



Nam Ngiep 1 Hydropower Project

Quarterly Environment Monitoring Report First Quarter of 2024

January to March 2024

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ABBREVIATIONS / ACRONYMS

AIP	Annual Implementation Plan
ADB	Asian Development Bank
ADM	Administration Division
BAC	Biodiversity Advisory Committee
BOF	Biodiversity Offset Framework
BOMC	Biodiversity Offset Management Committee
BOMP	Biodiversity Offset Management Plan
BOMU	Biodiversity Offset Management Unit
BSP	Biodiversity Service Provider
CA	Concession Agreement between the NNP1PC and GOL
CAP	Corrective Action Plan
CCA	Community Conservation Agreement
CDP	Community Development Plan
COD	Commercial Operation Date
CVC	Conventional Vibrated Concrete
CWC	Civil Works Contract
DAFO	District Agriculture and Forestry Office
DCC	Document Control
DD	Data Deficient of IUCN conservation status
DEB	Department of Energy and Business of the Ministry of Energy and Mine
DEMO	District Energy and Mines Office
DOF	Department of Forestry of Ministry of Agriculture and Forestry
DWP	Detailed Work Program
EC	Electrolytic Conductivity
EIA	Environmental Impact Assessment
EMMR	Environmental Management and Monitoring Reports
EMO	Environmental Management Office of ESD within NNP1PC
EMU	Environmental Monitoring Unit
EMWC	Electrical-Mechanical Works Contract
EPF	Environmental Protection Fund
ESD	Environmental and Social Division of NNP1PC
ESMMP	Environmental and Social Monitoring and Management Plan
FMM	Financial Management Manual
FPF	Forest Protection Fund
GOL	Government of Lao PDR
GIS	Geographic Information Systems

HMWC	Hydraulic Metal Works Contract
HR	Human Resources
H&S	Health and Safety
IAP	Independent Advisory Panel
IEE	Initial Environmental Examination
IMA	Independent Monitoring Agency
INRMP	Integrated Natural Resources Management Plan
IUCN	International Union for Conservation of Nature
ISP	Intergraded Spatial Planning
KGS	Khammany General Service
KPI	Key performance Indicator
kV	kilo-Volt
LC	Least Concern of IUCN conservation status
LTA	Lender's Technical Advisor
MAF	Ministry of Agriculture and Forestry
MEM	Ministry of Energy and Mines, Lao PDR
MOM	Minutes of Meeting
MONRE	Ministry of Natural Resource and Environment, Lao PDR
MOU	Memorandum of Understanding
MPI	Ministry of Planning and Investment
NC-NX	Nam Chouane-Nam Xang
NCR	Non-Compliance Report
NNP1PC	Nam Ngiep 1 Power Company Limited
OAA	Other aquatic animals
OC	Obayashi Corporation
OFIs	Opportunity for Improvement
O&M	Operation & Maintenance
ONC	Observation of Non-Compliance
OSOV	Owners' Site Office and Village
PAFO	Provincial Department of Agriculture and Forestry
PCD	Procurement Division
PEMO	Province Energy and Mine Office
PONRE	Provincial Department of Natural Resource and Environment, MONRE
RCC	Roller Compacted Concrete
SIR	Site Inspection Report
SMO	Social Management Office of ESD within NNP1PC
SMART	Spatial Monitoring and Reporting Tool

SOP	Standard Operating Procedure
SS-ESMMP	Site Specific Environmental and Social Monitoring and Management Plan
TD	Technical Division
TOR	Terms of Reference
TPZ	Totally Protected Zone
TSS	Total Suspended Solids
UAE	United Analysis and Engineering Consultant Company Ltd.
UR	Upper Reservoir
VU	Vulnerable of IUCN conservation status
WCS	Wildlife Conservation Organization
WMF	Watershed Management Fund
WMP	Watershed Management Plan
WRPC	Watershed and Reservoir Protection Committee
WRPO	Watershed and Reservoir Protection Office
WWTS	Wastewater Treatment System

EXECUTIVE SUMMARY

The quarterly environment monitoring report of Nam Ngiep 1 Hydropower Project provides information and analysis of compliance with the environmental and social obligations of the Project stipulated in the Concession Agreement between the Nam Ngiep 1 Power Company (NNP1PC) and the Government of Lao PDR (GOL), and as required by environmental legislation of the Lao PDR, the ADB Safeguard Policy Statement and IFC Performance Standards. The Company ensures compliance with these requirements through implementation of project specific sub-plans, programmes and activities prepared as part of the Environmental and Social Management and Monitoring Plan for the Operation Phase (ESMMP-OP).

During Q1 2024, activities related to the implementation of ISO14001:2015 continued such as the implementation of the four (04) Environmental Management Plans (EMPs). Following the completion of an internal audit in December 2023, a management review meeting was held on 11 January 2024, participated by the top management and management from all divisions. The main objectives of this meeting were to report general observations and findings from the internal audit and the implementation progress for general observations and opportunity of improvement (OFIs) identified during the Surveillance Audit in February 2023, and seek management's observations and directives, aimed at maintaining and enhancing the performance of the Environmental Management System (EMS).

The second Surveillance Audit by the accredited auditor (SGS) was conducted onsite on 15-16 February 2024. The audit plan and all objectives were successfully achieved, and all relevant divisions (ADM, TD, EGAT O&M, ESD) participated in all auditing processes. The audit report was received on 25 February 2024, five Opportunities for Improvement (OFIs) were identified and no non-conformities were raised.

On 19 and 26 March 2024, waste management training sessions were conducted for a total of 42 staff members, including those from NNP1, contractors (KGS, PKCC), and security personnel.

Three joint monthly site inspections were carried out among EMO, ADM and Technical Division (TD) to follow up on the progress of corrective actions from the previous findings related to Hazardous materials and waste management, provision of spill response kits at the required areas, and wastewater treatment system operation and maintenance. Three Site Inspection Reports (SIRs) were submitted to TD and ADM containing necessary corrective actions. All 31 rehabilitated areas were inspected, no evidence of erosion or instability were observed at any of the inspected sites.

A total of 20.29 m³ solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, an increase of 0.78 m³ compared with Q4 2023.

The environmental flow requirements have been monitored in accordance with the ESMMP-OP and the results show that the rate of water level increase due to dam operations (ramping-up) in a few cases did not comply with the requirements.

The concentration of dissolved oxygen (DO) at the surface level in R05 (Main Reservoir immediately upstream of the main dam) ranged between 5.1 mg/L and 8.1 mg/L. The monthly mean DO concentration at the intake level decreased from 0.6 mg/L in January 2024, to 0.4 mg/L in February 2024 and 1.0 mg/L in March 2024. The DO concentrations in Nam Chian and Nam Phouan were above 6 mg/L.

The DO concentrations at the surface level in the Re-regulation Reservoir (R07) were between 2.8 and 6.0 mg/L.

During turbine discharge, the DO levels in Nam Ngiep downstream the Re-regulation Dam were less than 6 mg/L.

The depth profile monitoring during the period indicates formation of oxyclines in the Main Reservoir at the monitored stations at varying depths.

Bolikhamxay Watershed and Reservoir Protection Office (WRPO) conducted the forest and reservoir patrol from January - March 2024 using the budget under the AIP2023. They also conducted outreach campaigns at nine villages within and nearby the NNP1 watershed area from 5-19 February 2024, including Bor, Nahan, Phonsong, Phon Ngeang, Phonxay, Phadai, Phouhomxay, HatGnuin, and Thahuea. Bolikhamxay WRPO Annual Implementation Plan (AIP) 2024 was submitted to ADB and the Independent Advisory Panel (IAP) on 4 January 2024. The IAP and ADB approved the plan on 4 February and 5 March 2024, respectively. Bolikhamxay WRPO is processing the fund disbursement request with the Forest Protection Fund (FPF) of the Department of Forestry (DOF) of the Ministry of Agriculture and Forestry (MAF).

In February 2024, the Xaysomboun WRPO resumed the forest, Totally Protected Zone (TPZ), and reservoir patrolling. However, there is still no progress with the operation of the Xaysomboun WRPO sub-office, the finalization of the reservoir fishery regulation, the establishment and enforcement by a special task force to deal with the threats, and the construction of the reservoir checkpoints as noted during the monthly meeting with Xaysomboun WRPO on 12 March 2024. EMO expects continued delays until the Xaysomboun WRPO is restructured.

Bolikhamxay Biodiversity Offset Management Unit (BOMU) remained active in patrolling and snare removal efforts from January to March 2024. BOMU also trained the livestock groups in Viengthong and Xaychamphone District as part of the Nam Chouane-Nam Xang (NC-NX) Community Development Plan (CDP) activity. BOMU submitted the draft AIP2024 to NNP1 EMO on 19 February 2024 and it was reviewed by NNP1 EMO on 22 February 2024. On 19 March 2024, the BOMU AIP 2024 was submitted to ADB and IAP for review and approval.

The fish species dominating the fish catch by weight in Q1 2024 include *Oreochromis niloticus*, *Scaphiodonichthys acanthopterus* and three species group of Hampala, Poropuntius, and *Sikukia gudgeri* and *Amblyrhynchichthys truncatus* that are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species, except *Sikukia gudgeri* which is classified as Data Deficient (DD) and *Oreochromis niloticus* is an exotic species. The recorded catch of threatened species includes two species are classified as Vulnerable species (VU): *Scaphognathops bandanensis*, and *Tor sinensis*.

1 INTRODUCTION

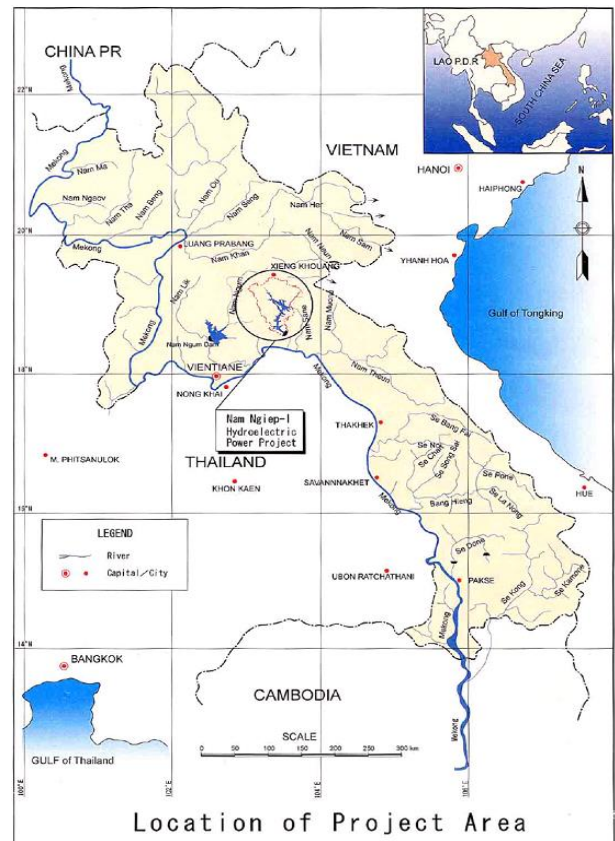
The Nam Ngiep originates in the mountains of Xiengkhouang Province, flowing through Khoum District into Thathom District of Xaysomboun Province, through Hom District and into Bolikhamxay Province. The Nam Ngiep meets the Mekong River just upstream from Pakxan in Bolikhamxay Province.

Two dams and power stations were constructed along the Ngiep River in Bolikhamxay. At the main dam site, a primary power station generated around 1,546 GWh of electricity for export to Thailand and release water to a regulating pond where a second dam and power station generate around 105 GWh of electricity for local use.

The Project Commercial Operation Date was achieved on 05 September 2019.

This Quarterly Environment Report provides a summary of environmental monitoring activities and mitigation actions during **Q1 2023**. The report is published on the Company website (<https://namngiep1.com/>).

Related construction Site Specific Environmental and Social Monitoring and Management Plans (SS-ESMMPs) are also publicly disclosed on the Company website as required under the Concession Agreement.



2 ENVIRONMENTAL MANAGEMENT AND MONITORING

The environmental management and monitoring activities reported in this section document the implementation of the relevant sub-plans and programmes of the Environmental and Social Management and Monitoring Plan for the Operation Phase during Q1 2024.

2.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

During Q1 2024, activities related to the implementation of ISO14001:2015 continued such as the implementation of the four (04) Environmental Management Plans (EMPs). The activities under the EMPs included 1) HSE awareness training for NNP1PC staff and contractors, 2) reducing the paper consumption in NNP1 offices, 3) minimising waste generation and maximising waste separation at sources to reduce the quantity of waste disposal at NNP1 project landfill, and 4) planting trees.

The details of EMPs 2023 implementation are shown in **Table 2-1**.

TABLE 2-1: THE DETAILS OF EMPs 2023 IMPLEMENTATION

EMP No.	Activity Description	KPI	Evaluation Date	Implementation Progress
01/2023*	Providing HSE awareness training to NNP1PC staff and contractors	80% of NNP1PC staff and the Contractors are trained on Health, Safety and Environmental awareness during April 2023 to March 2024.	29 March 2024	Progressed 73 % – The training sessions on waste management were completed on 19 and 26 March 2024. – To achieve the KPI, the second training on the ESMMP-OP dissemination for supervisors of each NNP1PC's division is scheduled for April 2024.
02/2023*	Reducing the paper consumption in NNP1 offices	Total use of A4 paper for printing in the NNP1PC's offices (VTE, OSOV1, OSOV2) is reduced by 10% during April 2023 to March 2024 compared with the previous 12 months.	29 March 2024	Achieved 0 %
03/2023*	Reducing the quantity of waste disposal at NNP1 Project Landfill	The quantity of waste disposed of in the NNP1 landfill is reduced by 5% within one year compared with the previous 12 months.	29 March 2024	Achieved 30.5 %
04/2023#	Planting tree	50% of plant survival, the potential plantation fields in contributing to the environmentally sustainability objectives (refer to Tree Planting Plan).	29 March 2024	Achieved 82%

*EMP_s were implemented in 2022 and continued in 2023 for further success

New EMP 2023 suggested by the external ISO Auditor (SGS)

2.1.1 Environmental Management Plan (EMP)

As part of EMP01 implementation, on 19 and March 2024, waste management training sessions were conducted for a total of 42 staff members, including those from NNP1 (housekeepers, maintenance staffs), contractors (KGS, PKCC), and security personnel. The second training on the ESMMP-OP dissemination for supervisors of each NNP1PC's division is scheduled for April 2024.



As part of EMP04 implementation, on 27 March 2024, monitoring, care and final evaluation of the planted trees were carried out at OSOV1, football field, and OSOV2. As shown below, the results indicate a survival rate of 82%:

Trees Species	Originally planted plants	Survived Plants	Dead Plants
Fruit Trees	36	35	1
Flower Trees	50	37	13
Local Trees	45	36	9
Total	131	108	23

2.1.2 Annual ISO14001:2015 Internal Audit

Following the completion of an internal audit in December 2023, a management review meeting was held on 11 January 2024, participated by the top management and management from all divisions. The main objectives of this meeting are to report general observations and findings from the internal audit and the implementation progress for general observations and opportunity of improvement (OFIs) identified during the Surveillance Audit in February 2023, and seek management's observations and directives, aimed at maintaining and enhancing the performance of the Environmental Management System (EMS). All divisions committed to collaborating closely to address any identified observations and opportunity for improvements (OFIs), prioritizing their importance and providing ongoing support to the EMS implementation.

The general observations and findings from the internal audit are presented in **Table 2-2** and the implementation progress for general observations and OFIs raised during the Surveillance Audit in February 2023 is shown in **Table 2-3**.

Table 2-2: The Internal audit OFIs reported during the Management Review Meeting

No	OFI description	No of OFIs	Area of Responsibility
1	Documentation works – DCC registered, updating procedures, records, and distribution	9	TD, ADM, HR, PCD, DCC, H&S, EMO
2	Emergency Preparedness - training, drill, records, equipment/kits	6	TD, ADM, H&S, PCD
3	Training needs, records	6	TD, EMO, ADM, H&S
4	Communication on NNP1 Policies, SOPs, and relevant EMS documents to Staff, Contractors, GOL, villagers	5	ADM, TD
5	Effluent discharge	2	EMO, ADM
6	Waste management , Environmental aspect	5	EMO, TD

Table 2-3: The OFIs reported during the Management Review Meeting

OFI	Description	Corrective Action
1	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 Safety Data Sheet labels were attached by the O&M team
2	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.	Completed Two rehearsal sessions were conducted on evacuation for flooding events in June 2023 for NNP1 staff and Contractors (EGAT O&M, PKCC, KGS). The response times at each step were recorded and discussed for further improvement.
3	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.	Completed The environmental aspect assessments are updated for transmission line works and emergency cases of dam collapse.

4	EMP04 of 2023 aims to plant 100 seedlings and ensure that over 50% of them survive. In order to 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.	Completed The program's objectives also identified the aim to enhance air quality and protect against soil erosion. Achieving these objectives will positively impact the long-term goal of Carbon capture.
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On 01 February 2024, a meeting involving the ISO Committee and Internal Audit teams, was held to communicate the internal audit results and implementation progress of the EMPs and prepare for the ISO 14001:2015 External Audit.

