



Nam Ngiep 1 Hydropower Project

Environmental Management Monthly Monitoring Report

December 2021

A	15 January 2022	Hendra WINASTU	Wanidaporn RODE	Khamlar PHONSAVAT	Final
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EXECUTIVE SUMMARY

During December 2021, EMO received two documents for review and approval. EMO issued one Non-Compliance Report (NCR) and one Site Inspection Report of Observation of Non-Compliance to a Contractor.

Due to the COVID-19 pandemic and the measures announced by the GOL, the regular joint site inspections were completely suspended at all restricted areas such as nearby villages and in Zone 2UR as well as at NNP1PC's operation sites during the reporting period. However, the EMO undertook their own site inspections of the Dam sites and NNP1PC's operation sites as normal.

The operation and adjustment of the newly constructed wastewater treatment systems are still in process. EMO requires more time in Q1 of 2022 to confirm the results and the sampling schedule is now adjusted from fortnightly to weekly basis to optimize the wastewater treatment conditions.

In December 2021, water quality depth profile measurements at R01, R02 and R03 (Main Reservoir) and NPH01 were suspended due to security concerns. However, in early January 2022, the Head of Thathom District Administration Office has confirmed that there is no security issue in the area and the water quality monitoring at R01, R02, R03 and NPH01 will be resumed in January 2022.

At R05, the average DO concentration was 4.7 mg/L in the upper 24 m varying between 4.2 mg/L and 6.1 mg/L, and the oxycline was generally found at a depth of 26.0 m with DO concentrations abruptly decreasing from about 4 mg/L to below 1 mg/L – deeper than November 2021. In the Re-regulation Reservoir, the mean DO concentration in the entire water column were 4.8 mg/L and 5.1 mg/L in R06 and R07 respectively.

The discharge from the Re-regulation Dam was mainly turbine discharge and occasionally gate discharge during the reporting period. No dead fish was observed in Nam Ngiep downstream in this monitoring period. NNP1PC is still in the process of collecting information to assist in developing measures to improve the DO levels downstream.

In December 2021, the local waste collection contractors continued collecting waste from the NNP1PC's operation sites and the nearby villages, and operating the NNP1 Project Landfill and Houay Soup Landfill. The work included waste segregation and disposal, waste cover, grass cutting and repairing perimeter fences.

A total of 29.7 m³ of solid waste was disposed of at the NNP1 Project Landfill, an increase of 8.8 m³ compared with November 2021. A total of 25.7 m³ of solid waste from Phouhomxay, Thahuea and Hat Gniun Villages was disposed of at Houay Soup Landfill, a decrease of 0.2 m³ compared with November 2021. During this period, the local recycle waste vendors have collected hazardous waste on site for further recycling and disposal. There was no trading of recyclable waste at the community recycle waste bank during the period of reporting.

There were no activities carried out by Watershed and Reservoir Protection Offices (WRPOs) in December 2021 under their approved Annual Implementation Plan (AIP) except for the reservoir and forest patrol. Xaysomboun WRPO carried out reservoir patrolling between 17-26 December 2021 while Bolikhamxay WRPO carried out the forest and reservoir patrolling between 14-23 December 2021. The field activity for patrolling and snare removal by Bolikhamxay Nam Chouane-Nam Xang Biodiversity Offset Management Unit (NC-NX BOMU) in December 2021 was rescheduled to January 2022 because a team member contracted COVID-19 and the task force therefore recommended all team members to perform strict quarantine for at least two-weeks before being tested again prior to resuming their work.

1. ENVIRONMENTAL MANAGEMENT MONITORING

1.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

Some pending documents relating to ISO14001:2015 are under preparation and review by the relevant parties. The work plan for EMO remains unchanged from the November 2021 Report.

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

Item	ISO14001:2015 Work Plan	Year 2020		Year 2021				Year 2022	
		Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	Continue to prepare EMS documents (8 Standard Operating Procedures are completed)								
2	NNP1PC Environmental Policy announcement								
3	NNP1PC ISO Committee establishment								
4	Training relevant staff on: <ul style="list-style-type: none"> - Requirement and Interpretation of ISO14001:2015 - Organization Context and Risk Management for ISO14001 - ISO14001:2015 Document Information - ISO14001:2015 Internal Audit 								
5	Implement the EMS procedures and processes								
6	ISO14001:2015 Internal Audit								
7	Implement the corrective actions and preventive actions according to the Internal Audit								
8	Management Review by NNP1PC Management								
9	ISO 14001:2015 Assessment and Certification Audit – Stage 1 (remote audit on the documentation review)								
10	Implement the corrective actions and preventive actions according to the Stage 1 Audit								
11	ISO 14001:2015 Assessment and Certification Audit – Stage 2 (remote audit, 4 man-days)								
12	Implement the corrective actions and preventive actions according to the Stage 2 Audit								
13	Certify of ISO14001:2015 upon successful completion of the audit								
	Completed activities per the plan								
	Plan to achieve the activities								

1.2 COMPLIANCE MANAGEMENT

In December 2021, EMO received two documents for review and approval. The status of document review is shown on **Table 1-2** below.

TABLE 1-2: SUMMARY STATUS OF DOCUMENT REVIEW IN DECEMBER 2021

Title	Date Received	Status
DWP & SS-ESMMP for Irrigation Repairing	30 November 2021 (1 st submission)	No objection with comment on 17 December 2021
Program Logic Controller operating procedure for the WWTS (SBR) at OSOV2	14 December 2021 (2 nd submission)	No objection with comment on 29 December 2021

Due to the COVID-19 situation, the GOL's lockdown measures continue to be in place in the area surrounding the project and its activities, and the suspension of the regular joint site inspections has continued at all areas such as at nearby villages, in Zone 2UR and at NNP1PC's operation sites during the reporting period. However, the EMO undertook their own site inspections of the Dam sites and NNP1PC's operation sites as normal including at OSOV1, OSOV2, and at the Main Dam grouting work.

The operation and adjustment of the newly constructed wastewater treatment systems (WWTS) are in progress. EMO has conducted six fortnightly samplings since the completion of the improvements. EMO requires more time to analyse the results and the sampling schedule is now adjusted from fortnightly to weekly basis to optimize the wastewater treatment conditions. In addition, the WWTS operation manual is developed with support of the Contractor (SCC). It is now under reviewing by EMO management.

EMO issued one Non-Compliance Reports (NCR) and one Site Inspection Report (SIR) during December 2021. The status of compliance reports (Observation of Non-Compliance or ONC; and Non-Compliance Report or NCR) issued by NNP1PC is summarized in **Table 1-3** and **Table 1-4** below.

