2.3-5*** and the proportion of OAA catch for the month of February from 2016 to 2023 are shown in ***Table 2.3-8.***

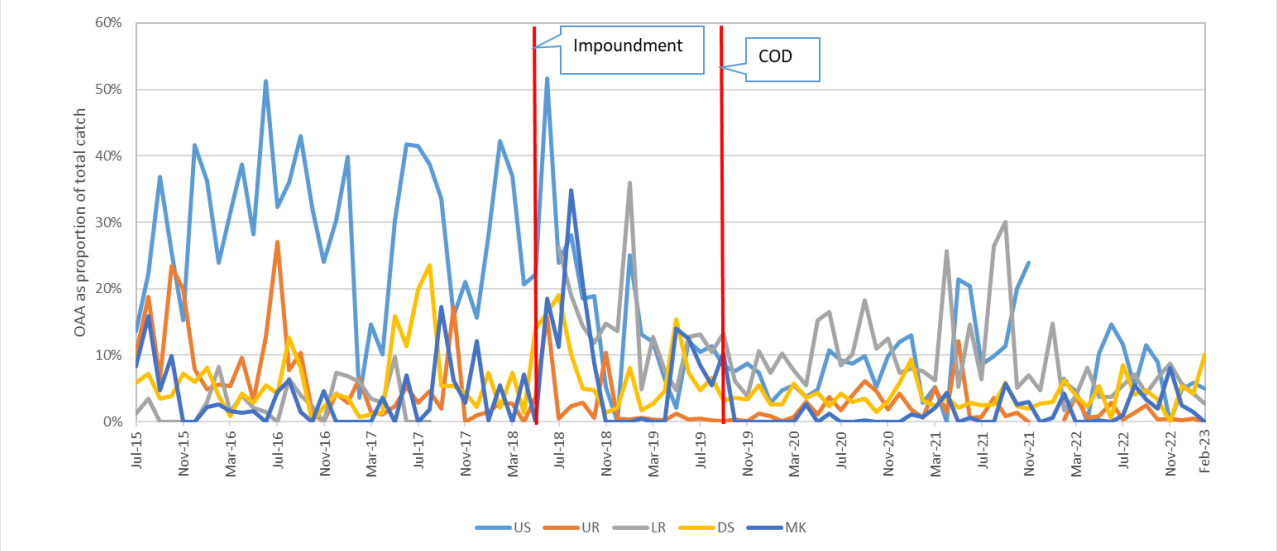

Figure 2.3-5: Proportion of OAA to the total reported number of fish and OAA for a 7-day period by fishing zone from July 2015 to February 2023

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

Fishing Zone	February 2016	February 2017	February 2018	February 2019	February 2020	February 2021	February 2022	February 2023
Upstream	23.91%	3.57%	42.22%	13.10%	4.66%	2.86%	5.96%	4.98%
Upper reservoir	5.57%	6.53%	2.90%	0.57%	0.07%	0.60%	0.38%	0.00%
Lower reservoir	8.18%	5.98%	0.00%	4.86%	10.18%	7.61%	1.67%	2.76%
Downstream	3.87%	0.71%	2.13%	1.66%	2.56%	3.17%	6.27%	10.11%
Mekong	2.54%	0.00%	5.42%	0.50%	0.00%	0.77%	4.18%	0.00%

3 EXTERNAL MISSIONS AND VISITS

There was no external mission and visit during the month of reporting.