The ISO Committee Meeting



2.1.3 Surveillance Audit

The second surveillance audit by the accredited auditor (SGS) was conducted onsite on 15-16 February 2024. The audit plan and all objectives were successfully achieved, and all relevant divisions (ADM, TD, EGAT O&M, ESD) participated in all auditing processes. The Audit Report was received on 25 February 2024, five Opportunities for Improvement (OFIs) were identified, and no non-conformities were raised.

The five OFIs included:

1. Posting of the relevant hazard symbol on the chlorine tank.
2. Record the gas leak inspection of the LPG gas pipeline at the canteen particularly at the joints.
3. Undertaking out inspections of the generators at OSOV1 and OSOV2.
4. Clearly record the inspection of the grounding system of the gas station to mitigate the risk of fire emergencies.
5. Clearly record the training evaluation method and results.

Table 2-4: The Second ISO Surveillance Audit

2.2 CONTRACTOR SS-ESMMPs

In Q1 2024, EMO received one DWP and SS-EMMP for riverbed excavation at a location downstream of the main powerhouse for review and approval. The purpose of the excavation is to improve better discharge from the PH and consequently increase generation capacity. The EMO requested additional information on work schedule, estimated spoil quantity generated from excavation and the designated spoil disposal area. TD subsequently provided the requested information to the EMO and EMO is reviewing the DWP/SS-EMMP taking into account the additional information.

On 12 January 2024, TD and EMO conducted Health, Safety and Environment (HSE) Induction Training for the Contractor at the Zone 2UR Suspension Bridge Construction Site, a total of 16 DLC Construction Co, Ltd (DLC) and Xaiyaphone contractor (DLC JV XPC) staffs attended. An environmental site inspection will be conducted every three weeks to ensure adequate environmental management by the contractor.



2.3 RESULTS OF COMPLIANCE INSPECTIONS AT CONSTRUCTION SITES

During Q1 2024, three joint monthly site inspections were carried out among EMO, ADM and Technical Division (TD) to follow up on the progress of corrective actions from the previous findings related to Hazardous materials and waste management, provision of spill response kits at the required areas, and wastewater treatment system operation and maintenance. Three Site Inspection Reports (SIRs) were submitted to TD and ADM containing necessary corrective actions. In addition, on 06 Feb 2024, EMO conducted a site inspection at the Zone 2UR Suspension Bridge construction site. Poor waste management practices were observed. The contractor was instructed to segregate the waste properly, improve housekeeping and ensure daily waste coverage with soil. By 20 February 2024, the contractor completed waste segregation and improved housekeeping in and around the working area.

Site Observation Photo

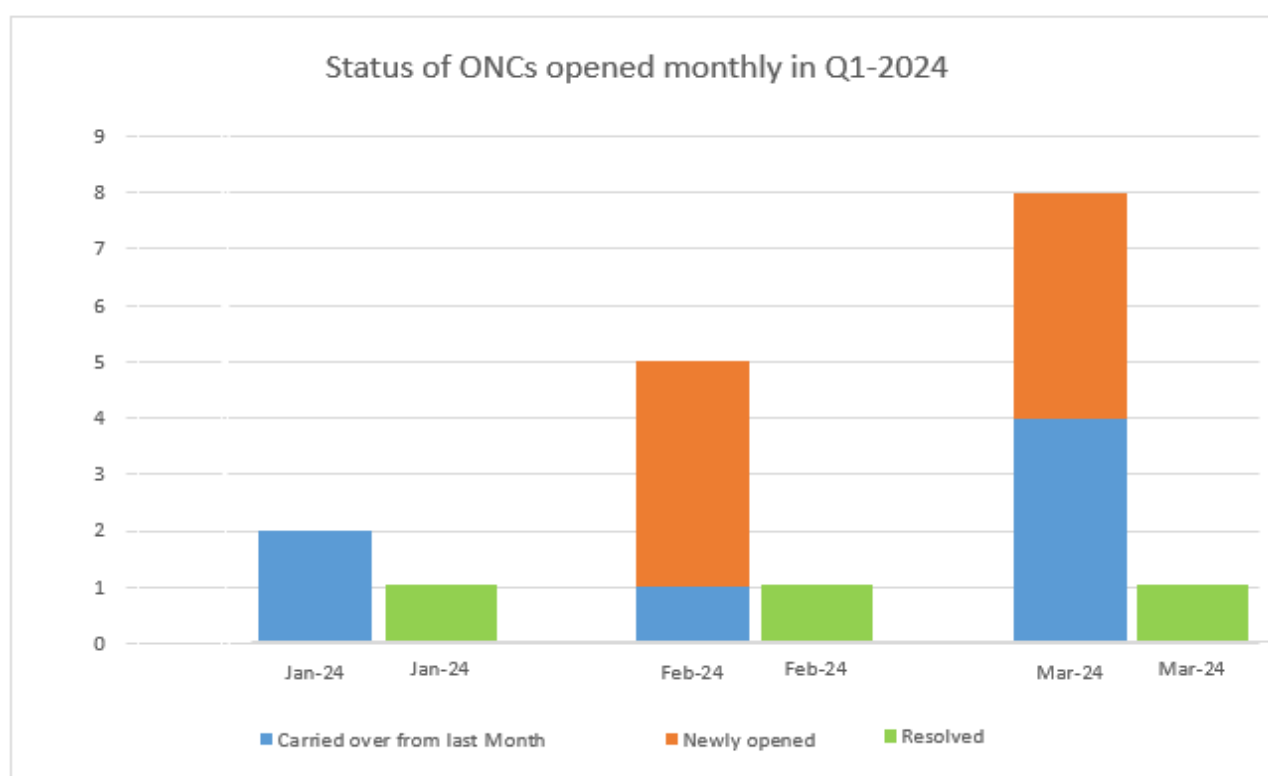


Mixed waste disposal observed at the Zone 2UR Suspension Bridge construction site
Corrective actions were completed on 20 February 2024

The status of ONC reports is summarized in **Table 2-5** and **Figure 2-1**. The Site Inspection Results During Q4 2023 is presented in **Appendix 1**.

TABLE 2-5: STATUS OF ONCs REPORT DURING Q1 2024

Status	ONC	NCR-Level 1	NCR-Level 2	NCR-Level 3	Incident Report
Carried over ONC/NCR from the previous quarter	2	0	0	0	0
Newly opened ONC/NCR	8	0	0	0	0
Total No. of ONC/NCR	10	0	0	0	0
Resolved ONC/NCR	3	0	0	0	0
Unresolved ONC/NCR carried forward to the next quarter	7	0	0	0	0

FIGURE 2-1: STATUS OF ONCs DURING Q1 2024

2.4 SITE DECOMMISSIONING AND REHABILITATION

All 31 rehabilitated areas were inspected. No evidence of erosion or instability were observed at any of the inspected sites.

2.5 ADB-IAP-LTA MISSION

During the ADB-IAP-LTA Mission from 22-27 January 2024, an onsite discussion took place with the LTA to seek recommendations for hazardous waste disposal (used fluorescent lamps and expired chlorine), the transfer of responsibility for community solid waste management and Houay Soup landfill to local authorities and thalweg depth monitoring. The detailed findings from the mission will be addressed in a separated Corrective Action Plan (CAP) in the **Appendix 2**.

Table 2-6: ADB-IAP-LTA Mission Photos

2.6 WASTE MANAGEMENT AT THE OPERATION SITES

2.6.1 Waste Management at NNP1 Project Sites

In Q1 2024, a total of 20.29 m³ solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, an increase of 0.78 m³ compared with Q4 2023. The project waste collection and NNP1 landfill management by the contractor continued routinely throughout Q1 2024. The amount of recyclable waste managed on site during Q1 2024 is shown in **Table 2-7**.

TABLE 2-7: AMOUNTS OF RECYCLABLE WASTE DURING Q1 2024

Source and Type of Recyclables		Unit	Total in Q1 2024 (A)	Sold (B)	Remaining Amount (A - B)
Construction activity					
1	Scrap metal	kg	0	0	0
Sub-Total 1		kg	0	0	0
Operation camp					
2	Plastic bottle	kg	164	138	26
3	Aluminium Can	kg	N/A*0	N/A	N/A

Source and Type of Recyclables		Unit	Total in Q1 2024 (A)	Sold (B)	Remaining Amount (A - B)
4	Paper/Cardboard	kg	151	132	19
5	Glass	kg	437	413	24
6	Scrap metal	Kg	0	0	0
Sub-Total 2		kg	752.0	683.0	69.0
Grand Total (Sub-Total 1+2)		kg	752.0	683.0	69.0

*Please note that aluminium cans are collected and sold separately by housekeepers before storage. There is no accurate recorded quantity. Therefore, it is appropriate to mark them as Non-available (N/A).

2.6.2 Hazardous Waste Management

The amounts of hazardous waste and hazardous materials that were collected, stored and disposed of during Q1 2024 are shown in **TABLE 2-8**.

TABLE 2-8: HAZARDOUS MATERIAL AND HAZARDOUS WASTE RECORDED DURING Q1 2024

No.	Type of Hazardous Material	Unit	Total in Q1 2024	Used/ Disposed	Remaining
1	Diesel	Litre	12,000	10,296	1,704
2	Gasoline	Litre	1,800	1,139	661
3	Lubricant (Turbine oil)	Litre	72	36	36
4	Colour paint	Litre	39	0	39
5	Thinner	Litre	1	0	1
6	Grease oil	Litre	785	0	785
7	Gear Oil	Litre	16.5	0	16.5
8	Chlorine Liquid	Litre	250	75	175
9	HA Cut AF	Litre	3,925	0	3,925
10	HA Cut Cat AF	Litre	373	0	373
	Type of Hazardous Waste				
11	Used Oil (Hydraulic + Engine)	Litre	355	0	355
12	Used oil mixed with water	Litre	0	0	0
13	Empty used oil drum/container (drum 200L)	Unit	53	0	53
14	Use Oil Filter	Unit	27	0	27
15	Contaminated soil, sawdust and textile material	M ³	1.2	0	1.2
16	Used tyre	Drum	5	0	5
17	Empty used chemical drum/container (drum 20L)	Unit	94	0	94
18	Lead acid batteries	Unit	6	0	6
19	Empty paint and spray cans	Can	111	0	111
20	Halogen/fluorescent bulbs	Unit	439	0	439
21	Empty cartridge (Ink)	Piece	117	0	117
22	Clinic Waste	Kg	11.6	0	11.6
23	Expired Chlorine Powder	Kg	65	0	65

2.6.3 Animal Fodder (Pig Feed) Collection Programme

During Q1 2024, local villagers collected 964 kg of food waste from the Owner's Site Office and Village (OSOV1's canteen) for feeding their animals. Additionally, food waste management was conducted by KGS routinely.

2.6.4 Community Solid Waste Management and Recycling Programme

During the ADB-IAP-LTA Mission from 22-27 January 2024, EMO reported an incident regarding the theft of a significant portion of HDPE lining from Houay Soup Landfill (HSL). The issue has been ongoing since NNP1PC-ESD officially informed EMU in March 2022 about the transfer of responsibility for community solid waste management and HSL. NNP1PC-ESD has notified the incidence to the EMU and the Special Taskforce team in Phouhomxay and the host villages for further investigation, as well as requested the EMU to speed up the handover process. The LTA acknowledged the delay in the handover process and provided the following recommendations during the wrap up meeting:

- Without a formal takeover (agreed upon by both sides) the overall responsibility remains with NNP1 PC.
- Operation of the landfill according to requirements is no longer possible due to the theft of parts of the membrane. Situation deteriorates rapidly.
- Rehabilitation costly with uncertain outcome.
- The possible alternative is to create new landfills specifically for each village to be served, but only after having reached a clear understanding with the respective villages on future waste management.

NNP1-EMO has contacted the Bolikhan EMU and expect to arrange a discussion meeting within Q2 2024.

Table 2-9: Theft of HDPE lining from Houay Soup Landfill

	
May 2023	January 2024

2.6.5 Houay Soup Landfill

There was no waste collection from communities to dispose of at Houay Soup Landfill during the reporting period since the waste collection services by the contractor hired by NNP1PC's ended in April 2022. Proper waste management is awaiting formal handover of the communities' solid waste management as noted above. In the meantime, the Bolikhan District EMU and villagers have managed solid waste. Some self-disposed solid waste was observed at the landfill. EMO reported to the EMU and the Special Taskforce team in Phouhomxay and the host villages for further investigation on an incident regarding the theft of a significant portion of HDPE lining from Houay Soup Landfill. The waste management handover issue has remained unresolved since NNP1PC-ESD officially informed EMU in March 2022 about the transfer of responsibility for community solid waste management and Houay Soup Landfill. EMO has requested the EMU to speed up the handover process and a discussion meeting is expected to be held within Q2 2024.

2.7 RESERVOIR OPERATIONS

2.7.1 Main Reservoir

The water level in the main reservoir, inflow to the reservoir and discharge from the reservoir since January 2020 are displayed in the graphs in **Figure 2-2** and **Figure 2-3**.

During Q1 2024, the mean daily inflow to the main reservoir was 55 m³/s. The minimum daily inflow was 31 m³/s, maximum daily inflow was recorded at 117 m³/s, and 25th percentile of 47 m³/s and 75th percentile of 61 m³/s. As indicated in **Figure 2-2**, the inflow during Q1 2024 was higher compared to the same period in 2023.

The water level in the main reservoir decreased with 9.31 m from El. 316.76 m asl (01 January 2024) to 307.45 m asl by the end of Q1 2024.

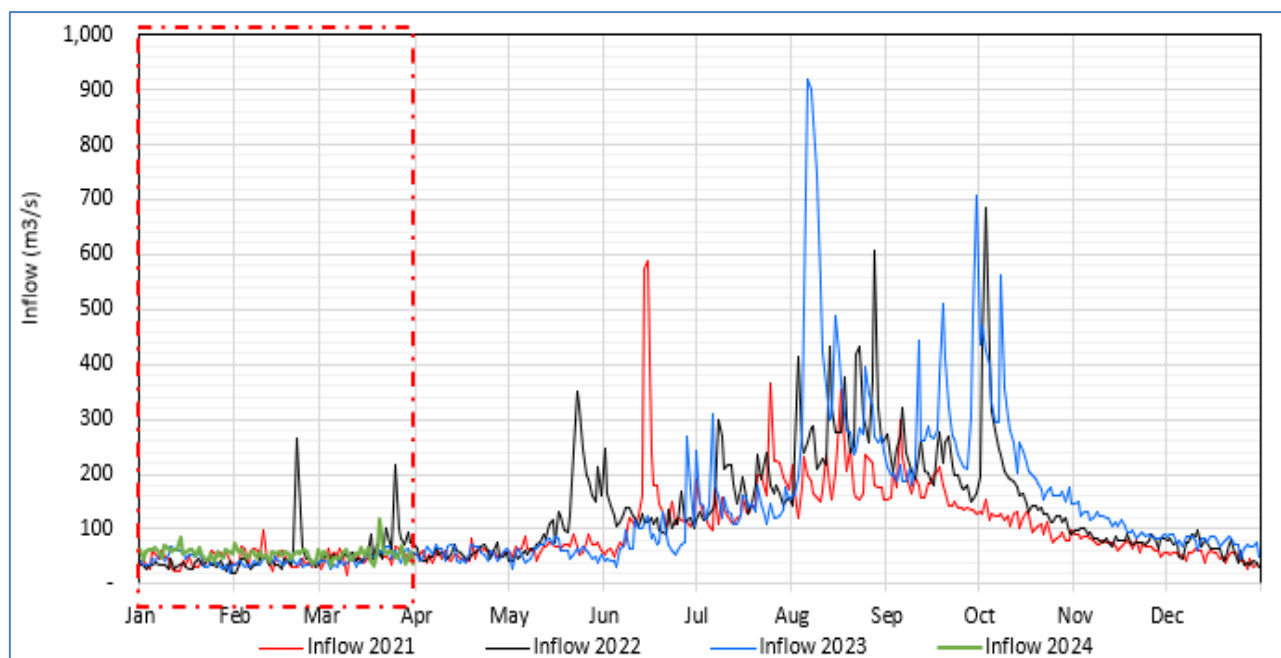


FIGURE 2-2: INFLOW TO THE MAIN RESERVOIR

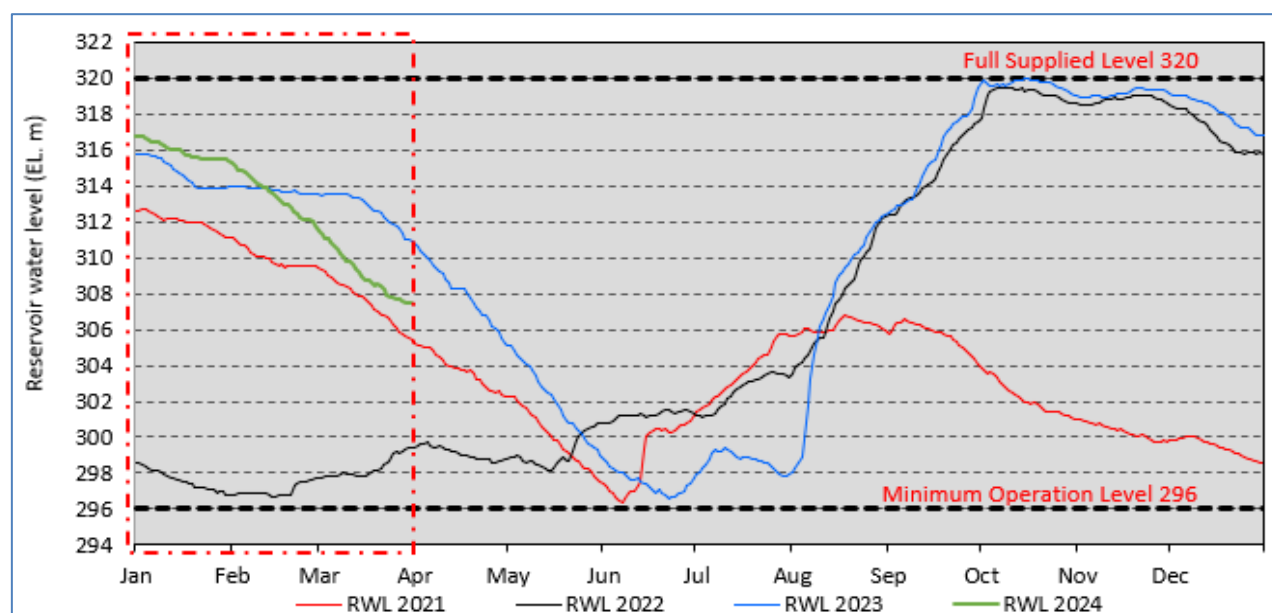


FIGURE 2-3: WATER LEVEL OF THE MAIN RESERVOIR

2.7.2 Environmental Flow Requirements (EFRs) for the Operation Phase

NNP1PC has monitored compliance with the Environmental Flow Requirements (EFRs) stipulated in the CA, Annex C, Clause 53 (g) and as further modified in the Environmental Flow Assessment Report of July 2014 approved by MONRE. The EFRs have been monitored in accordance with the monitoring programme outlined in the ESMMP-OP 2019 (Vol. II, Part 2 on Subplan 1 on Reservoir and River Health Management), except with respect to thalweg water depth monitoring.