TABLE 1-3: SUMMARY OF ONCS AND NCRS

Items	ONC	NCR-1	NCR-2	NCR-3
Carried over from November 2021	0	2	0	0
Newly Opened in December 2021	2	1	0	0
Total in December 2021	2	3	0	0
Resolved in December 2021	0	2	0	0
Carried over to January 2022	2	1	0	0
Unsolved Exceeding Deadlines	0	1	0	0

TABLE 1-4: SUMMARY OF THE NCR AND ONC ISSUED TO THE CONTRACTOR

Document Number / Date of Issue	Subject Description	Current Status at the end of December 2021
<p>NC No. 04/21 Issued Date: 09-11-21 (NCR Level 1)</p>	<p>Lack of spill control at the KENBER’s temporary camp and workshop (rental house) at Hat Gniun Village.</p> <ul style="list-style-type: none"> - No clean-up of the contaminated soil/sand on the ground that EMO previously instructed on NC No. 02/2021. - The contaminated sand and spilt oil inside of the bunding area of fuel station was cleaned up and disposed/dumped directly on the ground outside the bunding area without containing/storing properly. - New additional spillages on the ground were observed. 	<p>After EMO inspected and verified the status of corrective actions for the NC No. 02/21, EMO found that not all of required actions had been fully addressed and that oil spillage had occurred repeatedly.</p> <p>However, the NC No. 02/21 was closed with some unsolved issues transferred to the new NC No. 04/21 with a shorter deadline and enforcement.</p> <p>The new deadline for the corrective actions in NC No. 04/21 is 07 January 2022.</p>
<p>ONC_KENBER-0007</p>	<p>The contractor has a lack of spill response and control on site.</p> <ul style="list-style-type: none"> - Black oil and hydrocarbon spills from the generator and water pump to the ground and open ditch without provision of appropriate countermeasures; - No cleaning up of absorbent sand/ contaminated sand for a proper storage. 	<p>Deadline 05 January 2022</p>
<p>ONC_KENBER-0008</p>	<p>Reference to previous NCR (NC No. 03/2021) pursuant the poor waste management at the temporary camp (rental houses).</p> <p>The scattered waste was collected and burned in the area surrounding the rental houses in contravention of EMO’s repeated instructions that no burning of solid waste is allowed</p>	<p>Deadline 05 January 2022</p>

1.2.1 Site Inspection by Environment Management Unit (EMU)

The monthly site visit by the EMU of Bolikhan District and the quarterly site visit by the EMU of Xaysomboun Province were not carried out in December 2021 due to the COVID-19 lockdown measures.

1.2.2 Site Decommissioning and Rehabilitation

During the reporting period of December 2021, EMO has continued to monitor the status and progress of site rehabilitation for the Phouhomxay Village’s Irrigation canal rock and spoil disposal area and the former LILAMA10 camp. The percentage of vegetation cover is maintained at 65%, for the former LILAMA10 camp and 70% for Phouhomxay village’s irrigation spoil disposal area - same as in November 2021.

FIGURE 1-1: STATUS OF TWO SITES VEGETATION COVER AT THE END OF DECEMBER 2021



1.3 WATER QUALITY MONITORING

The analyses of Total Suspended Solids (TSS), Biochemical Oxygen Demand (BOD₅), Faecal Coliform Bacteria, Total Coliform Bacteria and *E. coli* have been carried out by NNP1PC's environmental laboratory since August 2017.

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

Due to the rapid increase in COVID-19 infection cases in the project related communities during December 2021, the GOL imposed additional COVID-19 preventative measures, which meant that the community water supply (groundwater and gravity fed) monitoring had to be suspended.

In addition, there is still no turbidity measurement data reported in December 2021 due to the Turbidity Meter was broken. It is expected to be repaired in January 2022.

1.3.1 Effluent Discharge from Camps and Construction Sites

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

The status of implementation of the corrective actions addressing non-compliances at the camps and key project facilities are summarized in **Table 1-5**.

TABLE 1-5: STATUS OF CORRECTIVE ACTIONS FOR NON-COMPLIANCES AT WWTSS IN DECEMBER 2021

Site	Sampling ID	Status	Corrective Actions
OSOV1	EF01	Non-compliance for total nitrogen in one out of three samplings, faecal coliform in two out of three samplings, and total coliform in all three samplings.	In Q1 of 2022, the treatment conditions will be adjusted including the treatment time and Chlorine dosing rate in the OSOV2 and the Main Powerhouse systems. The system in OSOV1 will be inspected to find the source of issues in the two constructed wetland ponds.
OSOV2	EF13	Non-compliance for ammonia-nitrogen and total nitrogen in all three samplings.	
Main Powerhouse	EF19	Non-compliance for total phosphorus in all three samplings, and ammonia nitrogen and total nitrogen in one out of three samplings.	

1.3.2 Ambient Surface Water and Reservoir Water Quality Monitoring

The ambient surface water and reservoir water quality monitoring programme comprises five monitoring stations in the main reservoir (R01-R05), two stations in the Re-regulation Reservoir (R06 and R07), five stations in the mainstream Nam Ngiep (NNG01 and NNG05 to NNG08) and four stations in the main tributaries to Nam Ngiep (Nam Chiane [NCH01], Nam Phouan [NPH01], Nam Xao [NXA01] and Nam Houay Soup [NHS01]). However, water quality monitoring at three stations in the main reservoir (R01-R03) and Nam Phouan (NPH01) were suspended due to the security concerns but it is scheduled to be resumed in January 2022.

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**.

The monitoring results for key parameters (DO, TSS and BOD₅) during December 2021 are presented in **Table 1-6, Table 1-7 and Table 1-8**. The full set of data for December 2021 is attached in **Annex A**. In addition, the results for DO timeseries are presented as line graphs in **Figure 1-4** and **DO Long Profile graphs in Figure 1-5**.

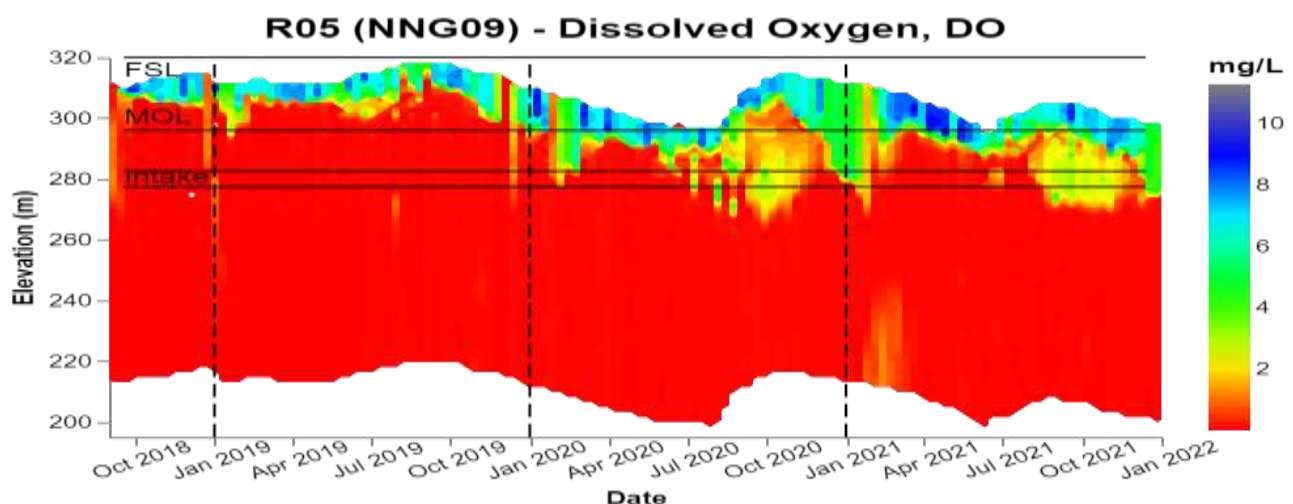
Main Reservoir

From 01 to 31 December 2021, the main reservoir water level decreased with 1.51 m from El. 300.07 m asl to El. 298.56 m.

Depth profile measurements and sampling at R01, R02 and R03 continue to be suspended due to security concerns during December 2021.

At R05, the average DO concentration was 4.7 mg/L in the upper 24 m varying between 4.2 mg/L and 6.1 mg/L, and the oxycline was generally found at a depth of 26.0 m with DO concentrations abruptly decreasing from about 4 mg/L to below 1 mg/L – deeper than November 2021. As shown in Figure 1-2, at the intake level (centreline approximately 20 m below surface), the mean DO concentration was about 4 mg/L until towards the mid-December 2021. DO concentrations below 0.5 mg/L (anoxic condition) were recorded at depths below 26 m corresponding to 6 m below the Intake centreline in early December 2021 to 4 m below the Intake by the mid-December 2021, taking into consideration slightly decreased water level in the reservoir over the period. It was clearly seen the mixing of water at the upper layer during the cold-dry season due to the drop of ambient temperature.