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	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
1-Mar-23	pH	5.0 - 9.0		6.58	6.83	6.75										6.9		
2-Mar-23	pH	5.0 - 9.0					6.59	6.77	6.91	6.98								
8-Mar-23	pH	5.0 - 9.0		6.9	6.7	6.5												
9-Mar-23	pH	5.0 - 9.0					6.79	6.84	6.78	6.91								
13-Mar-23	pH	5.0 - 9.0	6.7												6.96			
14-Mar-23	pH	5.0 - 9.0		6.47	6.56	6.74										6.9		
15-Mar-23	pH	5.0 - 9.0					6.62	6.85	6.69	6.83								
16-Mar-23	pH	5.0 - 9.0									6.71	6.85	6.99	7.1			7.14	7.04
22-Mar-23	pH	5.0 - 9.0		6.8	6.5	6.88												
23-Mar-23	pH	5.0 - 9.0					6.56	6.6	6.91	6.95								
29-Mar-23	pH	5.0 - 9.0		6.86	6.74	6.59												
30-Mar-23	pH	5.0 - 9.0					6.55	6.6	6.77	6.81								
1-Mar-23	Sat. DO (%)			95.2	87.8	99										102.8		
2-Mar-23	Sat. DO (%)						90.9	89	49.9	66.4								
8-Mar-23	Sat. DO (%)			97	94.8	119.6												
9-Mar-23	Sat. DO (%)						98.6	95.6	29.5	58.5								
13-Mar-23	Sat. DO (%)		97.2												93.8			
14-Mar-23	Sat. DO (%)			97.2	102.6	107.3										100.3		
15-Mar-23	Sat. DO (%)						103.9	103.2	31.7	38.1								
16-Mar-23	Sat. DO (%)										45.5	46.3	62	70.4			73.1	74.2
22-Mar-23	Sat. DO (%)			101.7	105.3	113.2												
23-Mar-23	Sat. DO (%)						96.6	98	31.9	44								
29-Mar-23	Sat. DO (%)			106.1	117.5	120.4												

		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																
30-Mar-23	Sat. DO (%)						109.8	107.1	38.9	50.7								
1-Mar-23	DO (mg/L)	>6.0		7.76	7.22	8.23										9.24		
2-Mar-23	DO (mg/L)	>6.0					7.54	7.42	4.16	5.35								
8-Mar-23	DO (mg/L)	>6.0		7.8	7.83	9.92												
9-Mar-23	DO (mg/L)	>6.0					8.16	7.99	2.52	4.72								
13-Mar-23	DO (mg/L)	>6.0	8.54												8.32			
14-Mar-23	DO (mg/L)	>6.0		7.91	8.42	8.68										8.72		
15-Mar-23	DO (mg/L)	>6.0					8.63	8.68	2.7	3.2								
16-Mar-23	DO (mg/L)	>6.0									3.9	3.98	5.27	5.92			6.07	6.13
22-Mar-23	DO (mg/L)	>6.0		7.91	8.31	8.93												
23-Mar-23	DO (mg/L)	>6.0					7.67	7.69	2.73	3.62								
29-Mar-23	DO (mg/L)	>6.0		8.42	9.34	9.55												
30-Mar-23	DO (mg/L)	>6.0					8.82	8.62	3.32	4.17								
1-Mar-23	Conductivity (µs/cm)			87	82	75										71		
2-Mar-23	Conductivity (µs/cm)						74	74	83	82								
8-Mar-23	Conductivity (µs/cm)			85	83	75												
9-Mar-23	Conductivity (µs/cm)						74	73	86	82								
13-Mar-23	Conductivity (µs/cm)		88												35			
14-Mar-23	Conductivity (µs/cm)			78	75	68										67		
15-Mar-23	Conductivity (µs/cm)						67	67	77	75								
16-Mar-23	Conductivity (µs/cm)										76	77	74	73			132	62
22-Mar-23	Conductivity (µs/cm)			78	78	69												
23-Mar-23	Conductivity (µs/cm)						68	67	77	74								
29-Mar-23	Conductivity (µs/cm)			95	95	84												
30-Mar-23	Conductivity (µs/cm)						82	81	88	88								
1-Mar-23	Temperature (°C)			25.77	25.21	24.7										20.46		
2-Mar-23	Temperature (°C)						24.73	24.52	24.43	26.53								