The results of the EFR compliance monitoring during Q1 2024 are summarized in **Table 2-10**.

TABLE 2-10: SUMMARY OF EFRs COMPLIANCE MONITORING IN Q1 2024

No	EFRs in the Downstream of the Re-regulation dam	EFRs compliance
1	Min flow 27 m ³ /s at all times	100% of observations comply
2	Thalweg water depth at least 0.5 m in the entire reach from immediately downstream of the Re-regulation dam until 4.3 km downstream the dam (measured at cross-sections where visual observations or boat navigation indicate shallow waters)	The Q1 2024 monthly thalweg monitoring missions only included monitoring of navigation difficulties and not water depth measurements, because the discharge from the re-regulation dam exceeded 50 m³/s at the time of the missions. The results of previous monitoring missions, as also confirmed by the LTA, have documented that when the discharge is 30 m³/s or greater, the water depth requirements are met and there are no problems with navigating the river. However, in Q4 2023, at the beginning of the dry season, NNP1PC conducted interviews with inhabitants who use boats to gather and assess any complaints about

No	EFRs in the Downstream of the Re-regulation dam	EFRs compliance
		boat navigation difficulties, there were no complaints from inhabitants and no damage observed. , NNP1PC has consulted with the Environmental and social specialist who recommended that revisions to the monitoring programme will be made as part of ESMMP-OP update which will be commenced from Q4 2024 to Q1 2025
3	Maximum rate of change (both rise and fall, separately) in stage of 0.6 m per hour	99% of hourly fluctuations comply (2181 out of 2183 data recorded)
4	Maximum fluctuation in stage of 1.7 m over 24-hour (this requirement is about range and determines the maximum difference in stage height over 24-hour periods)	99% of 24-hour fluctuations comply (2182 out of 2183 data recorded)
5	Maximum fluctuation in stage of 1.7 m over 7-days (this requirement is about range and determines the maximum difference in stage height over 7-day periods)	99% of 7-day fluctuations comply (2182 out of 2183 data recorded)

2.7.2.1 Minimum Flow Requirements

The discharge monitoring data for the re-regulation dam during Q1 2024 indicates that the minimum flow requirement of 27 m³/s has been met at all times. The Re-regulation Dam discharge graph can be found in **Figure 2-4**.

During Q1 2024, the mean discharge from the re-regulation dam was about 82 m³/s in January 2024 and about 126 m³/s and 122 m³/s in February and March 2024 respectively.

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. There were no complaints related to the flow discharges or fluctuation levels downstream the Re-regulation dam during the reporting period.

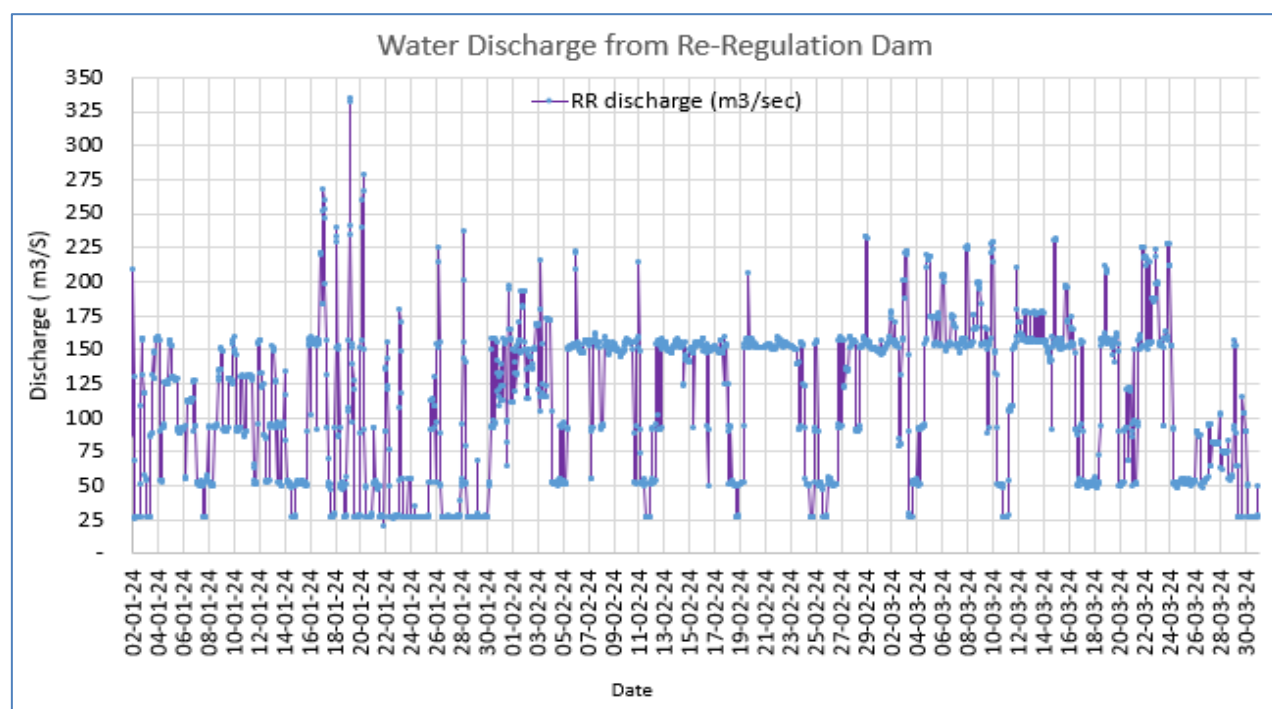


FIGURE 2-4: DISCHARGE FROM THE RE-REGULATION DAM DURING Q1 2024

2.7.2.2 Minimum Water Depth

Since 18 July 2018, NNP1PC has carried out weekly monitoring of river depths at 19 locations downstream the re-regulation dam as shown on **Figure 2-5**. These locations represent cross-sections with possible shallow water depths at low discharge rates.

The monitoring is undertaken to confirm compliance with the water depth requirements in the Concession Agreement, Annex C, and the approved Environmental Flow Assessment (Thalweg water depth at least 0.5 m in the entire reach from immediately downstream of the Re-regulation dam until 4.3 km downstream the re-regulation dam).

Starting in December 2020, the water depths have been measured across the river channel where visual observations or boat navigation indicate shallow waters to ensure that the measurements represent the river thalweg.

According to the recommendations by the Lenders' Technical Advisor (LTA) during the virtual site visit on 21 to 26 November 2021, NNP1PC has continued to monitor the situation at the critical sites under conditions with discharge of less than 30 m³/s for detecting any navigation problems and also monitor whether any complaints have been raised to consider how to solve the problems, if any. The results of these monitoring missions have documented that when the discharge is 30 m³/s or greater, the water depth requirements are met and there are no problems with navigating the river.

NNP1PC carried out three boat monitoring missions in Q1 2024 (see **Table 2-10**), however, as the discharge exceeded 50 m³/s on all three missions, the thalweg water depths were not measured. There were no boat navigation difficulties during the missions.

In Q4 2023, at the beginning of the dry season, NNP1PC conducted interviews with inhabitants who use boats to gather and assess any complaints about boat navigation difficulties.

NNP1PC has consulted with the Environmental and social specialist who recommended that revisions to the monitoring programme will be made as part of ESMMP-OP update which will be commenced from Q4 2024 to Q1 2025.

Table 2-11: River depth measurements in Nam Ngiep downstream the re-regulation dam

Station ID		RWD 01	RWD 02	RWD 02.a	RWD 03	RWD 04	RWD 05	RWD 06	RWD 07	RWD 08	RWD 09	RWD 10	RWD 11	RWD 12	RWD 13	RWD 14	RWD 15	RWD 16	RWD 17	RWD 18
Distance from Re-regulation Dam (km)		1.55	2.43	2.97	4.9	5.2	5.7	6.16	7.13	8.01	9.97	11.31	12.08	12.62	14.1	14.49	15.77	19.76	21.58	30.09
Date	Discharge (m ³ /s)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)	Depth (m)
18-Jan-24	51.7	- Measuring thalweg water depth is unnecessary when the discharge from the Re-regulation Dam exceeds 30 m³/s, as suggested by the LTA, ADB and NNP1PC. - NNP1PC (EMO and TD) closely monitors the Nam Ngiep River downstream the re-regulation dam to check boat navigation difficulties due to thalweg water depths below 0.5 m.																		
9-Feb-24	149.8																			
14-Mar-24	147.5																			

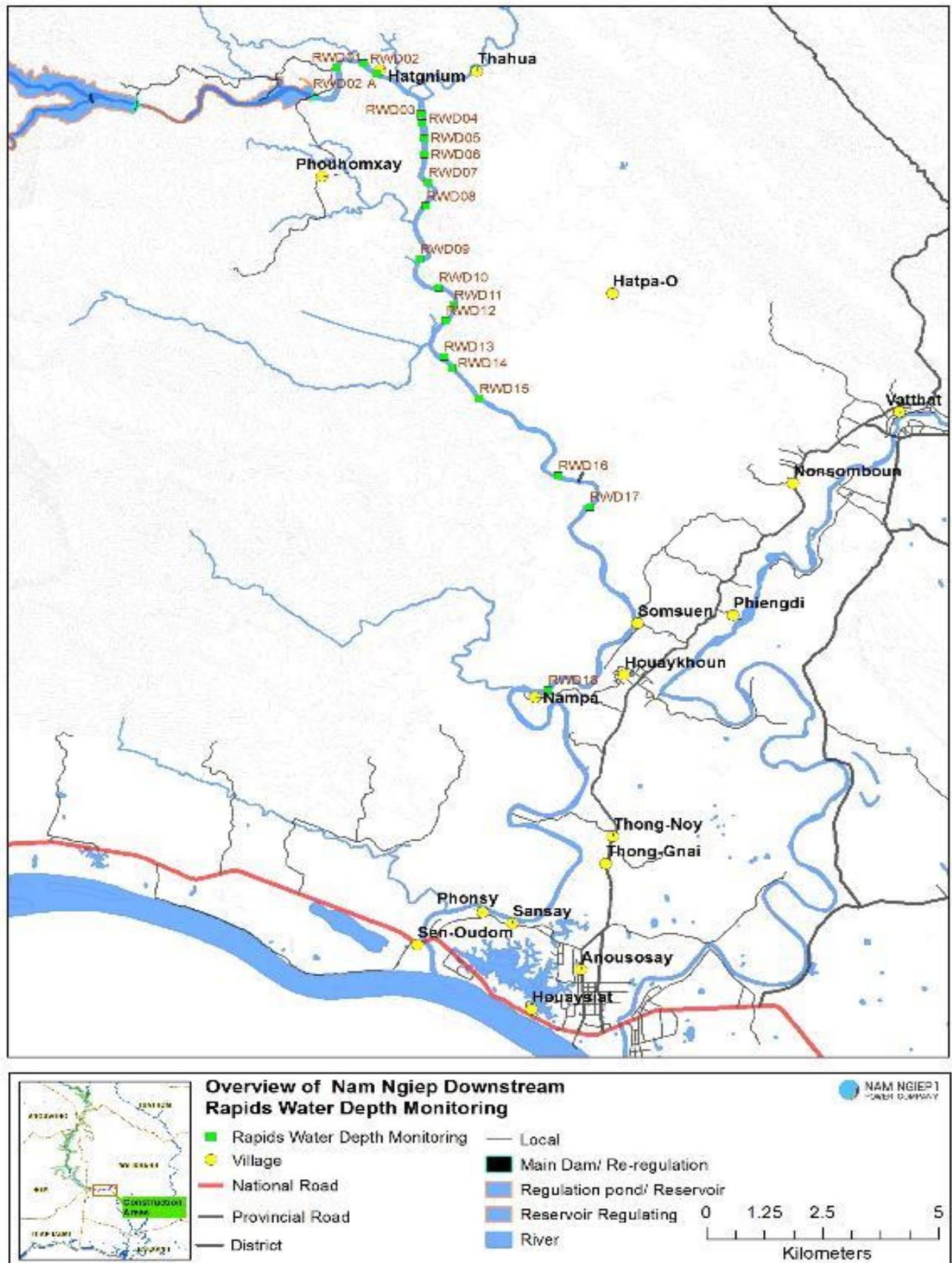


FIGURE 2-5: LOCATION MAP OF RIVER DEPTH MONITORING POINTS

2.7.2.3 Stage Height Fluctuations

The requirements on stage height fluctuations constitute a rise or a fall in water elevation and include two aspects:

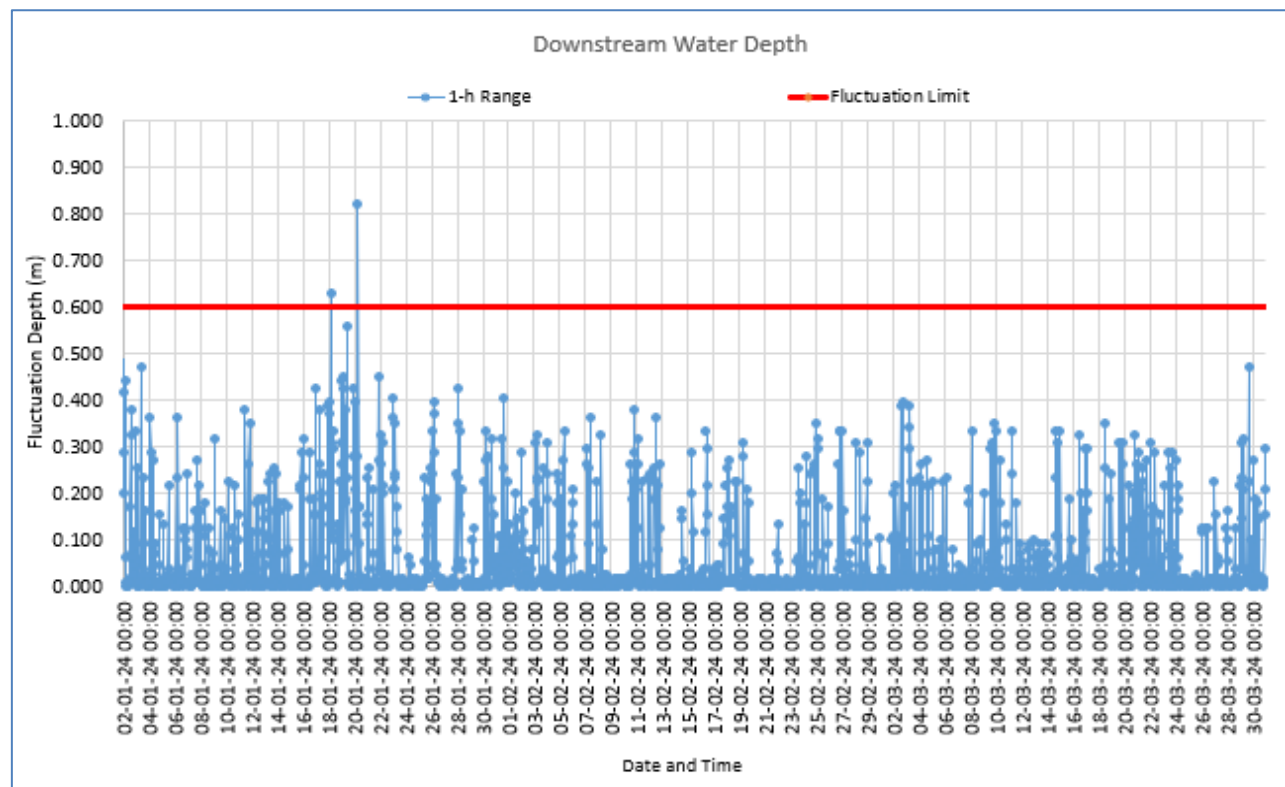
1. A requirement on the rate of change which is set at a maximum of 0.6 m per hour.
2. Requirements on the range in fluctuations over 24-hour periods and 7-day periods respectively, which is set at a maximum of 1.7 m for both periods. In other words, the range requirements determine the maximum difference in stage height over 24-hour periods and 7-day periods respectively.