FIGURE 1-2: DO DEPTH PROFILES TIME SERIES IN R5 (SINCE SEPTEMBER 2018 TO DECEMBER 2021)



At R04, the DO levels in the upper 22.0 m varied between 4.4 mg/L and 5.5 mg/L with oxycline at depths of 26 m below surface where the DO concentrations decreased from about 3 mg/L to below 0.3 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.

The BOD₅ measurements at R04 and R05 in both epilimnion and hypolimnion were less than 1.0 mg/L.

Re-regulation Reservoir

In December 2021, the turbine discharges from the main powerhouse varied between 13 and 225 m³/s usually interrupted by night-time periods with no discharge.

The mean DO concentration in the entire water column were 4.8 mg/L and 5.1 mg/L in R06 and R07 respectively during December 2021 corresponding to the relatively high DO levels at the intake in the main reservoir.

The BOD₅ concentrations in both R06 and R07 were less than 1.0 mg/L.

Nam Ngiep Downstream

During December 2021, the discharge from the Re-regulation Dam was mainly turbine discharge and occasionally gate discharge.

During periods with turbine discharge, the DO concentrations at NNG05 about 1.8 km downstream of the Re-regulation Dam was 5.3 mg/L corresponding to the relatively high DO levels in the re-regulation reservoir. However, a DO concentration during gate discharge was 8.4 mg/L and thus complied with the surface water quality standard.

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

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

Main Tributaries to Nam Ngiep

No water quality monitoring for Nam Phouan (NPH01) and Nam Chiane (NCH01) during December 2021.

All monitored parameters in the Nam Xao (NXA01) and Nam Houaysoup (NHS01) complied with the standards.

Figure 1-3: Surface Water and Re-regulation Reservoir Water Quality Monitoring Stations

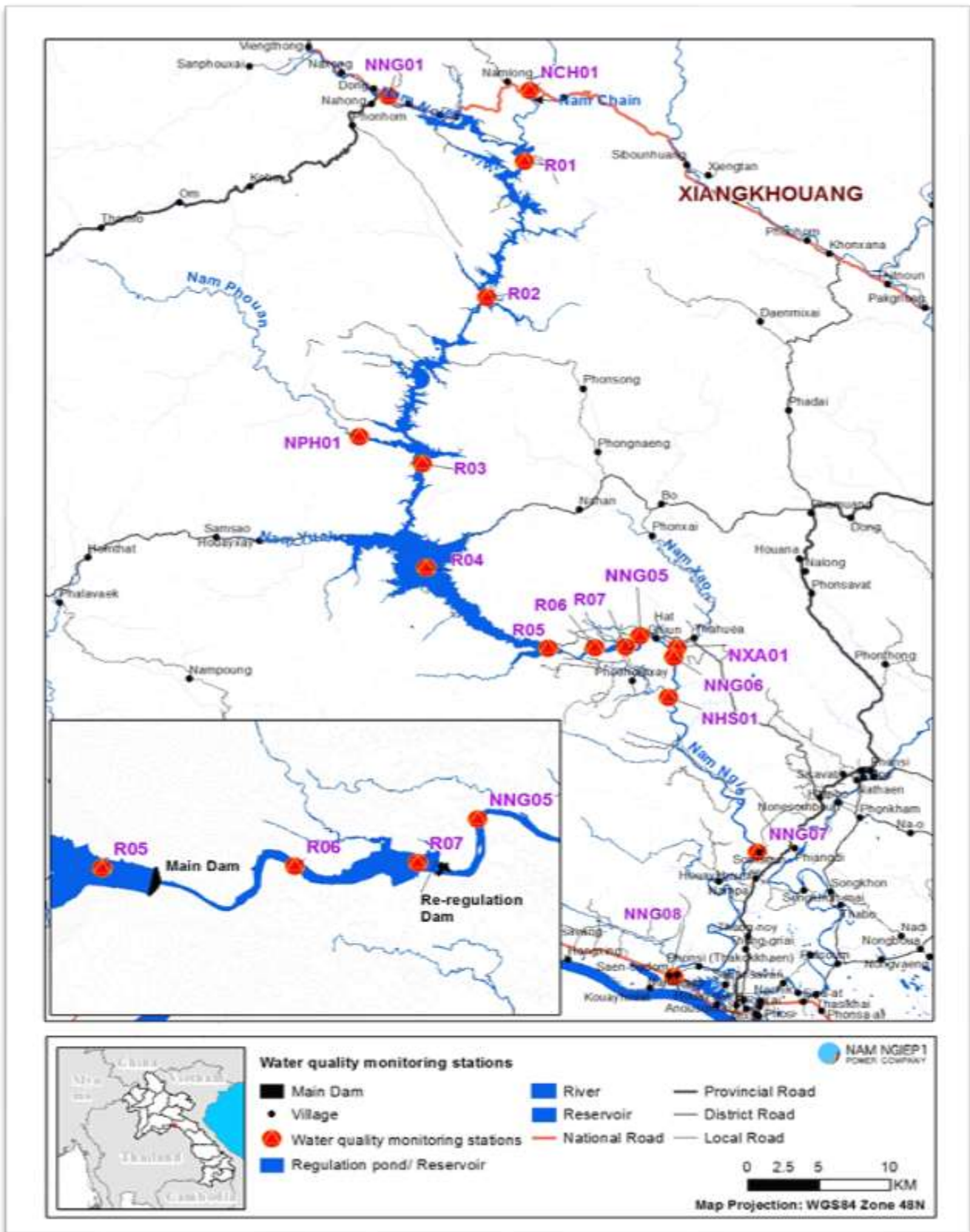


FIGURE 1-4: CONCENTRATION OF DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M SINCE SEPTEMBER 2019 TO DECEMBER 2021