		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																
8-Mar-23	Temperature (°C)			26.5	25.16	24.82												
9-Mar-23	Temperature (°C)						24.87	24.38	23.29	26.29								
13-Mar-23	Temperature (°C)		21.77												21.22			
14-Mar-23	Temperature (°C)			25.76	25.42	25.99										22.21		
15-Mar-23	Temperature (°C)						24.77	24.07	23.21	23.86								
16-Mar-23	Temperature (°C)										23.17	23.11	23.39	23.88			24.66	23.36
22-Mar-23	Temperature (°C)			28.26	27.54	27.45												
23-Mar-23	Temperature (°C)						27.42	27.79	23.29	25.46								
29-Mar-23	Temperature (°C)			26.95	27.25	27.17												
30-Mar-23	Temperature (°C)						26.53	26.45	23.59	25.57								
1-Mar-23	Turbidity (NTU)			3.17	1.45	1.38										2.42		
2-Mar-23	Turbidity (NTU)						1.31	1.21	1.83	2.21								
8-Mar-23	Turbidity (NTU)			2.17	1.66	1.59												
9-Mar-23	Turbidity (NTU)						1.16	1.34	0.98	2.62								
13-Mar-23	Turbidity (NTU)		4.95												3.06			
14-Mar-23	Turbidity (NTU)			4.72	1.85	1.43										4.44		
15-Mar-23	Turbidity (NTU)						1.36	1.14	0.9	2.34								
16-Mar-23	Turbidity (NTU)										1.73	1.94	3.1	9.21			3.16	2.74
22-Mar-23	Turbidity (NTU)			9.01	1.79	2.03												
23-Mar-23	Turbidity (NTU)						1.84	1.81	4.08	3								
29-Mar-23	Turbidity (NTU)			13.1	2.98	2.83												
30-Mar-23	Turbidity (NTU)						1.9	1.82	2.42	2.65								
13-Mar-23	TSS (mg/L)		<5												<5			
14-Mar-23	TSS (mg/L)			<5		<5										<5		
15-Mar-23	TSS (mg/L)						<5	<5										
16-Mar-23	TSS (mg/L)								<5	<5			<5	11.05			<5	<5
13-Mar-23	BOD_5 (mg/L)	<1.5	<1												<1			

		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																
14-Mar-23	BOD_5 (mg/L)	<1.5		<1		<1										<1		
15-Mar-23	BOD_5 (mg/L)	<1.5					<1	<1	<1	<1								
16-Mar-23	BOD_5 (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
23-Feb-23	COD (mg/L)	<5.0							<5	6.4								
24-Feb-23	COD (mg/L)	<5.0														<5		
25-Feb-23	COD (mg/L)	<5.0									<5	<5	<5	<5			6.4	<5
27-Feb-23	COD (mg/L)	<5.0	<5												<5			
13-Mar-23	COD (mg/L)	<5.0	<5												<5			
14-Mar-23	COD (mg/L)	<5.0														<5		
15-Mar-23	COD (mg/L)	<5.0							<5	6.4								
16-Mar-23	COD (mg/L)	<5.0									<5	9.6	6.4	<5			13.8	6.4
23-Feb-23	NH_3-N (mg/L)	<0.2					<0.2	<0.2										
24-Feb-23	NH_3-N (mg/L)	<0.2		0.3		0.2									<0.2			
27-Feb-23	NH_3-N (mg/L)	<0.2	<0.2												<0.2			
13-Mar-23	NH_3-N (mg/L)	<0.2	<0.2												<0.2			
14-Mar-23	NH_3-N (mg/L)	<0.2		<0.2		<0.2										<0.2		
15-Mar-23	NH_3-N (mg/L)	<0.2					<0.2	<0.2										
23-Feb-23	NO_3-N (mg/L)	<5.0					0.07	0.06										
24-Feb-23	NO_3-N (mg/L)	<5.0		<0.02		0.07										0.08		
27-Feb-23	NO_3-N (mg/L)	<5.0	0.09												0.08			
13-Mar-23	NO_3-N (mg/L)	<5.0	<0.02												<0.02			
14-Mar-23	NO_3-N (mg/L)	<5.0		<0.02		<0.02										<0.02		
15-Mar-23	NO_3-N (mg/L)	<5.0					<0.02	<0.02										
13-Mar-23	Faecal coliform (MPN/100 mL)	<1,000	170												540			
14-Mar-23	Faecal coliform (MPN/100 mL)	<1,000														79		
16-Mar-23	Faecal coliform (MPN/100 mL)	<1,000									49	39	130	79			70	1,600