For the 0.6 m in 1-hour maximum fluctuation EFR, the cumulative rises and falls are calculated from the hourly water level recordings.

Compliance with the 24-hour maximum fluctuation EFR is determined by calculating the difference between the maximum and the minimum stage height over each 24-hour period. In the same way, the 7-day maximum fluctuation EFR, is determined by calculating the difference between the maximum and the minimum stage height over each 7-day period. There is no compulsion for the Company to meet the stage height fluctuation EFRs after a high flow event passes over the Re-regulation dam spillway.

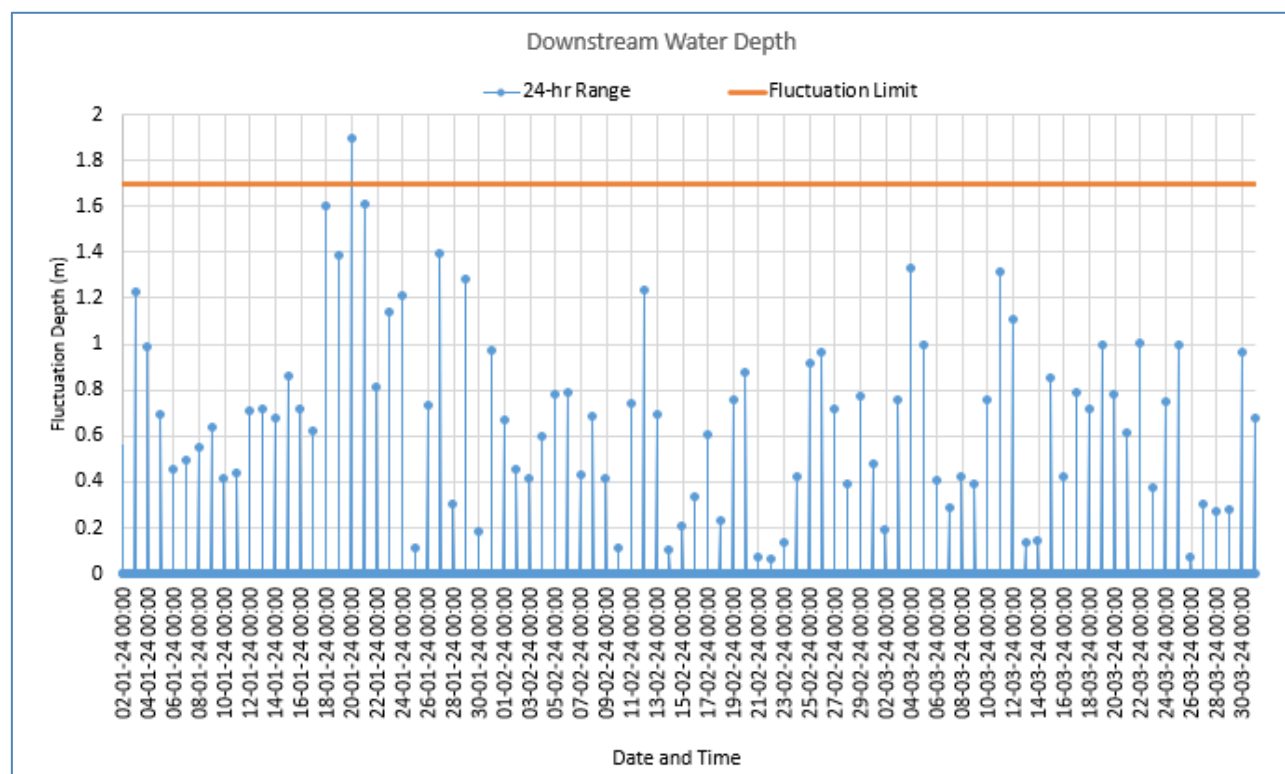
In practice, meeting stage height fluctuation EFRs are managed through controlling the rate of change in discharge from the re-regulation dam/powerhouse. This is done using established rating relationships between stage height and discharge, as set out in the Re-regulation dam operation manual. These relationships are regularly checked and revised as necessary, as they would change whenever the channel morphology changes due to significant erosion or deposition.

During Q1 2024, the maximum allowed rate of change of 0.6 m over 1-hour was complied with, except on 18 January 2024 (at 04:00) and 20 January 2024 at (06:00). It is important to note that NNP1PC has been conducting interviews with boat-using inhabitants since Q4 2023 to gather and assess any complaints about navigation difficulties. As of now, no complaints have been received, and no damage has been observed. The results are presented in **Figure 2-6**.

FIGURE 2-6: HOURLY STAGE HEIGHT FLUCTUATIONS DURING Q1 2024

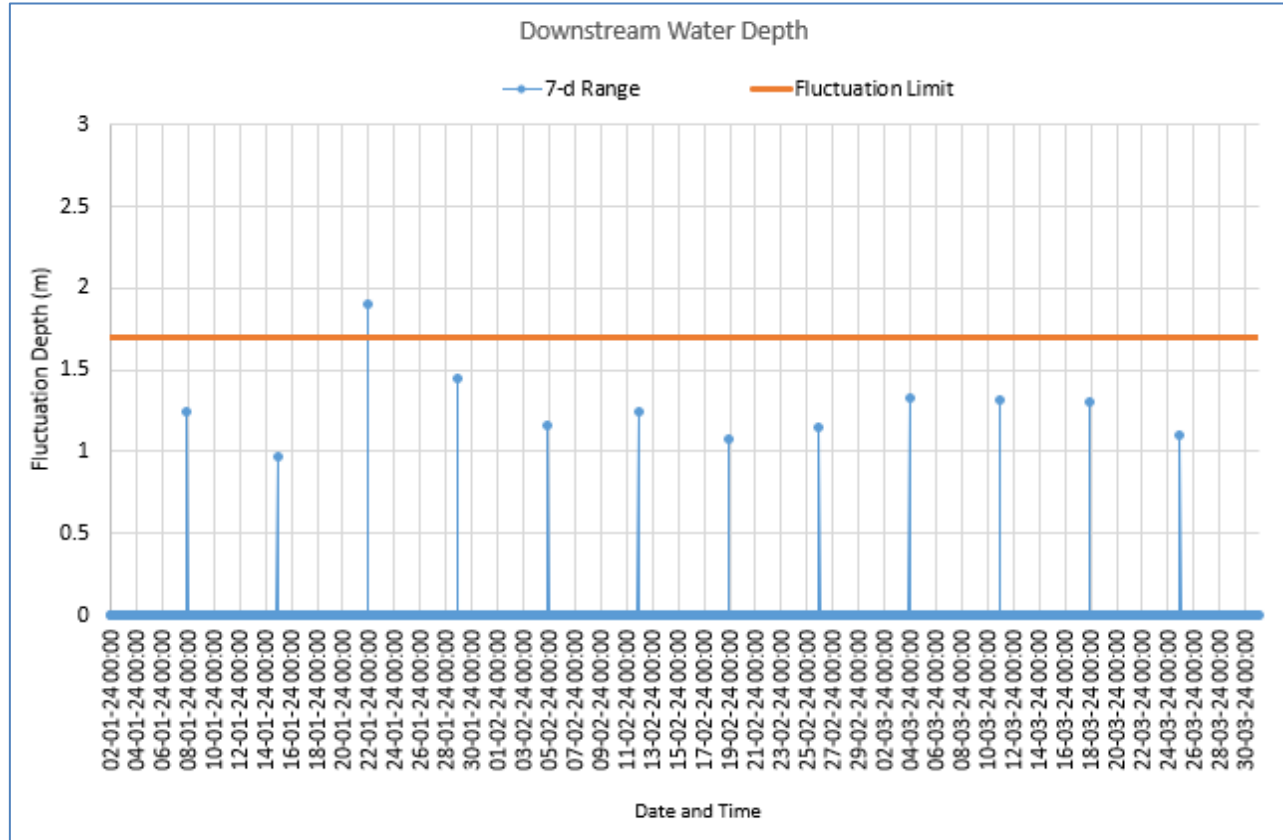
During Q1 2024, the maximum allowed difference in stage height of 1.7 m over 24-hour was complied with for all 24-hour periods (00:00 – 23:59), except in one instance on 20 January 2024.

The results of the monitoring are presented in **Figure 2-7**.

FIGURE 2-7: 24-HOUR STAGE HEIGHT DIFFERENCE (M) DURING Q1 2024

During Q1 2024, the maximum difference in stage height of 1.7 m over 7-days was complied with for all 7-day periods, except in one instance on 11-21 January 2024. The results are presented in **Figure 2-8**.

FIGURE 2-8: 7-DAY STAGE HEIGHT DIFFERENCE (M) DURING Q1 2024



2.8 WATER QUALITY MONITORING

2.8.1 Surface Water (River) and Depth Profile Water Quality

Descriptions of each monitoring station, surface water and depth profile water quality monitoring parameters, and the location of sampling map can be found in **Appendix 3** and all surface water quality data for Q1 2024 are listed in **Appendix 5.1**.

Dissolved Oxygen (DO)

The results of DO measurements for the station immediately upstream of the main dam (R05 – intake at 276 m asl.) and immediately downstream of the re-regulation dam (NNG05) are presented in **Figure 2-9**, the DO long profile measurement as timeseries are presented in **Figure 2-10**, and the full set of DO surface water quality data are shown in **Table 2-12**.

The water temperature and DO depth profiles in the main reservoir at R05 during Q4 2022, Q3 2023 and Q4 2023 are presented in **Figure 2-12** to **Figure 2-14**.

FIGURE 2-9: DISSOLVED OXYGEN IMMEDIATELY UPSTREAM AND DOWNSTREAM OF THE MAIN DAM

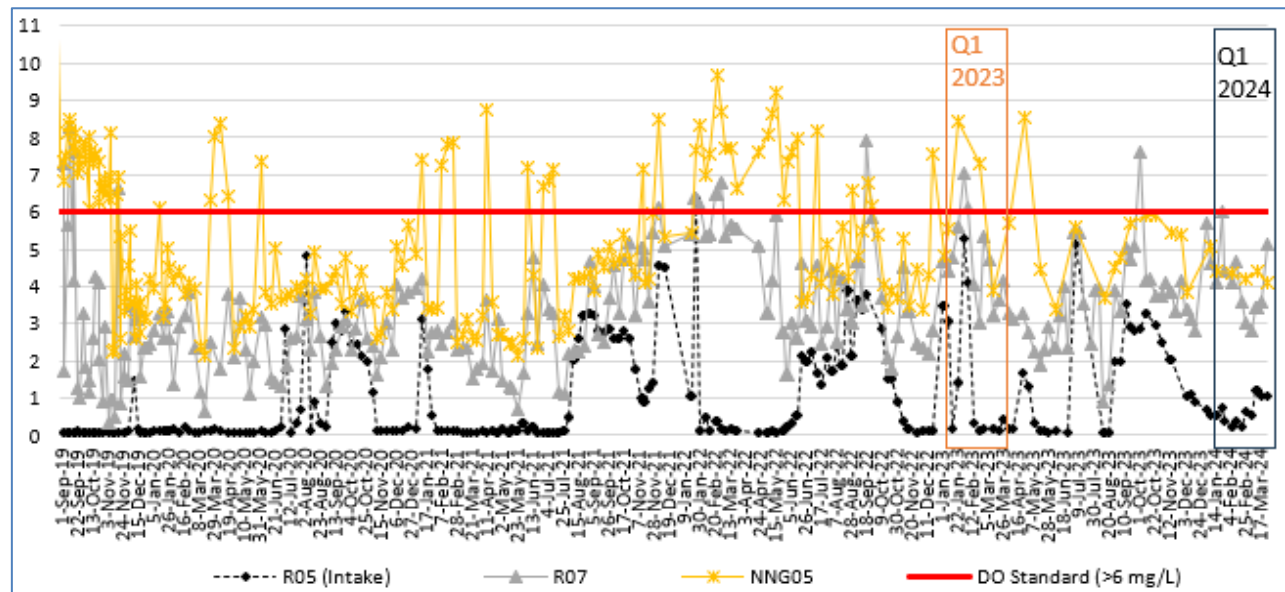
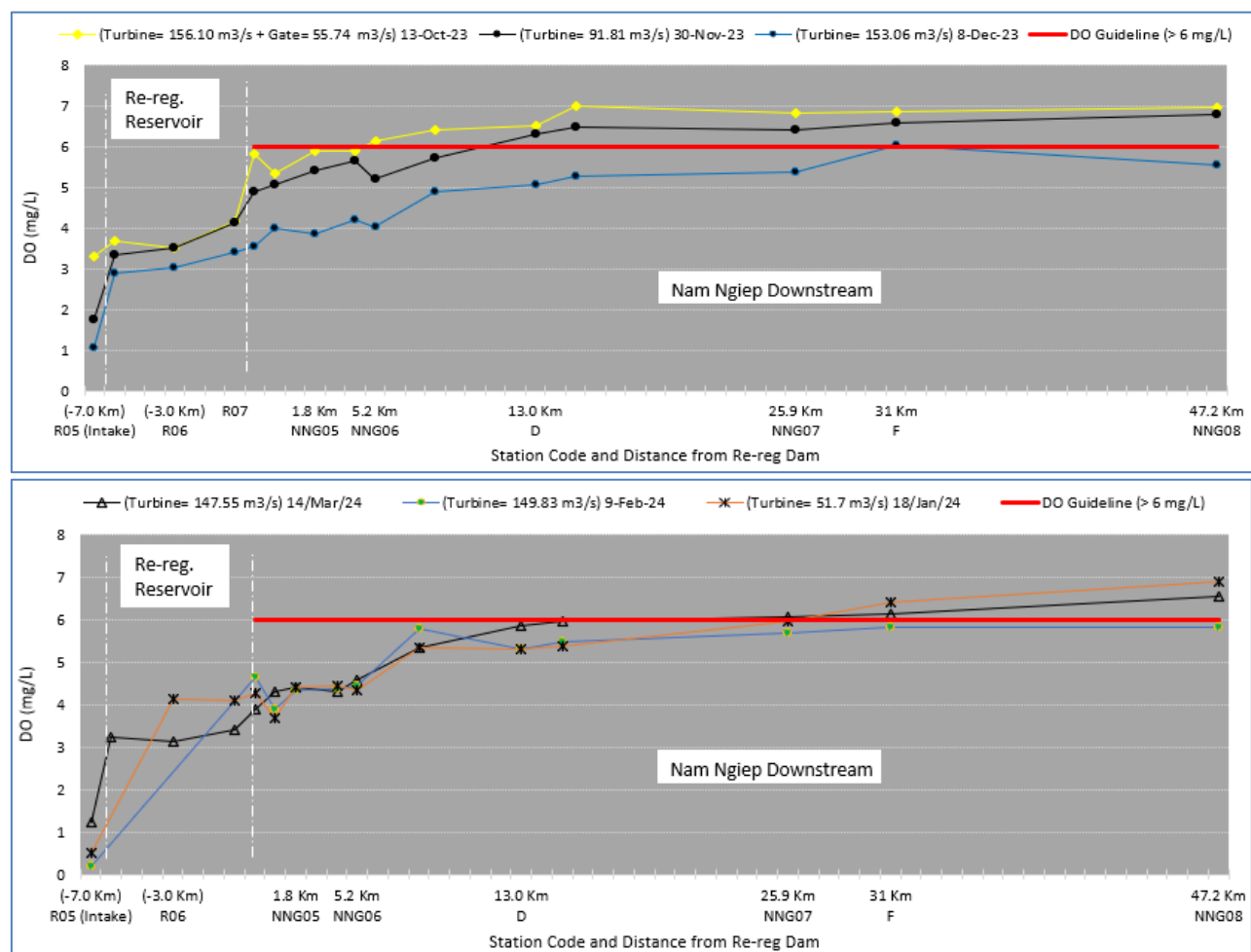


FIGURE 2-10: DISSOLVED OXYGEN LONG PROFILE MEASUREMENT FROM IMMEDIATELY UPPER MAIN DAM TO LOWER NAM NGIEP (Q4 2023 AND Q1 2024)



Main Reservoir

Figure 2-14 and **Figure 2-15** present the DO and water temperature depth profile timeseries in the Main Reservoir (R04 and R05) from September 2018 to March 2024, the graphs clearly show seasonal variations in water temperatures and a deepening of the thermocline during periods with cooler water leading to a corresponding deepening of the oxycline.