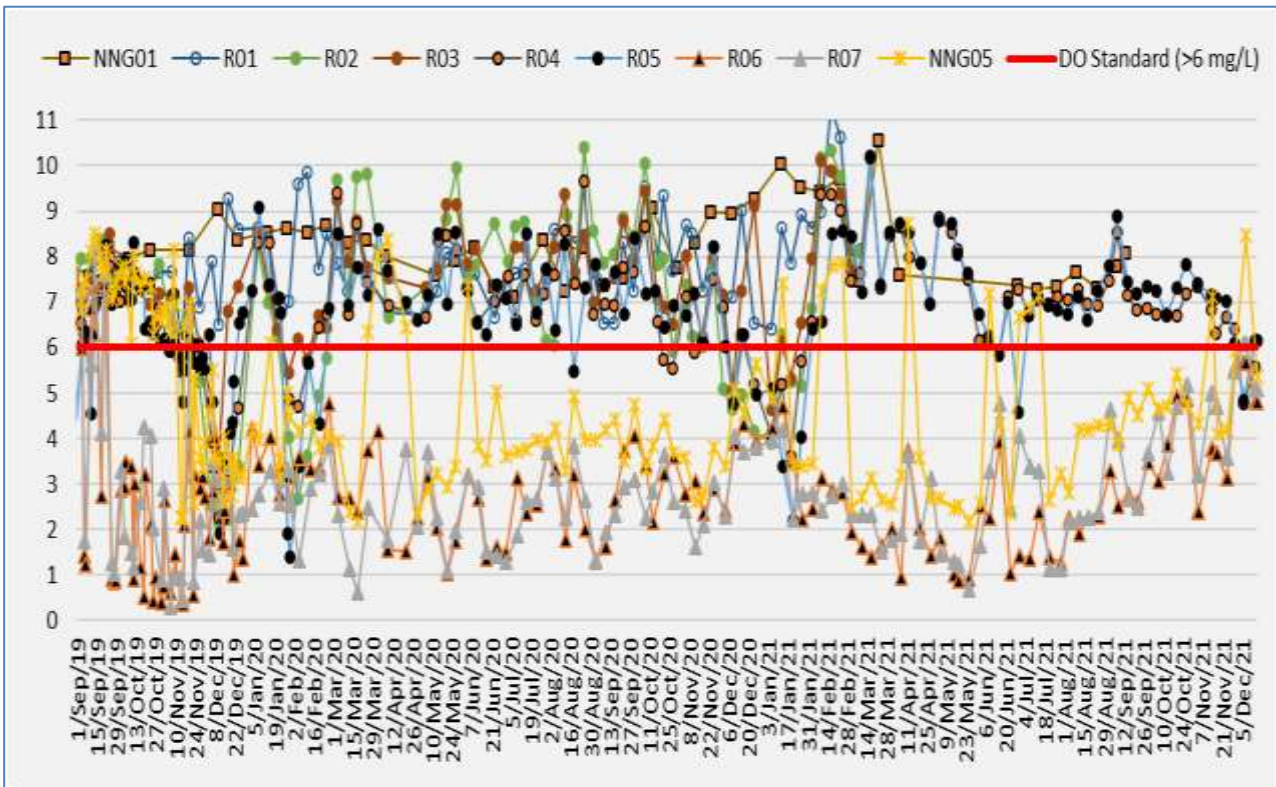


FIGURE 1-5: DISSOLVED OXYGEN (MG/L) LONG PROFILE IN DECEMBER 2021 (FROM IMMEDIATELY UPPER MAIN DAM TO LOWER NAM NGIEP RIVER)

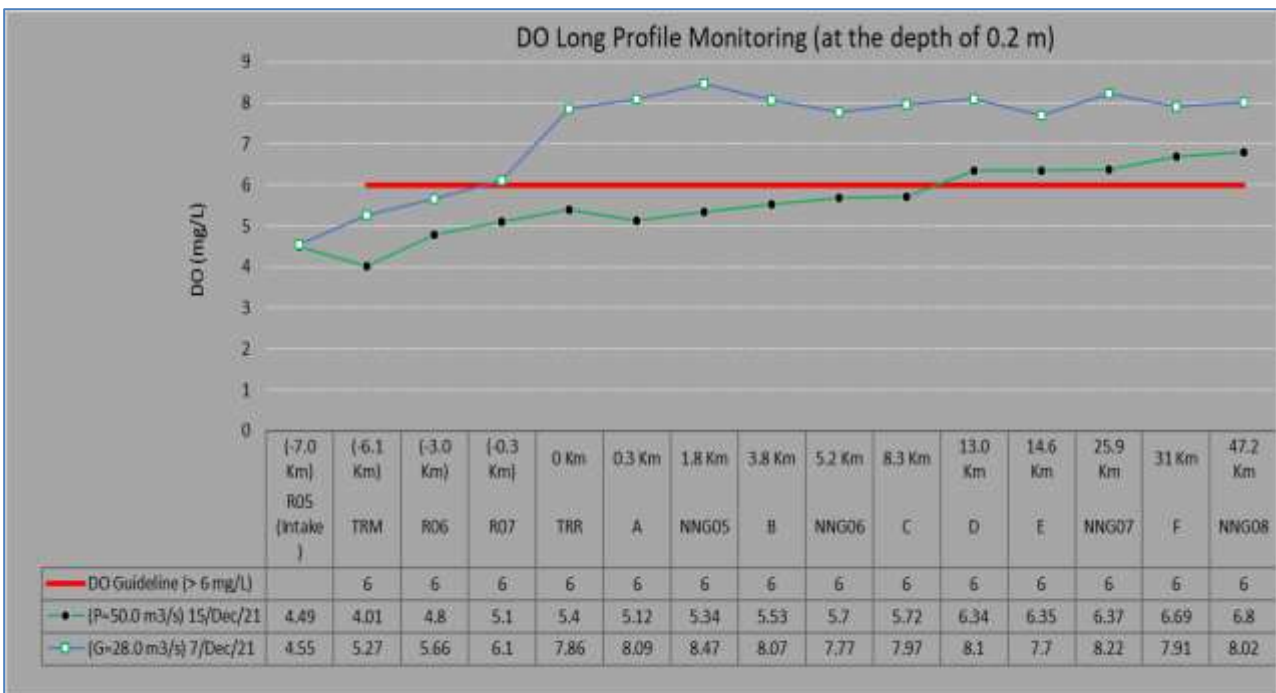


TABLE 1-6: RESULTS OF SURFACE WATER QUALITY MONITORING FOR DISSOLVED OXYGEN (MG/L) IN THE UPPER 0.2 M, NATIONAL WATER QUALITY STANDARD: >6.0 MG/L

DO (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
6-Dec-21					4.79	4.85	5.66	6.1								
7-Dec-21							5.66	6.1	8.47	7.77	8.22	8.02			8.72	8.16
14-Dec-21					5.57	6.17	4.8	5.1								
15-Dec-21						6.17	4.8	5.1	5.34	5.7	6.37	6.8			7.19	6.87

TABLE 1-7: 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
06-Dec-21					<5	<5	<5	<5								
06-Dec-21 Bottom					12.0	<5										
07-Dec-21									<5	<5	<5	<5			<5	<5

TABLE 1-8: RESULTS OF SURFACE WATER QUALITY MONITORING FOR BOD₅ (MG/L) - WATER QUALITY STANDARD: < 1.5 MG/L

BOD ₅ (mg/L)	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
06-Dec-21					<1	<1	<1	<1								
06-Dec-21 Bottom					<1	<1										
07-Dec-21									<1	<1	<1	<1			<1	<1

1.3.3 Groundwater Quality Monitoring

During December 2021, the groundwater quality monitoring in the communities was suspended due to a rapid increase in COVID-19 infection cases in the communities which meant that NNP1PC could not access the villages, and therefore there are no water quality monitoring results for the six wells located in Phouhomxay Village, Somseun Village, Nam Pa Village, Thong Noy Village and Pou Village to be reported in this month.

1.3.4 Gravity Fed Water Supply (GFWS) Quality Monitoring

Due to the rapid increase in COVID-19 infection cases in the communities, NNP1PC suspended the water quality monitoring of the community gravity fed water supply systems in Phouhomxay, Hat Gniun and Thahuea Villages in December 2021.

1.3.5 Landfill Leachate Monitoring

During December 2021, the landfill leachate monitoring was conducted at NNP1 Project Landfill (Last pond - LL4) and at Houay Soup Solid Waste Landfill (Last pond - LL6).

The results of the landfill leachate monitoring show compliance with the relevant effluent standards except for total coliform in leachate from the NNP1 Project Landfill. The leachate was still contained in the leachate ponds without discharging to the environment. EMO will continue to monitor the leachate and report the results in the next monthly progress report. The landfill leachate monitoring results for December 2021 can be found in **Table 1-9**.

TABLE 1-9: 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	Discharged Point
			Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline								
3-Dec-21	pH	6.0-9.0				7.34		7.26		
3-Dec-21	Sat. DO (%)					76.1		91.1		
3-Dec-21	DO (mg/L)					6.68		7.82		
3-Dec-21	Conductivity (µS/cm)					81		154		
3-Dec-21	Temperature (°C)					21.74		22.9		
3-Dec-21	BOD ₅ (mg/L)	<30				10.86		<6		
3-Dec-21	COD (mg/L)	<125				80.8		47.7		
3-Dec-21	Faecal Coliform (MPN/100mL)	<400				49		23		
3-Dec-21	Total Coliform (MPN/100mL)	<400				540		79		
3-Dec-21	Total Nitrogen (mg/L)	<10				18.6		15.4		
3-Dec-21	Ammonia nitrogen (mg/L)	<10				<2		<2		
3-Dec-21	Oil & Grease (mg/L)	<10				1		<1		

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 1-6** and **Figure 1-7** presents the values recorded since May 2018.