		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																
24-Feb-23	Total Coliform (MPN/100 mL)	<5,000														920		
25-Feb-23	Total Coliform (MPN/100 mL)	<5,000									240	110	350	540			920	920
27-Feb-23	Total Coliform (MPN/100 mL)	<5,000	540												240			
13-Mar-23	Total Coliform (MPN/100 mL)	<5,000	540												350			
14-Mar-23	Total Coliform (MPN/100 mL)	<5,000														920		
16-Mar-23	Total Coliform (MPN/100 mL)	<5,000									49	39	170	110			70	1,600
23-Feb-23	TKN						<1.5	<1.5										
24-Feb-23	TKN			<1.5		<1.5										<1.5		
27-Feb-23	TKN		<1.5												<1.5			
13-Mar-23	TKN		<1.5												<1.5			
14-Mar-23	TKN			<1.5		<1.5										<1.5		
15-Mar-23	TKN						<1.5	<1.5										
23-Feb-23	TOC (mg/L)								1.08	1.12								
24-Feb-23	TOC (mg/L)															0.87		
25-Feb-23	TOC (mg/L)										1.01	1.2	1.17	1.16			2.82	2.06
27-Feb-23	TOC (mg/L)		0.96												<0.5			
13-Mar-23	TOC (mg/L)		1.26												1.2			
14-Mar-23	TOC (mg/L)															1.47		
15-Mar-23	TOC (mg/L)								1.32	1.26					<0.5			
16-Mar-23	TOC (mg/L)										2.05	1.55	1.33	1.19			2.81	2.47
23-Feb-23	Phytoplankton Biomass (g dry wt/m^3)						1.8	0										
24-Feb-23	Phytoplankton Biomass (g dry wt/m^3)			0.4		2.2												

		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																
14-Mar-23	Phytoplankton Biomass (g dry wt/m³)			3.4		2.2												
15-Mar-23	Phytoplankton Biomass (g dry wt/m³)						1	2										
23-Feb-23	Total Phosphorus (mg/L)						0.01	<0.01										
24-Feb-23	Total Phosphorus (mg/L)			0.01		0.01												
27-Feb-23	Total Phosphorus (mg/L)		<0.01												<0.01			
13-Mar-23	Total Phosphorus (mg/L)		0.01												0.02			
14-Mar-23	Total Phosphorus (mg/L)			0.02		0.01										0.02		
15-Mar-23	Total Phosphorus (mg/L)						<0.01	0.01										
23-Feb-23	Total Dissolved Phosphorus (mg/L)						<0.01	<0.01										
24-Feb-23	Total Dissolved Phosphorus (mg/L)			<0.01		<0.01												
27-Feb-23	Total Dissolved Phosphorus (mg/L)																	
13-Mar-23	Total Dissolved Phosphorus (mg/L)		<0.01												0.01			
14-Mar-23	Total Dissolved Phosphorus (mg/L)			0.01		<0.01										0.01		
15-Mar-23	Total Dissolved Phosphorus (mg/L)		<0.01				<0.01	<0.01							<0.01			
23-Feb-23	Hydrogen Sulfide (mg/L)						<0.02	<0.02										
24-Feb-23	Hydrogen Sulfide (mg/L)			<0.02		<0.02												
14-Mar-23	Hydrogen Sulfide (mg/L)			<0.02		<0.02												
15-Mar-23	Hydrogen Sulfide (mg/L)						<0.02	<0.02										
14-Mar-23	Turbidity (NTU)-bottom					3.03												
15-Mar-23	Turbidity (NTU)-bottom						8											
14-Mar-23	TSS (mg/L)-bottom			<5		<5												
15-Mar-23	TSS (mg/L)-bottom						<5	<5										
14-Mar-23	BOD_5 (mg/L)-bottom					<1												

		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																
15-Mar-23	BOD_5 (mg/L)-bottom						<1	5.6										
23-Feb-23	NH_3-N (mg/L)-bottom						<0.2	<0.2										
24-Feb-23	NH_3-N (mg/L)-bottom					0.3												
14-Mar-23	NH_3-N (mg/L)-bottom					<0.2												
15-Mar-23	NH_3-N (mg/L)-bottom						<0.2	<0.2										
23-Feb-23	NO_3-N (mg/L)-bottom						0.06	0.08										
24-Feb-23	NO_3-N (mg/L)-bottom					0.06												
14-Mar-23	NO_3-N (mg/L)-bottom					<0.02												
15-Mar-23	NO_3-N (mg/L)-bottom						<0.02	<0.02										
23-Feb-23	TKN-bottom						<1.5	<1.5										
24-Feb-23	TKN-bottom					<1.5												
14-Mar-23	TKN-bottom					<1.5												
15-Mar-23	TKN-bottom						<1.5	<1.5										
23-Feb-23	Total Dissolved Phosphorus (mg/L)-bottom						<0.01	0.02										
24-Feb-23	Total Dissolved Phosphorus (mg/L)-bottom					<0.01												
14-Mar-23	Total Dissolved Phosphorus (mg/L)-bottom					<0.01												
15-Mar-23	Total Dissolved Phosphorus (mg/L)-bottom						<0.01	0.03										
23-Feb-23	Total Phosphorus (mg/L)-bottom						<0.02	0.03										
24-Feb-23	Total Phosphorus (mg/L)-bottom					<0.02												
14-Mar-23	Total Phosphorus (mg/L)-bottom					<0.01												
15-Mar-23	Total Phosphorus (mg/L)-bottom						0.01	0.05										
23-Feb-23	Hydrogen Sulfide (mg/L)-bottom						<0.02	<0.02										