The depth profile monitoring during Q1 2024 indicates formation of thermoclines and oxyclines in the main reservoir at the monitored stations at different depths.

At R05, when comparing Q1 2024 with Q1 2023, overall, the thermocline and oxycline show similar patterns.

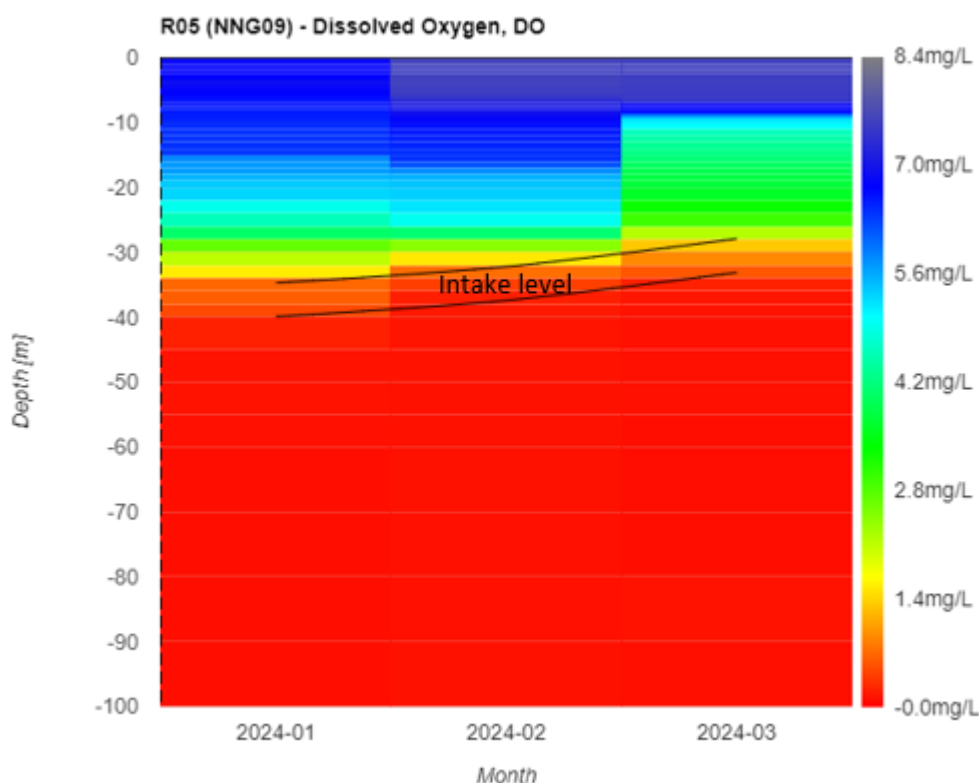
Figure 2-13 shows the average DO concentrations observed during Q1 2024. It reveals a minor improvement in the DO level near the water surface and no significant improvement at the intake level compared to the same period in Q1 2023.

At R05 (the station closest to the main dam), during Q1 2024, the thermocline and the oxycline occurred at about 7.5 m - 36 m depths with DO concentrations dropping from about 5 mg/L - 8 mg/L in the epilimnion down to 1 mg/L – 3 mg/L below the thermocline (see **Figure 2-11**).

The monthly mean DO concentration at the intake level varied slightly from about 0.6 mg/L in January 2024, to 0.9 mg/L in March 2024. Anoxic levels were found at decreasing depths from about 50 m in January 2024 (about 10 m below the intake sill) to 34 m in March 2024 (about 4 m below the intake sill) (see **Figure 2-11**).

The DO concentrations at R03 and R04 showed a similar pattern to R05.

FIGURE 2-11 MONTHLY MEAN CONCENTRATIONS OF DISSOLVED OXYGEN IN R05



At R02, during Q1 2024, DO concentrations varied between 2.0 mg/L and 10.2 mg/L with an average of 6.8 mg/L in the upper 7.5 m and DO fluctuate between 0.5 mg/L and 5.0 mg/L with a mean of 2.6 mg/L in the depths below 8 m to the bottom.

At R01, the mean DO concentration throughout the quarter was about 7.6 mg/L over the entire water column with no measurements below 6.2 mg/L.

Re-regulation Reservoir (R06 and R07)

The depth profiles at R06 and R07 in the Re-regulation Reservoir showed no indications of a thermocline, because the Re-regulation Reservoir behaves more like a river than a lake.

The mean monthly DO concentrations at R06 over the entire water column varied from 4.0 mg/L in January, 3.2 mg/L in February to 2.90 mg/L in March 2024. A similar pattern was found at R07. The decreasing DO concentrations in R06 and R07 are likely linked to the decreasing DO concentrations at the intake level in the main reservoir. However, it should be noted that the actual flow patterns and movements of water from R05 to the intake is not known and is likely rather complex with circulation patterns or other complex water movements near the intake, which adds uncertainties to correlating water quality data at or near the intake depth at R05 in the main reservoir with water quality data in the Re-regulation Reservoir.

Nam Ngiep Upstream and Tributaries

The Nam Ngiep Upstream station, NNG01, and the station in Nam Chian (NCH01) a left bank tributary at the upper part of the reservoir had DO concentrations above 6 mg/L during Q1 2024.

Downstream Stations

During Q1 2024, a total of three monitoring missions were conducted. All three monitoring missions were undertaken during turbine discharges greater than 50 m³/s (greater than minimum environmental flow requirement) and with no gate discharge.

As indicated in **Figure 2-10**, periods with turbine discharge have resulted in DO about 4 mg/L over the first 5 km downstream the re-regulation dam and then gradually increasing to close to 6 mg/L (the National Surface Water Quality Standard) near the confluence with the Mekong River.

No dead fish was observed in Nam Ngiep downstream during Q1 2024.

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.

FIGURE 2-12: MAIN RESERVOIR DISSOLVED OXYGEN AT THE END OF Q1 2024

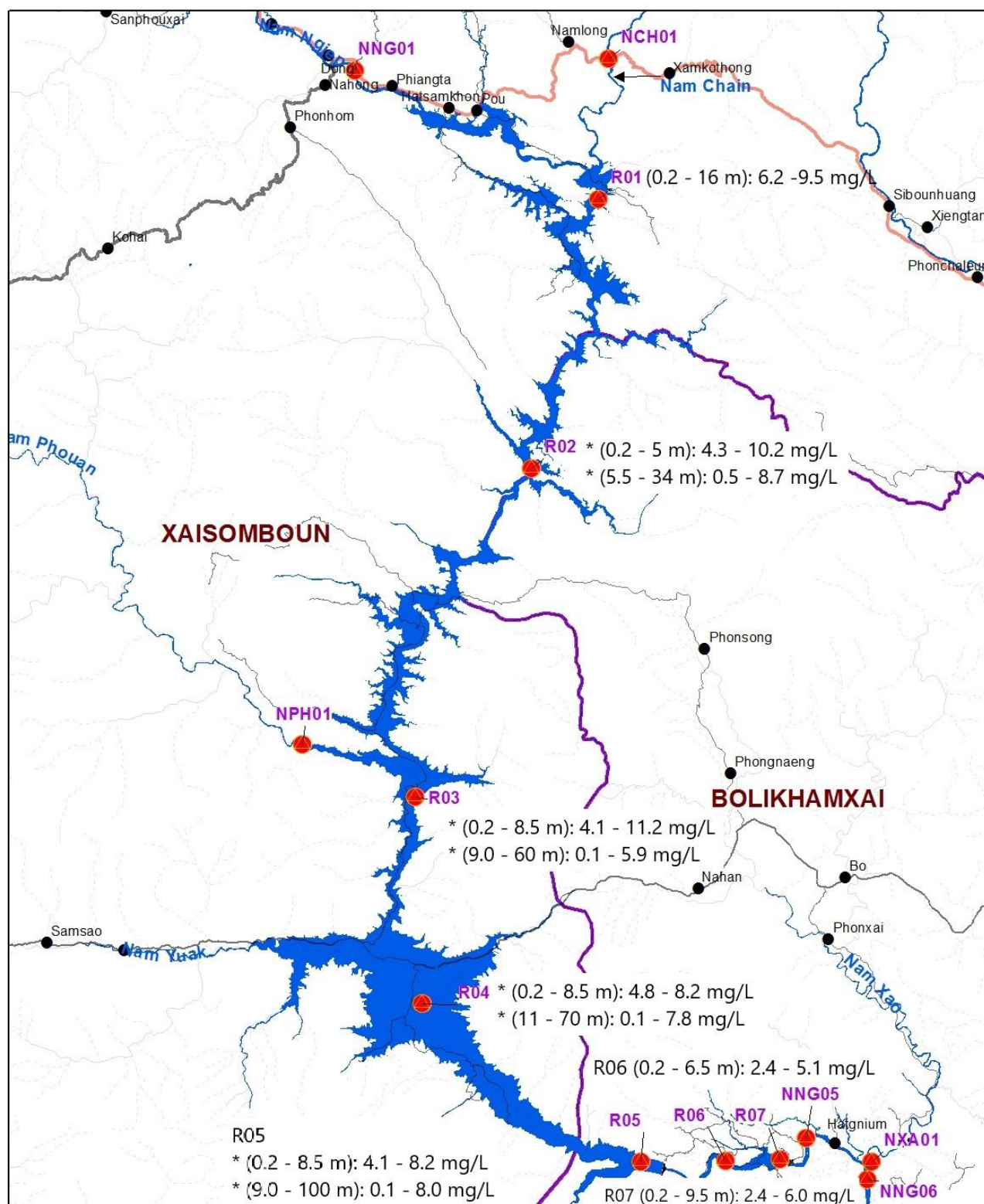


FIGURE 2-13: WATER TEMPERATURE AND DISSOLVED OXYGEN – DEPTH PROFILES IN THE MAIN RESERVOIR IMMEDIATELY UPSTREAM OF THE MAIN DAM (R05)

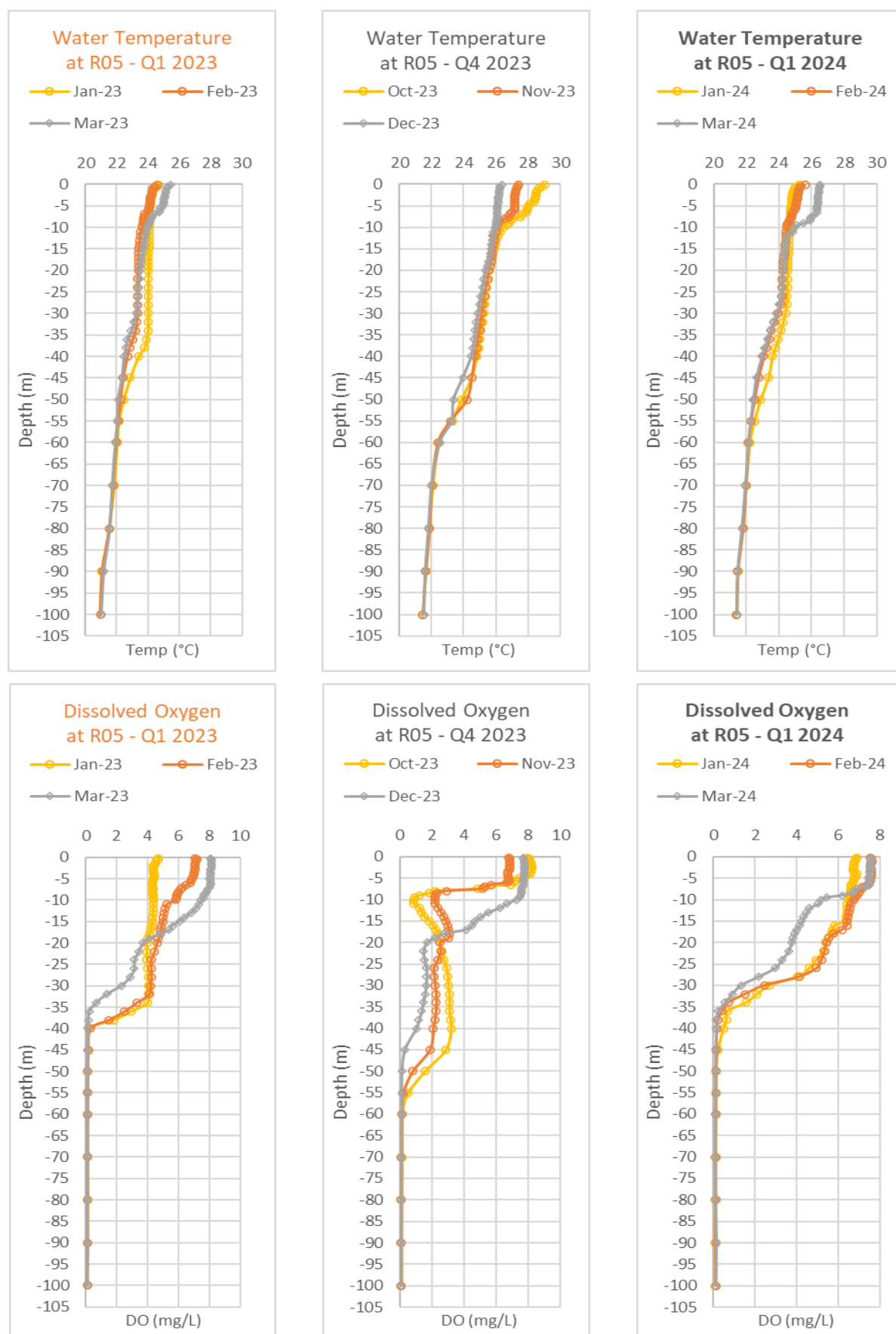


FIGURE 2-14: WATER TEMPERATURE AND DO DEPTH PROFILES IN THE MAIN RESERVOIR (R04 - R05), WITH POSITION OF INTAKE AT THE ACTUAL WATER LEVEL DURING SEPTEMBER 2018 – MARCH 2024