During December 2021, the mean inflow to the main reservoir was 50 m³/s. The minimum and maximum inflows were 26 m³/s (on 27 December 2021) and 66 m³/s (on 10 December 2021) respectively.

From 01 to 31 December 2021, the water level in the main reservoir decreased from El. 300.07 m asl to El. 298.56 m.

In December 2021, the hourly turbine discharges from the Main Powerhouse varied between 13 and 225 m³/s usually interrupted by night-time periods with no discharge.

FIGURE 1-6: INFLOW TO THE MAIN RESERVOIR

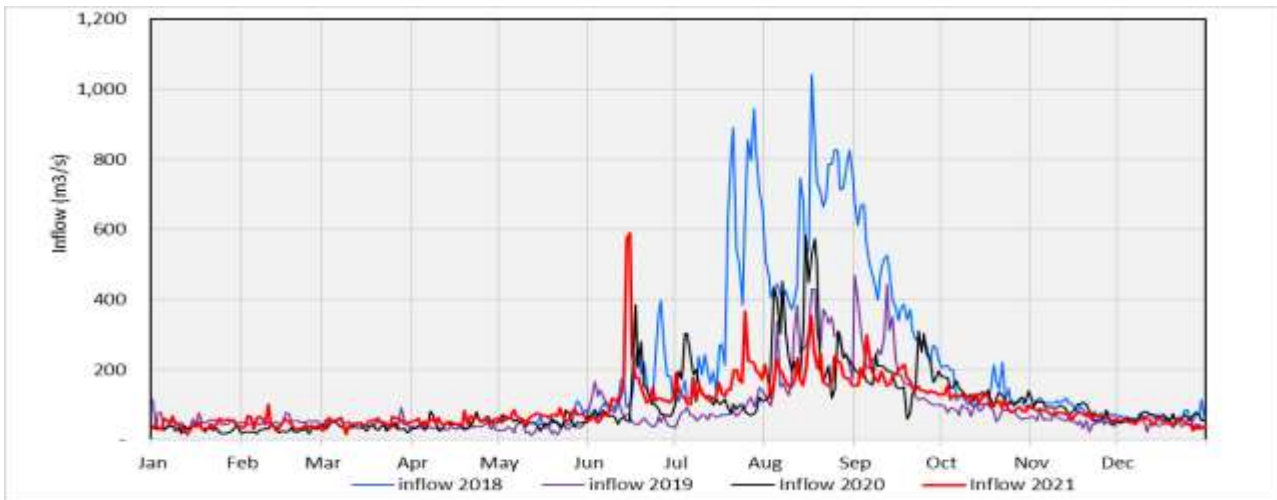
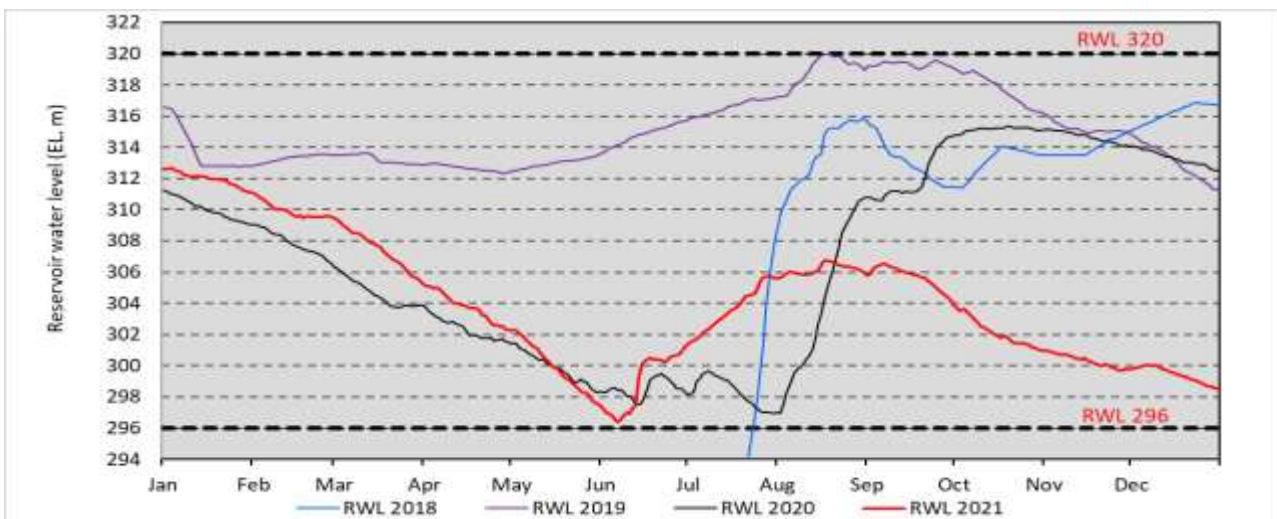


FIGURE 1-7: WATER LEVEL FOR THE MAIN RESERVOIR



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

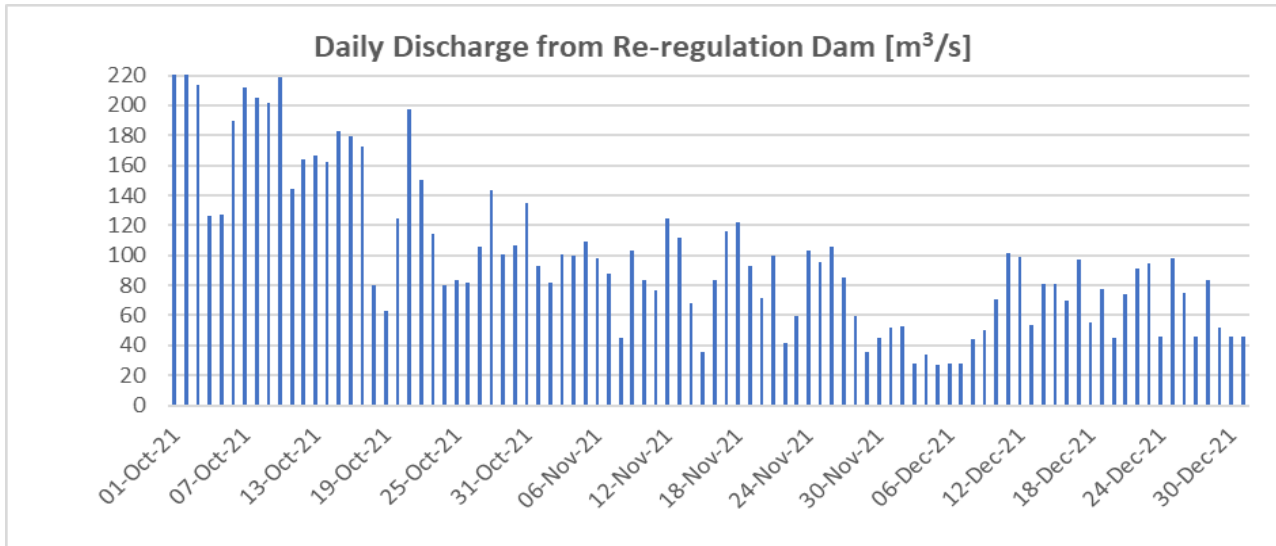
1.4.2 Re-regulation Reservoir – Discharge

The daily discharge monitoring data for the Re-regulation Dam during October to December 2021 is presented in **Figure 1-8**.