		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																
24-Feb-23	Hydrogen Sulfide (mg/L)-bottom					<0.02												
14-Mar-23	Hydrogen Sulfide (mg/L)-bottom					<0.02												
15-Mar-23	Hydrogen Sulfide (mg/L)-bottom						<0.02	0.02										
23-Feb-23	Phytoplankton Biomass (g dry wt/m³)-bottom						0.6	1.8										
24-Feb-23	Phytoplankton Biomass (g dry wt/m³)-bottom																	
14-Mar-23	Phytoplankton Biomass (g dry wt/m³)-bottom					1.2												
15-Mar-23	Phytoplankton Biomass (g dry wt/m³)-bottom						2	1.2										

TABLE A-2: RESULTS OF CAMP EFFLUENTS IN FEBRUARY AND MARCH 2023

	Site Name	OSOV1 (Owner's Site Office and Village)				OSOV2 (ESD Camp)				Main Powerhouse			
	Station Code	EF01				EF13				EF19			
	Date	10-Feb-23	22-Feb-23	06-Mar-23	20-Mar-23	09-Feb-23	22-Feb-23	06-Mar-23	20-Mar-23	10-Feb-23	22-Feb-23	06-Mar-23	20-Mar-23
Parameters (Unit)	**Guideline**												
pH	6.0 - 9.0	6.7	6.9	7	6.85	6.9	6.82	7.25	7.5	6.9	7.04	7.2	7.05
Sat. DO (%)		44.5	51.5	44.6	55.1	68.6	79.2	82.2	105.4	38.8	32	50.5	52.9
DO (mg/L)		3.63	4.27	3.71	4.3	5.56	6.48	6.94	8.27	3.08	2.53	3.98	4.2
Conductivity (µs/cm)		390	378	364	310	484	475	613	590	1,171	1,490	2,002	1,463
Temperature (°C)		25.61	24.75	24.65	27.17	26.07	25.55	23.68	27.73	27.06	27.13	27.1	28.96
Turbidity (NTU)		0.89	1.57	1.08	1.52	14.7	17.1	11.4	10.7	42.4	51.7	66.4	33.7
TSS (mg/L)	<50	<5	<5	<5	<5	20.33	<5	9.4	7.63	56.5	59.1	80.0	44.6
BOD_5 (mg/L)	<30	<6	<6	<6	<6	9.57	<6	<6	<6	<6	<6	<6	8
COD (mg/L)	<125		<25	<25	<25		52.5	37.8	40.2		113.0	188.0	69.5
NH_3-N (mg/L)	<10.0		4.10	<2	3.00		16.40	23.50	28.10		8.90	3.10	21.30
Total Nitrogen (mg/L)	<10.0		4.51	3.09	3.11		17.60	23.80	29.50		24.80	10.80	58.00
Total Phosphorus (mg/L)	<2		1.13	0.76	1.48		1.83	2.45	2		13.8	13.0	10.3
Oil & Grease (mg/L)	<10.0		<1	<1			<1	1.2			<1	2.1	
Total coliform (MPN/100 mL)	<400	700	1,600	240	1,600	16,000	0	0	2	0	1,600	0	1,600
Faecal Coliform (MPN/100 mL)	<400	460	5	79	140	9,200	0	0	0	0	1,600	0	920
Residual Chlorine (mg/L)	<1.0					0.04	0.69	1.25	0.97	0.17		0.68	0.08