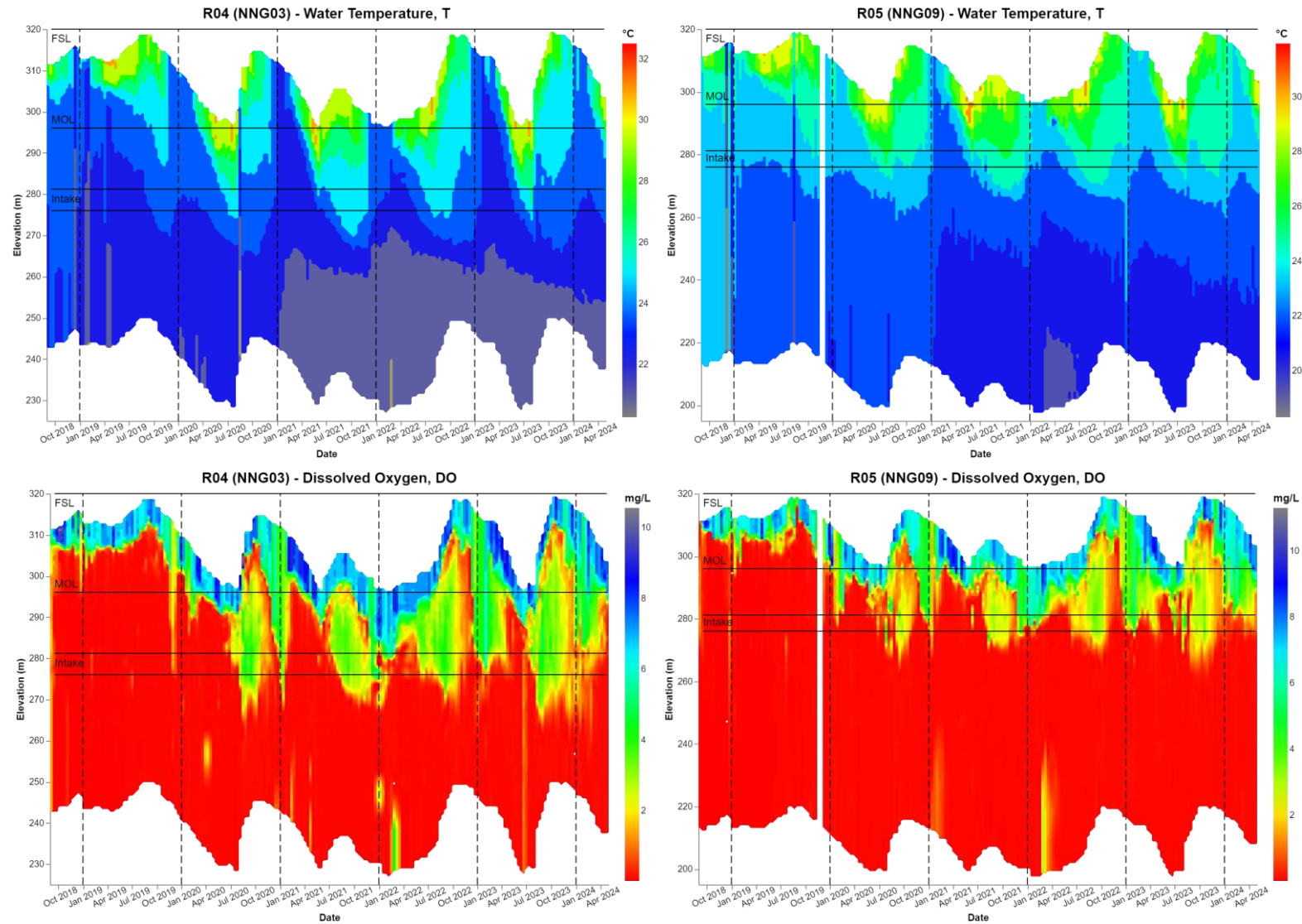


FIGURE 2-15: THE STRAIGHT-LINE GRAPH OF MONTHLY AVERAGED DO AND WATER TEMPERATURE AT R04 AND R05

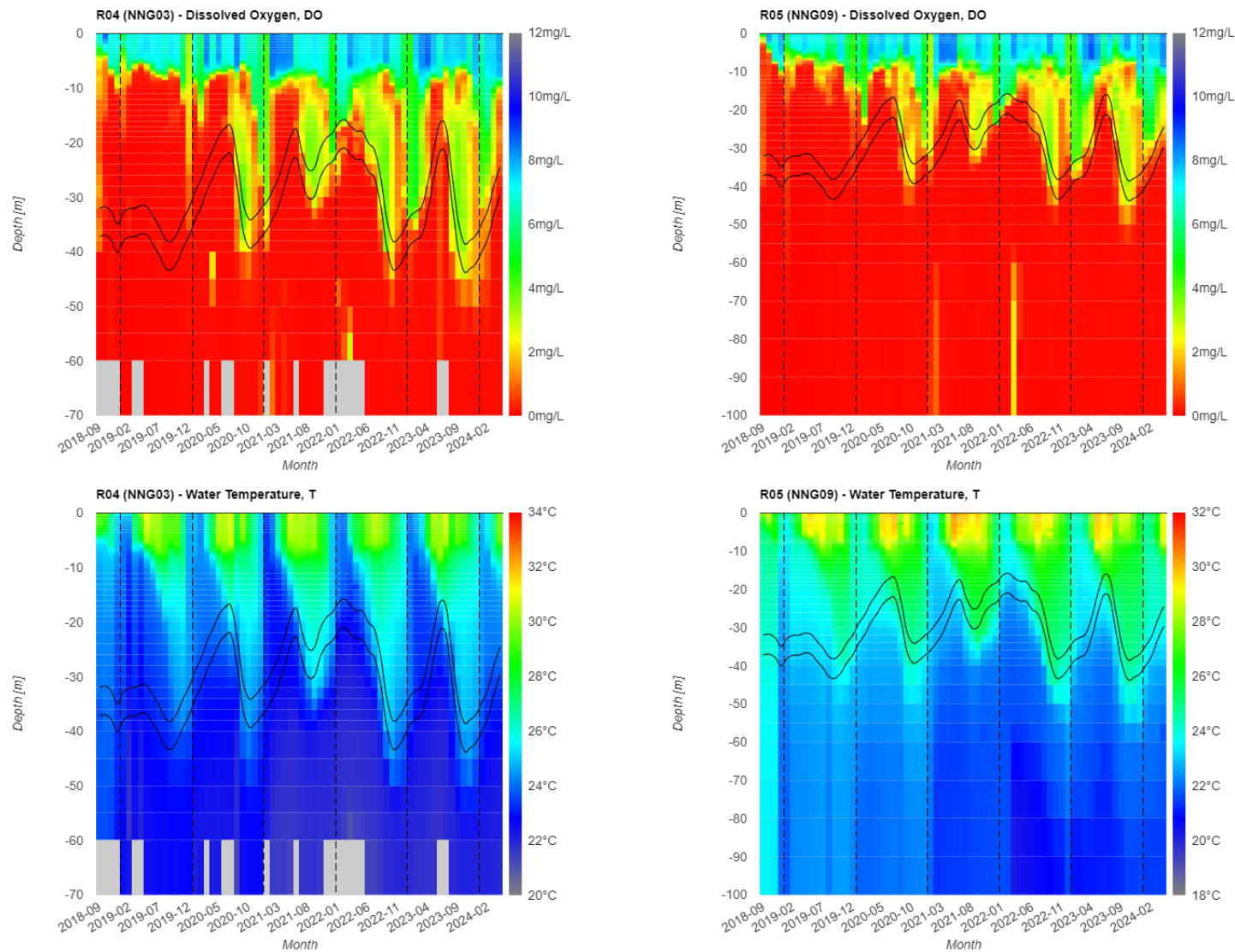


TABLE 2-12: DO (MG/L) RESULTS OF SURFACE WATER IN MAIN RESERVOIR, DO (MG/L) RESULTS OF R05 AT INTAKE DEPTH, RE-REGULATION RESERVOIR, NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 2024**(NATIONAL SURFACE WATER QUALITY STANDARD FOR DISSOLVED OXYGEN: ≥ 6 MG/L)**

Station Code	NNG01	R01	R02	R03	R04	R05 Intake	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
4-Jan-24				7.89	6.69	0.68	7.41	4.91	5.68								
10-Jan-24		9.52	8.01	8.51													
11-Jan-24					7.73	0.53	7.46	3.65	4.64							8.08	7.73
15-Jan-24	8.55													9.89			
16-Jan-24		9.11	8.65	9.54													
17-Jan-24					7.08	0.53	7.04	4.12	4.09								
18-Jan-24										4.41	4.34	5.97	6.89			6.56	6.47
23-Jan-24		8.03	6.47	7.97													
25-Jan-24					7.27	0.77	7.33	5.1	6.02								
30-Jan-24				4.36	6.18	0.37	5.14	4.16	4.43								
6-Feb-24	8.02													9.38			
7-Feb-24		7.68	6.74	7.54											9.15		
8-Feb-24					7.45	0.22	7.99	3.34	4.11								
9-Feb-24										4.34	4.45	5.67	5.83			6.76	5.17
14-Feb-24		6.95	5.35	6.15													
15-Feb-24					8.14	0.37	7.63	4.09	4.69								
21-Feb-24		8.39	8.77	8.61													
22-Feb-24					7.2	0.24	7.18	2.6	3.6								
27-Feb-24		8.04	9.16	8.62													
28-Feb-24					7.93	0.62	7.42	3.35	3.02							6.1	6.32
5-Mar-24		8.12	9.39	11.1													

Station Code	NNG01	R01	R02	R03	R04	R05 Intake	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
6-Mar-24					7.15	0.52	7.01	2.5	2.8								
11-Mar-24	8.15													9.15			
12-Mar-24		7.66	8.6	8.82											8.85		
13-Mar-24					8.13	1.22	8.14	3.12	3.42								
14-Mar-24										4.4	4.58	6.05	6.54			5.7	5.97
19-Mar-24		6.5	7.8	7.98													
20-Mar-24					7.17	1.08	7.03	3.39	3.57								
27-Mar-24		7.26	8.11	8.08													
28-Mar-24					7.94	1.08	7.96	2.84	5.13							7.95	6.55

Ammonia Nitrogen

In Q1 2024, Ammonia Nitrogen complied with the National Surface Water Quality Standard (<0.2 mg/L) in all monitored stations.

TABLE 2-13: AMMONIA NITROGEN (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 2024

(NATIONAL SURFACE WATER QUALITY STANDARD FOR AMMONIA NITROGEN: <0.2 MG/L)

Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
15-Jan-24	<0.2												<0.2			
16-Jan-24		<0.2		<0.2												
17-Jan-24					<0.2	<0.2										
6-Feb-24	<0.2												<0.2			
7-Feb-24		<0.2		<0.2										<0.2		
8-Feb-24					<0.2	<0.2										
11-Mar-24	<0.2												<0.2			
12-Mar-24		<0.2		<0.2										<0.2		
13-Mar-24					<0.2	<0.2										

Biochemical Oxygen Demand (BOD₅)

Since 2014, the Biochemical Oxygen Demand (BOD₅) values in the Nam Ngiep River and its tributaries have generally been below the detection limit (< 1 mg/L). The results for Q1 2024 indicate that the BOD₅ levels are in compliance with the standard at all stations.

In addition, 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.

TABLE 2-14: BOD_5 (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 2024**(NATIONAL SURFACE WATER QUALITY STANDARD FOR BOD_5 : <1.5 MG/L)**

Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
15-Jan-24	1.5												<1			
16-Jan-24		<1		<1												
16-Jan-24 Bottom				<1	5.7	<1										
17-Jan-24					<1	<1	<1	<1								
17-Jan-24 Bottom																
18-Jan-24									<1	<1	<1	<1			<1	<1
6-Feb-24	<1												<1			
7-Feb-24		<1		<1										<1		
7-Feb-24 Bottom				<1												
8-Feb-24					<1	<1	<1	<1								
8-Feb-24 Bottom					<1	<1										
9-Feb-24									<1	<1	<1	<1			<1	<1
11-Mar-24	<1												<1			
12-Mar-24		<1		<1										1.07		
12-Mar-24 Bottom				5.1												
13-Mar-24					<1	<1	<1	<1								
13-Mar-24 Bottom					<1	<1										
14-Mar-24									<1	<1	<1	<1			<1	<1

Chemical Oxygen Demand (COD)The COD measurements in Q1 2024 are presented in **Table 2-15**.

TABLE 2-15: COD (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q1 2024**(NATIONAL SURFACE WATER QUALITY STANDARD FOR COD: < 5 MG/L)**

Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
15-Jan-24	9.6												<5			
17-Jan-24							<5	<5								
18-Jan-24									<5	6.4	<5	<5			<5	<5
6-Feb-24	<5												<5			
7-Feb-24														12.8		
8-Feb-24							<5	9.6								
9-Feb-24									6.4	6.4	6.4	<5			12.8	6.4
11-Mar-24	<5												<5			
12-Mar-24														<5		
13-Mar-24							6.4	<5								
14-Mar-24									<5	<5	6.4	<5			9.6	<5

Faecal Coliform Bacteria

The results of the faecal coliform analyses in Q1 2024 are presented in **Table 2-16**.

Faecal coliform complied with the standard in all stations.

TABLE 2-16: FAECAL COLIFORMS (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q1 2024**(NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: <1,000 MPN/100 ML)**

Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NC H01	NP H01	NXA01	NHS01
15-Jan-24	540												4			
18-Jan-24									13	7	33	17			26	540
6-Feb-24	170												17			
8-Feb-24													14			
9-Feb-24									17	14	17	27			240	350
11-Mar-24	350												540			
12-Mar-24														540		
14-Mar-24									49	79	110	350			240	540

Total Coliform Bacteria

The results of measurements for total coliform bacteria are presented in **Table 2-17**. The results indicate a similar pattern and same tendency as for faecal coliform bacteria. There were no exceedances of the National Surface Water Quality Standard (<5,000 MPN/100 mL) for total coliform bacteria.

TABLE 2-17: TOTAL COLIFORM (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q1 2024**(NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: <5,000 MPN/100 ML)**

Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG0 7	NNG0 8	NCH 01	NPH 01	NXA0 1	NHS 01
15-Jan-24	920												14			
18-Jan-24									22	11	79	33			70	920
6-Feb-24	540												49			
8-Feb-24														22		
9-Feb-24									33	70	170	240			1,600	920
11-Mar-24	1,600												1,600			
12-Mar-24														1,600		
14-Mar-24									1,600	920	1,600	920			920	1,600

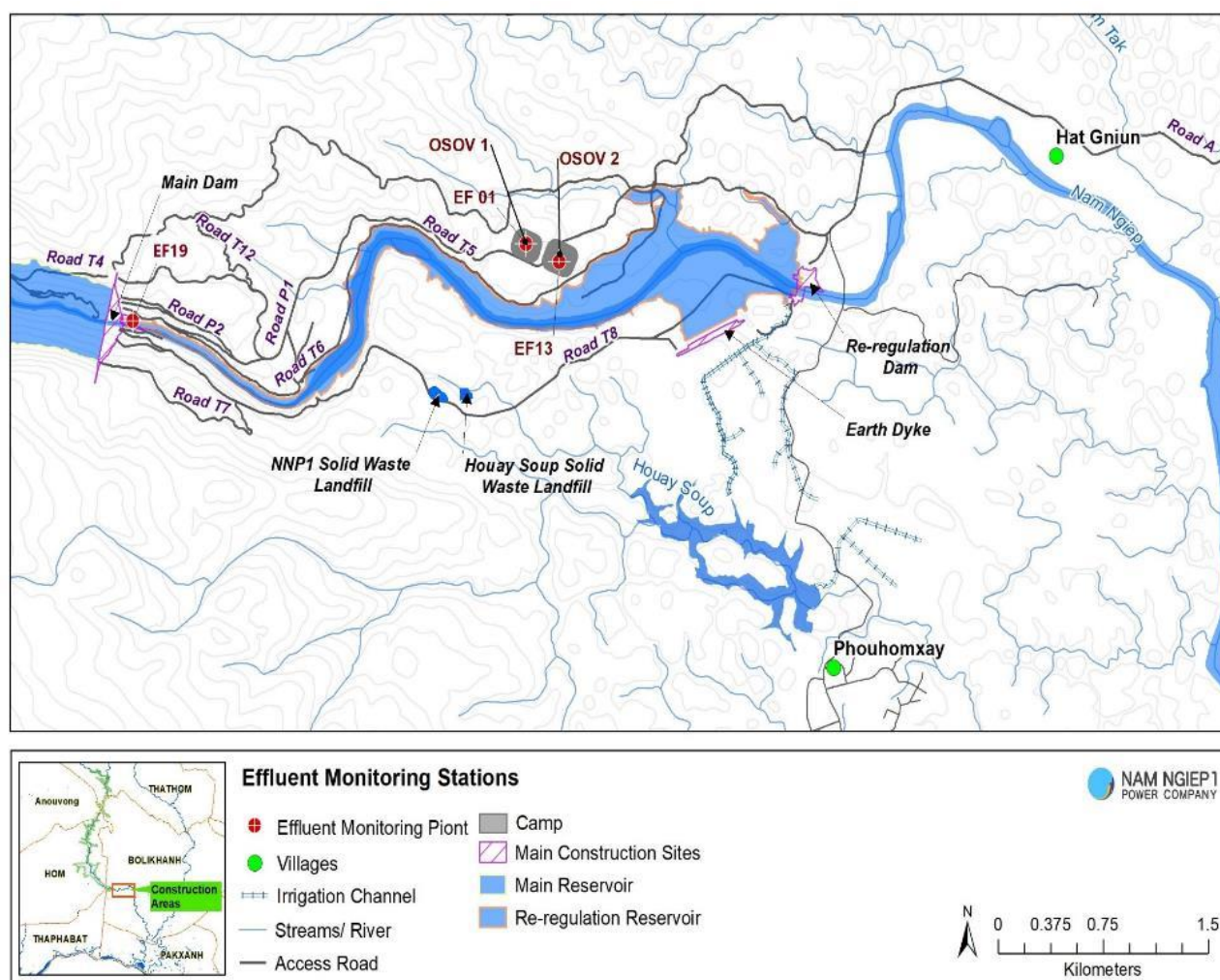
2.8.2 Compliance Monitoring of Effluents from Camps

A total of 03 sites discharged effluents in Q1 2024, including 02 camps (OSOV1 and OSOV2) and at the Wastewater Treatment System of the Main Powerhouse. The effluent monitoring location sites can be found in **Figure 2-16**.

The results are described in **Table 2-18** and the full data set is in **Appendix 5.2**.

The status of compliance as of 30 March 2024 can be summarized as follows:

- Non-compliance with Ammonia-Nitrogen, Total Nitrogen, Total Phosphorus for Wastewater Treatment Systems in the Main Powerhouse (EF19) and OSOV2 Camp (EF13);
- Non-compliance with Faecal Coliform and Total Coliform at OSOV1 (EF01) and OSOV2 (EF13).