During December 2021, the mean daily discharge from the Re-regulation Dam was about 62 m³/s with hourly turbine discharges varying between 32 m³/s and 159 m³/s, hourly gate discharge varied between 26 m³/s and 91 m³/s, and hourly total discharge varying between 26 m³/s and 166 m³/s. The hourly discharge was kept above the minimum flow requirement of 27 m³/s at all times, except on 04 December 2021 with the discharge of 26 m³/s for six hours.

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 1-8: DAILY DISCHARGE MONITORING AT THE RE-REGULATION DAM IN OCTOBER TO DECEMBER 2021



1.4.3 Nam Ngiep Downstream Water Depth Monitoring

In December 2021, EMO carried out two boat missions to monitor the water depth in the Nam Ngiep downstream of the Re-regulation Dam. A total of 19 sites have been identified with potential shallow water depths and in one of the two boat missions, the talweg water depth was less than 0.5 m at four of the sites (distance between 1.5 and 5.6 km from the Re-regulation Dam) during the discharge of 28.0 m³/s on 07 December 2021.

1.5 PROJECT WASTE MANAGEMENT

1.5.1 Solid Waste Management

In December 2021, a total of 29.7 m³ of solid waste was disposed of at the NNP1 Project Landfill, an increase of 8.8 m³ compared with November 2021.

During this reporting period, 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 included waste segregation and disposal, waste cover and compaction, grass cutting and repairing of perimeter fences.

FIGURE 1-9: WASTE MANAGEMENT ACTIVITIES AT NNP1 LANDFILL DURING DECEMBER 2021



The total amount of recyclable waste selling and collection this month is summarized in **Table 1-10**.

TABLE 1-10: AMOUNTS OF RECYCLABLE WASTE SOLD AND COLLECTION

Source and Type of Recycled Waste		Unit	Sold	Cumulative Total by December 2021
1	Plastic bottles	kg	5	5
2	Aluminium	kg	27	27
3	Paper/Cardboard	kg	0	0
4	Glass	kg	0	0
5	Scrap Metal	Kg	0	0
Total		kg	32	32

In December 2021, while continuing observing the required COVID-19 precautions, the villagers from Phouhomxay Village and host villages collected 246 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 December 2021 are shown in **Table 1-11** and **Table 1-12**.

TABLE 1-11: RECORD OF HAZARDOUS MATERIAL INVENTORY

No.	Type of Hazardous Material	Unit	Total in December 2021 (A)	Used (B)	Remaining at the end of December 2021 (A – B)
1	Diesel	Litre	3,093	1,520	1,573
2	Gasoline	Litre	610	100	510
3	Lubricant (Turbine oil)	Litre	14,122	1,600	12,522
4	Colour Paint	Litre	242	0	242
5	Thinner	Litre	7	0	7
6	Grease Oil	Litre	220	0	220
7	Gear Oil	Litre	468	0	468
8	Chlorine Liquid	Litre	100	0	100
9	Chlorine Powder	kg	65	0	65
10	SIKA	Litre	7	0	7

TABLE 1-12: RECORD OF HAZARDOUS WASTE INVENTORY

No.	Hazardous Waste Type	Unit	Total in December 2021 (A)	Disposed (B)	Remaining at the end of December 2021 (A - B)
1	Used Oil (Hydraulic and Engine)	Litre	320	0	320
2	Used oil mixed with water	Litre	6,800	4,800	2,000
3	Empty 200L drum of used oil	Unit	22	0	22
4	Contaminated soil, sawdust and textile material	m ³	1	0	1
5	Empty 20L chemical drum	Drum	18	0	18
6	Lead battery	Unit	7	0	7
7	Halogen/fluorescent bulbs	Unit	278	0	278
8	Empty cartridge (Ink)	Unit	21	0	21
9	Clinic Waste	kg	5	0	5

1.6 COMMUNITY WASTE MANAGEMENT

1.6.1 Community Recycling Programme

Due to the continuation of COVID-19 measures, many local recycling businesses and vendors have not yet resumed their recyclable waste trading in the community area. No recycle waste trade activities in the community recycle waste bank in December 2021.

1.6.2 Community Solid Waste Management

In December 2021, a total of 25.7 m³ of solid waste from Phouhomxay, Thahuea and Hat Gniun Villages was disposed of at Houay Soup Landfill, a decrease of 0.2 m³ compared with November 2021.

During this reporting period, the local waste collection contractor conducted regular waste collection from the three villages and operated the Houay Soup Landfill for two days per week. The work included waste collection, segregation and disposal, waste cover and compaction, grass cutting and repairing the perimeter fences. The contractor also assisted on the big cleaning in the three villages.

FIGURE 1-10: WASTE MANAGEMENT ACTIVITIES DURING DECEMBER 2021



2. WATERSHED AND BIODIVERSITY MANAGEMENT

2.1 WATERSHED MANAGEMENT

2.1.1 Implementation of Annual Implementation Plan (AIP) 2020

Xaysomboun Watershed and Reservoir Protection Office (WRPO) conducted reservoir patrolling between 17 to 26 December 2021 but no progress on other pending activities under the approved Xaysomboun AIP of 2019 and 2020 such as the Participatory Land Use Plan (PLUP) training and PLUP improvement for Phonhom Village, relocation of staff and equipment to the newly built Xaysomboun WRPO sub-office, construction of reservoir access checkpoint at WRPO sub-office, construction of 2 ranger stations and 2 reservoir TPZ checkpoints, producing TPZs protection handbook, installation of signs and poles for TPZs, as well as the organization of meeting on role and responsibilities on the reservoir fishery management and the annual meeting.

The meeting between NNP1 Environment and Social Division (ESD) management and the Xaysomboun Provincial Governor and Bolikhamxay Vice Provincial Governor who is also the Chairman of Bolikhamxay Watershed and Reservoir Protection Committee (WRPC) related to the annual implementation activities will be organized in January 2022.

2.1.2 Preparation and implementation of Annual Implementation Plan (AIP) 2021

Bolikhamxay WRPO conducted internal monthly meeting of December 2021 on 13 December 2021 and discussed the results of overall patrolling works as well as the patrolling plan for December 2021. They conducted forest and reservoir patrol between 14 to 23 December 2021.

Xaysomboun WPRO confirmed in the second week of December 2021 that they will not submit the AIP2021 but will focus on the preparation of AIP2022.

The plan for Lao Newt and Gecko, Camera Trap, and Gibbon survey in the NNP1 watershed was finalized by NNP1 EMO and BSP-WCS on 24 December 2021 and communicated with Xaysomboun WRPO on 27 December 2021. Xaysomboun WRPO confirmed that they agree with the schedule of survey between 10 January to 2 March 2022 and the GOL team arrangements. However, they still insist for the extra accommodation allowance to be provided and so the biological monitoring surveys in the NNP1 watershed cannot be implemented until the meeting with Xaysomboun Provincial Governor scheduled on 25 January 2022.

2.1.3 Preparation of the Annual Implementation Plan (AIP) 2022

EMO submitted the draft AIP2022 of DOF-MAF and Bolikhamxay WRPO to ADB, IAP and LTA on 21 December 2021 for their review and approval. Xaysomboun WRPO confirmed to submit the draft AIP2022 to EMO in January 2022.

2.2 BIODIVERSITY OFFSET MANAGEMENT

2.2.1 Implementation of BOMP Annual Implementation Plan (AIP) 2021

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

a. Component 1 - Spatial Planning and Regulation

Nam Chouan-Nam Xang (NC-NX) demarcation and the placement of NC-NX Totally Protected Zone (TPZ) boundary signs in Vangphieng village was completed on 12 December 2021. There are a total of six NC-NX boundary posts and 29 TPZ signs installed in the village according to the plan. NC-NX Biodiversity Offset Management Unit (BOMU) is preparing the field report and will further process with the recognition by District authority of Viengthong and Xaychamphone that is scheduled to be completed in the Q1 of 2022.

b. Component 2 – Law Enforcement

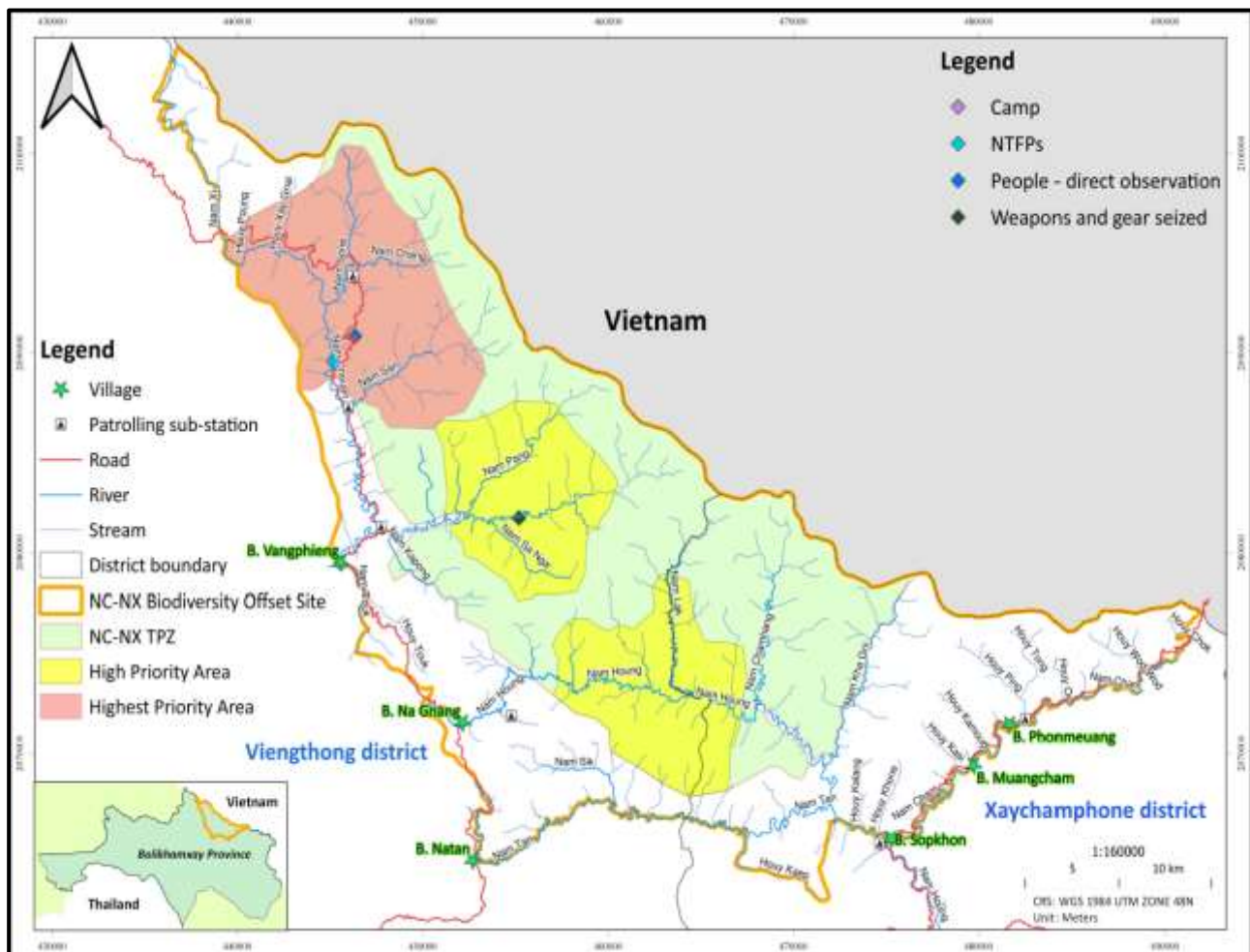
The four patrol teams scheduled to continue the patrolling in December 2021 between 24 December to 12 January 2022 focussing on TPZ highest priority area including Nam Xi, Houay Poug, Houay Xay Gnai and its mountain ridges, Nam San and Nam Pang Mountain ridges, Houay Phai and Houay Hee, the upstream of Nam Sone and Nam Chang as well as TPZ high priority area including Nam Ma, Nam Pang, Nam Sa Nga and mountain ridges. However, one of the patrol team members was tested positive for COVID-19 on 24 December 2021 at NC-NX BOMU office in Viengthong District through the Rapid Testing (antigen test) prior to their departure. The district special task force for COVID-19 performed further examination using the Polymerase Chain Reaction (PCR) Test on the concerned person and the result is negative. However, the task force recommended all patrol and snare removal team members at NC-NX BOMU office to perform strict quarantine for at least two-weeks and being tested again prior to resuming their work.

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

Team	Patrolling Area/distance	Observations/Actions Taken
1	TPZ highest priority area including Nam Chang, Nam Chouan, Houay Poug, Houay Payang and downstream of Nam Sone.	The team heard gunshots (2 times) in a location at Houay Payang. The team also noticed a man in the same area but they lost him in pursuit. The team observed signs of NTFP collection at Nam Chouan.

	(15 days covering 66.13 km distance of forest)	
2	Nam Hong TPZ highest priority area including Houay Xay Noi, Nam Chang and upstream of Nam Sone. (15 days covering 78.91 km distance of forest patrol)	The team did not encounter any threats during patrolling.
3	TPZ highest priority area including Houay Payang, Nam San and mountain ridges. (15 days covering 57 km of forest patrol)	The team did not encounter any threats during patrolling.
4	TPZ high priority area including Nam Pang, Nam Ma and mountain ridges. (15 days covering 65.26 km of forest patrol)	The team encountered and destroyed one fishing camp and seized one fishing net found within the fishing camp.

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





c. Component 3 – Conservation Outreach

Biodiversity Service Provider-Wildlife Conservation Society (BSP-WCS) continued working on the finalizing the draft outreach strategy in December 2021.

The outreach activity through radio broadcast in the two districts and six NC-NX villages was re-scheduled to the second week of January 2022.

d. Component 4 – Conservation linked livelihood development

The activity under the approved Community Development Plan (CDP) was rescheduled to January 2022 and will also be elaborated under the AIP2022.

BSP-WCS has finalized the Draft Community Conservation Agreement (CCA) and its relevant documents to EMO in the last week of December 2021. The final draft will be shared with BOMU for their further review in early January 2022.

NC-NX BOMU shared the snare removal of November 2021 SMART data and reported to EMO on 24 December 2021. The snare removal of December 2021 was scheduled to start on 24 December 2021 focusing on the TPZ highest priority area including upstream of Nam San and its mountain ridges. However, due to the COVID-19 case then the field work is now rescheduled to January 2022.

e. Component 6 – Biological Monitoring

The biological monitoring surveys in the NNP1 watershed and NC-NX offset site are scheduled for 2022. NNP1PC started the procurement of consultancy service for fishery monitoring under the No Net Loss (NNL) program in the NNP1 watershed and NC-NC offset site at the end of December 2021.

2.2.2 Preparation of Annual Implementation Plan (AIP) 2022

NC-NX BOMU submitted the draft Biodiversity Offset Management (BOM) AIP2022 to EMO on 24 December 2021. EMO provided the comments back to NC-NX BOMU on 29 December 2021. The draft is expected to be submitted to ADB, IAP, and LTA for their review and approval in January 2022.