FIGURE 2-16: LOCATION OF EFFLUENT MONITORING POINTS**TABLE 2-18: RESULTS OF THE EFFLUENT WATER QUALITY MONITORING OF THE CAMPS IN Q1 2024 (NON-COMPLIANCE PARAMETERS ONLY)**

Date	Parameter (Unit)	Guideline in the CA	Site Name	OSOV1	OSOV 2	Main Powerhouse
			Station Code	EF01	EF13	EF19
22-Jan-24	NH ₃ -N (mg/L)	<10.0		<2	7.5	5.5
12-Feb-24	NH ₃ -N (mg/L)	<10.0		<2	7.0	8.7
26-Feb-24	NH ₃ -N (mg/L)	<10.0		<2	5.5	9.2
04-Mar-24	NH ₃ -N (mg/L)	<10.0		<2	10.0	7.0
26-Mar-24	NH ₃ -N (mg/L)	<10.0		<2	7.9	16.3
22-Jan-24	Total Nitrogen (mg/L)	<10.0		3.1	9.1	5.0
12-Feb-24	Total Nitrogen (mg/L)	<10.0		0.1	8.5	9.8
26-Feb-24	Total Nitrogen (mg/L)	<10.0		0.4	8.2	10.7
04-Mar-24	Total Nitrogen (mg/L)	<10.0		0.6	12.0	10.6
26-Mar-24	Total Nitrogen (mg/L)	<10.0		0.9	9.0	20.7
22-Jan-24	Total Phosphorus (mg/L)	<2		1.8	0.9	7.8
12-Feb-24	Total Phosphorus (mg/L)	<2		1.1	1.0	7.2
26-Feb-24	Total Phosphorus (mg/L)	<2		1.5	0.8	8.4

		Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
04-Mar-24	Total Phosphorus (mg/L)	<2	1.2	1.1	8.7
26-Mar-24	Total Phosphorus (mg/L)	<2	2.7	0.9	7.5
22-Jan-24	Total coliform (MPN/100 mL)	<400	1600	5400	0
12-Feb-24	Total coliform (MPN/100 mL)	<400	350	130	0
26-Feb-24	Total coliform (MPN/100 mL)	<400	350	3500	0
04-Mar-24	Total coliform (MPN/100 mL)	<400	460	16000	0
26-Mar-24	Total coliform (MPN/100 mL)	<400	1600	49	2
22-Jan-24	Faecal Coliform (MPN/100 mL)	<400	110	920	0
12-Feb-24	Faecal Coliform (MPN/100 mL)	<400	70	0	0
26-Feb-24	Faecal Coliform (MPN/100 mL)	<400	33	1600	0
04-Mar-24	Faecal Coliform (MPN/100 mL)	<400	70	16000	0
26-Mar-24	Faecal Coliform (MPN/100 mL)	<400	540	2	0

TABLE 2-19: COMPLIANCE STATUS OF EFFLUENT DISCHARGE FROM THE CAMPS IN Q1-2024

Site	ID	WWTS	Key Non-Compliance Issues ¹ in Q1-2024	Corrective Actions
OSOV 1 (Owner's Site Office and Village)	EF01	- Septic tanks (kitchen and black water) and wetland (grey water), discharge: 70 m³/day. - The effluent from this site flows into the Re-regulation Reservoir.	- Faecal coliform (<400 MPN/100 mL): Non-compliance in 1 out of 5 samplings. Q1 mean 164 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 3 out of 5 samplings. Q1 mean 872 MPN/100 mL. - Total Phosphorus (<2 mg/L): Non-compliance in 1 out of 5 samplings. Q1 mean 1.7 mg/L.	Carried out routine maintenance of the Wastewater Treatment System including cleaning all 17 septic tanks, inspecting the air blowers to ensure they are functioning properly and maintaining wetland system.
OSOV 2 (ESD Camp)	EF13	- Septic tanks (kitchen and black water) and SBR with chlorination system. - The effluent from this site is led into a ditch connected to the Re-regulation reservoir, however,	- Total nitrogen (<10 mg/L): Non-compliance in 1 out of 5 samplings. Q1 mean 9.4 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 3 out of 5 samplings. Q1 mean 3,704 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 3 out of 5 samplings. Q1 mean 5,016 MPN/100 mL.	The installed WWTS does not eliminate nitrogen or phosphorus. However, there is no concern given the low discharge effluent quantity, which is completely absorbed in the soil within a distance of less than 300 m

¹ The values in brackets indicate the applicable standard

Site	ID	WWTS	Key Non-Compliance Issues ¹ in Q1-2024	Corrective Actions
		due to low quantities of effluent, the liquid is absorbed in the soil before reaching the reservoir.		before reaching the re-regulation pond. Cleaning all 17 septic tanks and inspecting the air blowers and closely monitoring the residual chlorine content and chlorination dosage adjustment to ensure they are functioning properly
Main Powerhouse	EF19	- Septic tanks (grey and black water), biofilm tank and chlorination tank. - The effluent from this site flows into the tailrace of the Main Powerhouse and then into the Re-regulation Reservoir.	- Ammonia-nitrogen (<10 mg/L): Non-compliance in 1 out of 5 samplings. Q1 mean 9.3 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 3 out of 5 samplings. Q1 mean 11.3 mg/L. - Total Phosphorus (<2 mg/L): Non-compliance in all 5 samplings. Q1 mean 7.9 mg/L.	As above

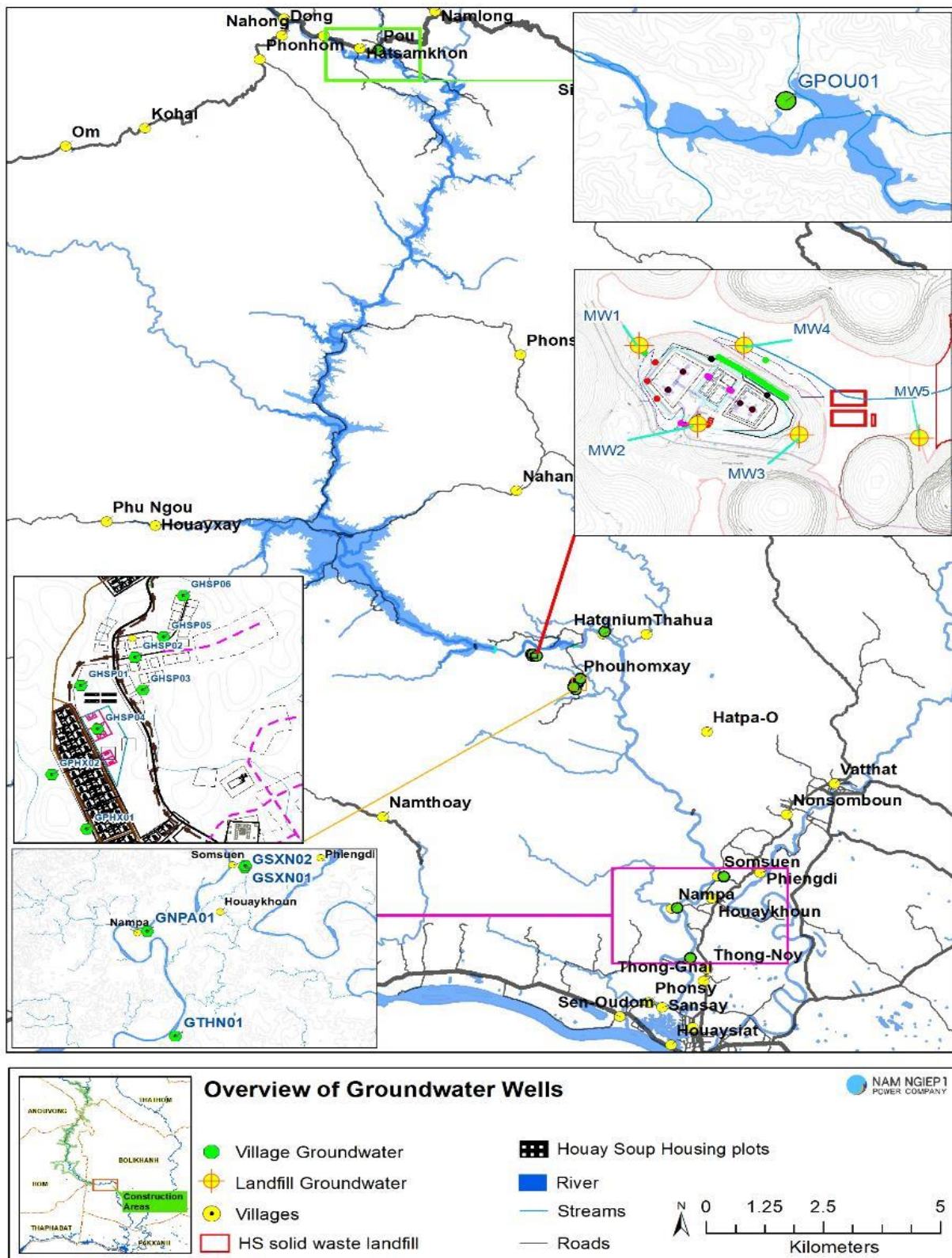
2.8.3 Groundwater Quality Monitoring

During Q1 2024, a total of seven boreholes at Somseun, Nam Pa, Thong Noy, (one borehole in each village) and Phouhomxay and Pou Villages (two boreholes in each village) have been monitored for the following parameters:

- a. *Monthly:* pH, DO (%), DO (mg/L), Conductivity ($\mu\text{S}/\text{cm}$), Temperature ($^{\circ}\text{C}$), Turbidity (NTU), Faecal Coliform (MPN/100 mL) and *E. coli* (MPN/100 mL);
- b. *Annually (Not for This Quarter):* Arsenic (mg/L), Total Iron (mg/L), Magnesium (mg/L), Fluoride (mg/L), Total Hardness (mg/L), Nitrate (mg/L), Nitrite (mg/L) and Lead (mg/L).

The groundwater sampling locations are displayed in **Figure 2-17** and the groundwater monitoring data is presented in **Appendix 5.3**.

FIGURE 2-17: GROUNDWATER SAMPLING LOCATIONS



Key findings from the groundwater quality monitoring are summarized as the follows:

Phouhomxay Village: all monitored parameters complied with the standard, except faecal coliform and E. coli bacteria (January 2024) in both water supply wells.

Thong Noy Village: all monitored parameters complied with the standard, faecal coliform and E. coli bacteria.

Somsuen Village: all monitored parameters complied with the standard, except faecal coliform and E. coli bacteria in January 2024.

NamPa Village: all monitored parameters complied with the standard.

Pou Village: all monitored parameters complied with the standard.

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.

There are two types of water supply systems in Lao PDR:

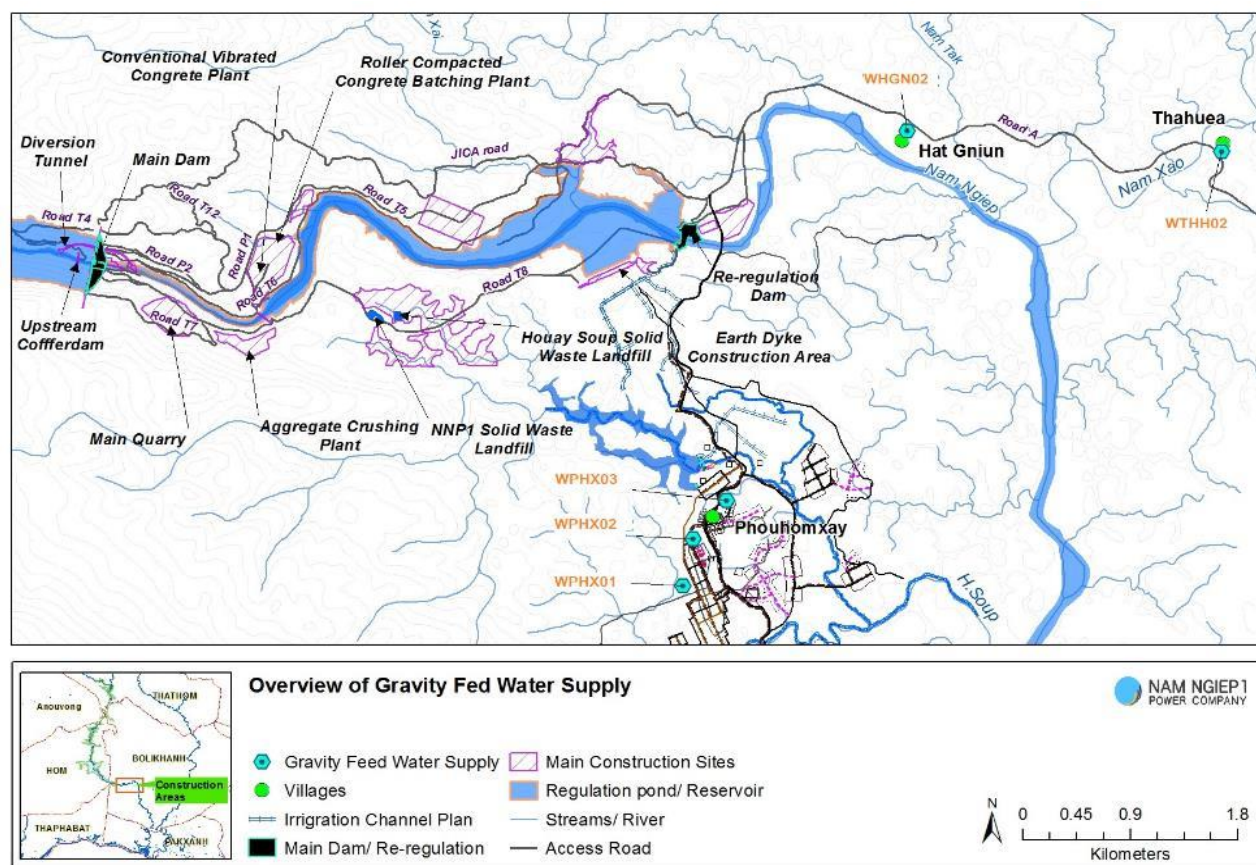
- (A) **Nam Papa systems (water supply)** – water from natural water sources that has gone through a treatment process to become clean and safe water in compliance with the drinking water quality standards. These systems are managed by the Department of Water Supply, Ministry of Public Works and Transport; and
- (B) **Nam Sa-at Systems (domestic water supply)** – provide water to rural areas that are not connected to Nam Papa systems. Nam Sa-at systems include gravity fed systems and boreholes with motorised pumps or hand pumps. These systems are managed by the Centre for Environmental Health and Water Supply (Nam Sa-at) under the Department of Hygiene and Health Promotion, Ministry of Health.

The community water supply systems related to the NNP1 hydropower project are under Nam Sa-at system with the monitoring requirements identify in the Minister's Decision on the Water Quality Standard Management for Drinking and Domestic Use, No. 561/MoH dated 27 February 2014.

The issue of bacterial contamination in the communities' water supply have been investigated by ESD team together with the respective local authorities and the villagers to find the likely root causes. A series of actions have been taken to prevent the contamination according to the Water Safety Plans (WSP); however, the Project, Nam Sa-at (GOL) and the villagers considered that disinfection treatment processes (e.g., chlorination, ceramic filtration) would not be sustainable and cost effective in a long run. It is well understood and agreed with the villagers that the water shall be boiled before drinking as mentioned above. It is also noted that boiling of water from domestic water supply (Nam Sa-at) systems before drinking is a general practice in the rural areas of Lao PDR.

2.8.4 Gravity Fed Water Supply (GFWS) Monitoring

The monitoring of the GFWS aims to assess the quality of water that is being used for bathing and washing by villagers at Hat Gniun, Thahuea and Phouhomxay villages. The gravity fed water supply system at Phouhomxay Village has been in use since December 2017.

FIGURE 2-18: OVERVIEW OF GRAVITY FED WATER SUPPLY

Water samples were taken from the taps for analysis during the reported period and selected results are shown in **Table 2-20**. The full set of data is presented in **Appendix 5.4**.

TABLE 2-20: THE GFWS MONITORING RESULT IN Q1 2024

Date	Parameter (Unit)	Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
		Guideline				
29-Jan-24	Faecal Coliform (MPN/100 mL)	0	240	130	79	240
19-Feb-24		0	13	170	130	170
26-Mar-24		0	8	49	33	7.8
29-Jan-24	E.Coli Bacteria (MPN/100 mL)	0	49	33	22	33
19-Feb-24		0	14	4.5	7.8	34
26-Mar-24		0	5	23	13	4.5

Thaheua Village (WTHH02): all parameters complied with the standard, except for faecal coliform and *E.coli*.

Hat Gnuin Village (WHGN02): all parameters complied with the standard, except for faecal coliform and *E.coli*.

Phouhomxay Village (WPHX02-tap water at primary school; and **WPHX03**-tap water at the villager's house): all parameters complied with the standard, except faecal coliform and *E.coli* in Q1 2024 samples. Note here that during sampling of tap water in Phouhomxay Village, surface water from Houay Soup Stream was still supplied into the system.

As observed in the field during water sample collection, livestock is roaming around in the water intake areas which may have contributed to the presence of Faecal Coliform Bacteria and *E.coli* in GFWS samples. According to the 2019 site condition survey, it is not feasible for fencing off the upstream water course due to cattle having access from all directions along the stream. The villagers generally use tap water for washing and cleaning. They were informed about the monitoring results and were advised to prevent the bacterial contamination by removing livestock from the intake areas and boil water before drinking. The advice to boil the water 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.