3. FISHERY MONITORING

The fishery monitoring survey still could not be completed according to the schedule because of the extended enforcement of lockdown as part as the COVID-19 measures in Xaysomboun and Bolikhamxay Province. The results will be presented in the next monthly report.

4. EXTERNAL MISSIONS AND VISITS

No external mission and visits during the period 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 CHIANE AND NAM XAO) QUALITY MONITORING

		River Name	Nam Ngiep											Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup	
		Zone	Location Refer to Construction Sites															
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream		
		Station Code	NN G 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
6/Dec/21	pH	5.0 - 9.0				7.11	6.76	6.72	6.82									
7/Dec/21	pH	5.0 - 9.0								6.72	6.9	7.04	7			6.93	6.88	
14/Dec/21	pH	5.0 - 9.0				7.74	6.94	6.66	6.64									
15/Dec/21	pH	5.0 - 9.0								6.83	6.92	6.95	6.97			6.85	6.69	
6/Dec/21	Sat. DO (%)					58.2	58.9	69.7	74.9									
7/Dec/21	Sat. DO (%)									100.8	90.9	95.3	92.6			94.9	93.9	
14/Dec/21	Sat. DO (%)					67.1	75	57.7	62									
15/Dec/21	Sat. DO (%)									64.2	67.2	65.3	83.7			81.5	73.2	
6/Dec/21	DO (mg/L)	>6.0				4.79	4.85	5.66	6.1									
7/Dec/21	DO (mg/L)	>6.0						5.66	6.1	8.47	7.77	8.22	8.02			8.72	8.16	
14/Dec/21	DO (mg/L)	>6.0				5.57	6.17	4.8	5.1									
15/Dec/21	DO (mg/L)	>6.0					6.17	4.8	5.1	5.34	5.7	6.37	6.8			7.19	6.87	
6/Dec/21	Conductivity (µs/cm)					63	62	65	65									
7/Dec/21	Conductivity (µs/cm)									65	69	70	70			125	60	
14/Dec/21	Conductivity (µs/cm)					64	63	66	66									
15/Dec/21	Conductivity (µs/cm)									65	67	67	66			131	61	
6/Dec/21	Temperature (°C)					25.25	25.24	26.23	25.8									

15 January 2022

		River Name	Nam Ngiep											Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup	
		Zone	Location Refer to Construction Sites															
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream		
		Station Code	NG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
7/Dec/21	Temperature (°C)										24.19	23.31	22.91	22.31			19.42	16.49
14/Dec/21	Temperature (°C)					24.83	25.31	24.68	25.12									
15/Dec/21	Temperature (°C)										24.24	23.86	23.73	24.15			21.59	18.42
6/Dec/21	TSS (mg/L)				<5	<5	<5	<5										
7/Dec/21	TSS (mg/L)										<5	<5	<5	<5			<5	<5
6/Dec/21	BOD ₅ (mg/L)	<1.5				<1	<1	<1	<1									
7/Dec/21	BOD ₅ (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
6/Dec/21	COD (mg/L)	<5.0						<5	<5									
7/Dec/21	COD (mg/L)	<5.0									<5	<5	<5	<5			<5	<5
6/Dec/21	NH ₃ -N (mg/L)	<0.2				<0.2	<0.2											
6/Dec/21	NO ₃ -N (mg/L)	<5.0				<0.02	0.09											
6/Dec/21	Faecal coliform (MPN/100 mL)	<1,000				0	0	0	0									
7/Dec/21	Faecal coliform (MPN/100 mL)	<1,000									0	9	8	33			130	33
6/Dec/21	Total Coliform (MPN/100 mL)	<5,000				0	0	2	2									
7/Dec/21	Total Coliform (MPN/100 mL)	<5,000									7	17	79	220			240	350
6/Dec/21	TKN					<1.5	<1.5											
6/Dec/21	TOC (mg/L)							1.54	1.24									
7/Dec/21	TOC (mg/L)										1.2	1.21	1.26	1.55			1.38	1.3
6/Dec/21	Phytoplankton Biomass (g dry wt/m ³)					0.6	1											
6/Dec/21	Total Phosphorus (mg/L)					<0.01	0.02											

15 January 2022

		River Name	Nam Ngiep											Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup	
		Zone	Location Refer to Construction Sites															
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream		
		Station Code	NG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
6/Dec/21	Total Dissolved Phosphorus (mg/L)					0.01	<0.01											
6/Dec/21	Hydrogen Sulfide (mg/L)					<0.02	<0.02											
6/Dec/21	TSS (mg/L)-bottom					11.97	<5											
6/Dec/21	BOD ₅ (mg/L)-bottom					<1	<1											
6/Dec/21	Total Coliform (MPN/100 mL)-bottom					0	0											
6/Dec/21	Faecal coliform (MPN/100 mL)-bottom					0	0											
6/Dec/21	NH ₃ -N (mg/L)-bottom					0.4	<0.2											
6/Dec/21	NO ₃ -N (mg/L)-bottom					0.08	<0.02											
6/Dec/21	TKN-bottom					<1.5	<1.5											
6/Dec/21	Total Dissolved Phosphorus (mg/L)-bottom					0.08	0.01											
6/Dec/21	Total Phosphorus (mg/L)-bottom					0.11	0.03											
6/Dec/21	Hydrogen Sulfide (mg/L)-bottom					<0.02	<0.02											
6/Dec/21	Phytoplankton Biomass (g dry wt/m ³)-bottom					15	2											

TABLE A-2: RESULTS OF CAMP EFFLUENTS IN DECEMBER 2021

Parameters (Unit)	Site Name	OSOV1 (Owner's Site Office and Village)			OSOV2 (ESD Camp)			Main Powerhouse		
	Station Code	EF01			EF13			EF19		
	Date	03-Dec-21	09-Dec-21	13-Dec-21	03-Dec-21	09-Dec-21	13-Dec-21	03-Dec-21	09-Dec-21	13-Dec-21
	Guideline									
pH	6.0 - 9.0	6.73	6.46	6.86	7.37	7.3	7.48	7.56	8.14	7.04
Sat. DO (%)		43.2	68	54.6	76.8	80.6	76.7	84.6	84.5	74.5
DO (mg/L)		3.66	5.82	4.66	6.47	6.73	6.53	6.53	6.58	5.92
Conductivity (µs/cm)		378	364	303	411	431	436	937	1,700	1,630
TDS (mg/L)		189	182	151.5	205	215.5	218	468.5	850	815
Temperature (°C)		23.53	23.57	23.48	23.95	24.4	23.32	28.68	28.12	26.85
Turbidity (NTU)										
TSS (mg/L)	<50	<5	<5	<5	9.68	8.4	10.4	33	30	33
BOD ₅ (mg/L)	<30	6.57	<6	<6	<6	<6	<6	<6	<6	<5
COD (mg/L)	<125	<25	<25	<25	36.2	38	44	68	29	36
NH ₃ -N (mg/L)	<10.0	6.2	6.3	3.8	19.50	20.50	21.10	11.40	<2	<2
Total Nitrogen (mg/L)	<10.0	13.5	7.84	4.34	29.60	22.90	23.80	12.20	1.59	1.69
Total Phosphorus (mg/L)	<2	0.87	1.04	1.14	1.70	1.15	1.68	4.11	7.26	7.29
Oil & Grease (mg/L)	<10.0	<1			<1			1		
Total coliform (MPN/100 mL)	<400	1,600	3,500	540	130	49	240	0	0	0
Faecal Coliform (MPN/100 mL)	<400	540	3,500	49	79	9	23	0	0	0
Residual Chlorine (mg/L)	<1.0				0.16	0.22	0.27	0.74	1.76	1.29