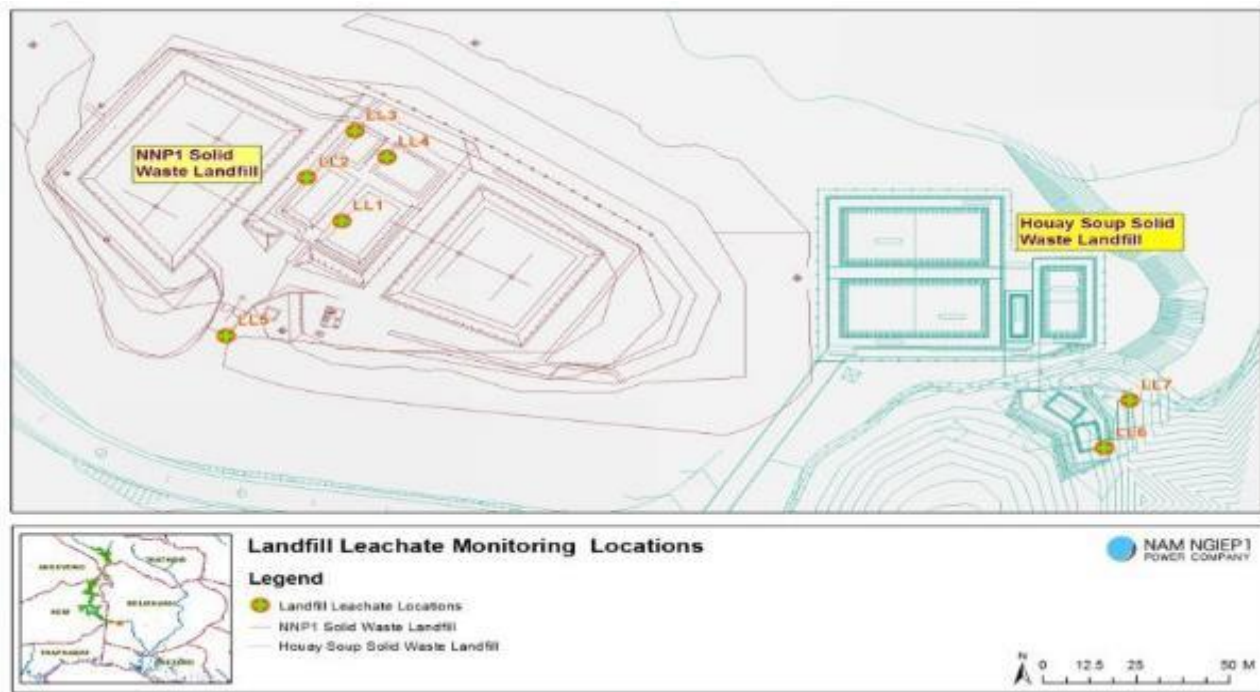
As mentioned in **section 2.8.3**, the gravity fed system is a domestic water supply managed by the Centre for Environmental Health and Water Supply (Nam Sa-at) under the Department of Hygiene and Health Promotion, Ministry of Health. It is well understood and agreed with the villagers that the water shall be boiled before drinking.

For Phouhomxay Village, the villagers requested NNP1PC and the District Water Supply Office during a meeting in March 2022 to reuse the Gravity Fed System (GFS) as a main supply and reserve the existing ground water supply system for times when the GFS would have to be repaired. The water from the gravity fed system needs to be boiled before drinking, but may be used for other purposes such as washing, feeding animals, watering the garden, and other households' activities.

In addition, to ensure sufficient water quantity, the ESD will work with the District Water Supply Office to improve the water intake of the GFS under NNP1PC's Corporate Social Responsibility (CSR). For the presence of bacteria, the community confirmed that they will boil water before drinking. It is also noted that boiling domestic water supply (Nam Sa-at) before drinking is a general practice in the rural areas of Lao PDR.

2.8.5 Landfill Leachate Monitoring

The landfill leachate treatment systems at NNP1 Project landfill and Houay Soup landfill are monitored to control the functioning of the treatment process and ensure compliance with effluent standards. However, due to no rainfall during Q1 2024, no leachate flow into the treatment system of NNP1 Project landfill did not reach the last treatment pond and sampling of effluent could therefore not be carried out for Q1 2024. The monitoring locations are presented in the **Figure 2-19**.

FIGURE 2-19: LANDFILL LEACHATE MONITORING LOCATION

2.8.6 Water Quality Compliance Monitoring

The water quality non-compliance issues in Q1 2024 are summarized in **Table 2-21**.

TABLE 2-21: NON-COMPLIANCES RELATING TO WATER QUALITY MONITORING IN Q1 2024

No	Non-compliance Issues	Corrective Actions	Status
1	During turbine discharge (Q1 2024), Dissolved Oxygen (DO) in the Nam Ngiep River downstream the Re-regulation Dam was lower than the National Surface Water Quality Standard (6 mg/L)	- NNP1PC has continued implementing the water quality monitoring program and discussed the results with the LTA during the May 2023 visit; - LTA recommended to maintain the monitoring program, and concluded that other measures aiming at an improvement, like e.g. the possibility of artificial re-aeration of the water in the re-regulation pond for increasing oxygen content, are not required.	- Closely monitoring
2	Effluents discharged from the Wastewater Treatment Systems (WWTS) at OSOV1,	In January, February and March 2024, EMO, ADM and TD conducted a monthly joint inspection for the operation and maintenance of the WWTS:	- Closely monitoring the system operation and maintenance.

No	Non-compliance Issues	Corrective Actions	Status
	OSO2 and the Main Dam exceeded the National Effluent Standard Guideline for some parameters	- All 17 septic tanks and air blowers at OSOV1 were randomly checked by the ADM staff and they are functioning properly. - Wetland maintenance at OSOV1 including weeding and replacing dead reeds and fixing the fence have been completed. - Closely monitor the residual chlorine content and chlorination dosage adjustment for the effluents of OSOV2 and the Main Powerhouse WWTS.	
3	Groundwater quality monitored for the communities (Phouhomxay, Thong Noy and Som Seun Villages) were not in compliance with the National Groundwater Quality Standard for drinking purpose on Faecal Coliform and <i>E.coli</i> parameters	- A full inspection of the water supply systems in Som Seun, Nam Pa and Thong Noy Village was conducted in September 2020 by NNP1PC team including consultations with the Village Water Use Committee (VWUC) and also interviews with some consumers (detailed in Q4 2020 Report). - Potential contamination sources of coliform were identified and recommendations on operation and maintenance of the water supply system were provided to the involved parties. - The villagers were informed about the monitoring results and were advised to boil water before drinking 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 were advised/encouraged to boil water before drinking. - Continue to monitor.
4	Gravity Fed Water Supply monitored for the communities (Thaheua, HatGnuin, and Phouhomxay)	- Site observations were conducted during the routine water sampling, it was observed that livestock was roaming around the water intake areas and faeces from livestock and birds may contribute to the presence of bacterial contamination. It is not feasible to fence off the upstream water course due to	- The villagers generally use tap water for washing and cleaning, and were encouraged to

No	Non-compliance Issues	Corrective Actions	Status
	Village) were not complied with the National Drinking Water Quality Standard on Faecal Coliform and <i>E.coli</i> parameters.	cattle having access from all directions along the stream. The villagers were informed about the monitoring results and were advised to boil water before drinking.	boil water before drinking. - Continue monitoring.

3 WATERSHED AND BIODIVERSITY MANAGEMENT

3.1 WATERSHED MANAGEMENT

3.1.1 Implementation of Watershed Management Plan

3.1.1.1 Xaysomboun Watershed and Reservoir Protection Office (WRPO)

A meeting was held on 26 April 2023 between the Head of Xaysomboun Province Agriculture and Forestry Office (PAFO) and NNP1PC to address the outstanding delays of Xaysomboun WRPO. The meeting agreed on the next steps and a timeline for the related actions. The progress of the actions as of March 2024 is summarized below:

- The Xaysomboun PAFO agreed to update the NNP1 EMO team 15 working days after the meeting about the Fishery Co-Management Plan (FCMP). Xaysomboun WRPO shared the Minutes of Meeting (MOM) from the FCMP meeting in Thathom and Hom District with the NNP1 EMO on 7 September 2023. The Head of Xaysomboun WRPO agreed with the recommendation from NNP1 EMO to use the existing draft of fishery regulation that was already discussed and agreed per the MOM on 20 May 2020 to avoid further delays in the regulation finalization. However, there was no further update as of the end of January 2024. The Head of Xaysomboun WRPO informed during the monthly meeting on 12 March 2024 that he is still working on the fishery regulation, and the FCMP was not submitted to the Head of Xaysomboun PAFO for approval. NNP1 EMO is asking the Head of Xaysomboun PAFO to approve the FCMP within April 2024. NNP1 will also request support from the Chairman of the Xaysomboun Watershed and Reservoir Protection Committee (WRPC) for the fishery regulation approval meeting to be organized in April or May 2024.
- Xaysomboun WRPO planned to continue with Total Protected Zone (TPZ), forest, and reservoir patrols in January 2024 after a monthly meeting among XSB WRPO, NNP1 EMO and BSP-WCS on 16 January 2024. However, because the Head of Xaysomboun WRPO and patrolling members were occupied with their internal assignments, the forest and reservoir patrols were rescheduling and conducted from 13 to 18 February 2024 and the TPZ from 24 February to 8 March 2024. The Head of Xaysomboun WRPO and the patrolling team discussed the patrolling results in February and March 2024 with the NNP1 EMO and Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS) during the monthly meeting on 12 March 2024. NNP1 EMO and BSP-WCS noted that the patrolling team was not well prepared for the discussion, there was no proper record from their observations, and they did observation surveys instead of law

enforcement. The Head of Xaysomboun WRPO informed the meeting that he is still working on the TOR of the special task force and could not clearly explain the structure of the special task force and operation plan. NNP1 EMO discussed with the Vice District Governor of Hom the staff assignment and operation of the Xaysomboun WRPO sub-office and the Special Task Force to deal with the threats in the NNP1 watershed and its TPZs on 27 March 2024 at the Hom District administrative office. The Vice District governor agreed with the NNP1 EMO on the need to operate the sub-office as soon as possible with the District WRPO as the key implementing unit per the MOM of September 2023. He also confirmed that the Hom District has sufficient resources for staff assignments and activities with the engagement of relevant district offices like District Agriculture and Forestry (DAFO), District Forest Inspection (DOFI), District Natural Resource and Environment (DONRE), District Energy and Mine Office (DEMO), District Public Work and Transport (DPWT), and District Military. He recommended that NNP1 organize a meeting about the WRPO's role and responsibility at the province and district levels, the operation of the Xaysomboun WRPO sub-office, and the Special Task Force establishment. He agreed with NNP1 EMO that the meeting should be among NNP1PC and the key persons, including the Chairman of the Xaysomboun Watershed and Reservoir Protection Committee (WRPC), the Head of Xaysomboun PAFO, the Vice District Governor of Hom and Thathom, the Head of DAFO of Hom and Thathom, and the Head of Xaysomboun WRPO. NNP1 EMO is preparing the MOM for the meeting held on 27 March 2024 for distribution to NNP1 management and FPF DOF-MAF, and will discuss the plan for the meeting with key persons in Xaysomboun Province internally.

- On 5 January 2024, the NNP1 EMO, Xaysomboun WRPO, and local contractor (from Ban Houayxai) inspected the items that needed fixing. The budget for fixing was finalized on 10 January 2024, and the local contractor started the work on 15 January 2024. The local contractor completed fixing the Xaysomboun WRPO sub-office on 15 February 2024. However, the Head of Xaysomboun WRPO did not purchase the small equipment and utilities as planned in January 2024 as of the end of March 2024. The staff assignment and installation of solar panels that were supposed to be ready on 15 February 2024, as confirmed by the Head of Xaysomboun WRPO, have not yet been carried out.
- On 5 January 2024, the NNP1 EMO, XSB WRPO, and the local contractor (from Ban Namkhien) revisited the location of the reservoir checkpoint. Construction will start after the contractor signs the contract with XSB WRPO. The head of Xaysomboun WRPO informed NNP1 EMO on 23 February 2024 that the local contractor (from Ban Namkhien) is still preparing the material for construction as of the end of February 2024. The construction has not yet started as of the end of March 2024, and the Head of Xaysomboun WRPO could not provide any reasons for it.

3.1.1.2 Bolikhamxay Watershed and Reservoir Protection Office (WRPO)

Bolikhamxay WRPO organized a monthly meeting on 18 January 2024. There were 9 participants in the meeting, including seven representatives from Bolikhamxay WPRO, one from BSP-WCS, and one from NNP1 EMO. The key discussion points are as follows:

- The Head of Bolikhamxay WRPO presented a brief report on patrolling work in November 2023. The patrol team found a hunting camp, rice plantation, and fishing area. All parties agreed to continue patrols along the reservoir from Houay Katha to zone 3 of TPZ1, and forest patrols will be carried out in Houay Xou.

- The head of Bolikhamxay WRPO informed the BSP-WCS and NNP1 EMO that coordination with Xaysomboun WRPO for joint work is difficult. He will report this issue to the members of the ADB-IAP mission in the last week of January 2024 to seek recommendations on how to deal with the forest encroachment within the NNP1 watershed because most of the villagers involved or offenders are from Xaysomboun Province.

Bolikhamxay WRPO and BSP-WCS conducted outreach campaigns at nine villages within and nearby the NNP1 watershed area from 5-19 February 2024, including Bor, Nahan, Phonsong, Phon Ngeang, Phonxay, Phadai, Phouhomxay, HatGnuin, and Thaheua. Bolikhamxay WRPO carried out forest and reservoir patrolling from 28 February 2024 to 8 March 2024. Because of the unavailability of the provincial and district members of WRPO in March 2024, the results of the patrolling will be discussed in the first week of April 2024.

3.1.1.3 NNP1PC EMO

NNP1 EMO discussed with the Thathom and Hom District Agriculture and Forestry Office (DAFO) the preparation of activities for 2024, referring to the 5-year action plan for strengthening the capacity of local producers at the end of January 2024. Thathom and Hom District Agriculture and Forestry Office (DAFO) submitted the draft plan for 2024 activities to NNP1 EMO on 7 and 9 February 2024, respectively. EMO reviewed the plan on 15 February 2024, and it was finalized on 29 February 2024.

In January 2024, NNP1 EMO and Thathom DAFO handed over the greenhouse material to two households at Ban Phonhom in addition to those planned for 2023. In addition, NNP1 EMO and Thathom DAFO also monitored the greenhouse products. The team noted that they earned additional income from selling their crops, around 2 million kips per household from January to February 2024.

NNP1 EMO and Thathom DAFO organized a consultation meeting to establish the farmer groups (Kai Noy rice and handicraft) in Phonhom and Nahong Village on 27-28 March 2024. Thathom DAFO will issue an official letter on the establishment of the farmer groups, and the activity will be implemented starting in April 2024 as per the 2024 plan.



Consultation meeting at Phonhom Village on 27 March 2024



Figure 3-1: Representative photos of consultation meetings to establish the farmer groups in Thathom District from 27 to 28 March 2024.

ADB shared a draft letter on the No Net Loss (NNL) issue to the NNP1PC on 16 January 2024. After review and further communication between NNP1PC and ADB, it was noted during the joint ADB-IAP-LTA mission in the last week of January 2024 that the letter would be submitted in February 2024. ADB and JBIC issued separate letters to the Ministry of Planning and Investment (MPI) and the Ministry of Energy and Mine (MEM) on 20 February 2024. ADB and JBIC met with the Minister of Ministry of Energy and Mine (MEM), Ministry of Planning and Investment (MPI), and Ministry of Forest (MOF) as well as the relevant Director Generals (DG) and Deputy Director Generals (DDG) on 15 March 2024. Some of the key points from the discussion:

- All ministers acknowledged CA's priority over PM Decrees (and ADB also sought legal advice and confirmed that the GOL CA supersede the PM Decrees).
- All ministers were supportive and committed to discussing internally to solve the issues.
- MPI will coordinate with relevant GOL offices and brief the PMO on the issues.

NNP1PC will closely follow up on the discussions above with relevant GOL parties, including at the central, provincial, and district levels, with a sincere attitude to support the implementation of activities and solve the issues.

The progress of actions to deal with the pending issues under the NNP1 Watershed and Biodiversity Program is summarized in **Table 3-1**.

TABLE 3-1: THE ACTION TAKEN UNDER THE NNP1 WATERSHED AND BIODIVERSITY PROGRAM

No.	Actions	Target date	Status as of March 2024
1	Specific activity under WMP and NC-NX BOMP		
a	The Law Enforcement Strategy for the NNP1 sub-catchment will adapt or learn from the NC-NX Law Enforcement Strategy and the strategy	Q2 2022 (original) Q2 2023 (new)	Completed for the NC-NX offset site Delayed for the NNP1 watershed: There was no further discussion on the Law Enforcement Strategy (LES) document in the first quarter 2024. It is expected to be further delayed until Xaysomboun WRPO is restructured.
b	The operation of the Xaysomboun WRPO sub-office at Hom District	Jan 2022 (original) Q2 2023 (new)	Delayed The Head of Xaysomboun WRPO committed during the joint ADB-IAP-LTA mission in January 2024 that the operation of the sub-office will start on 15 February 2024. However, there is no official document for the staff assignment at the XSB WRPO sub-office and no specific timeline for its operation, as noted during the monthly meeting on 12 March 2024. NNP1 EMO discussed the staff assignment and operation of the Xaysomboun WRPO sub-office with the Vice District Governor of Hom on 27 March 2024. The Vice District governor agreed to operate the sub-office as soon as possible with the District WRPO as the key implementing unit per the MOM of September 2023. He also confirmed that the Hom District has sufficient resources for staff assignments and activities with the engagement of relevant district offices. He recommended that NNP1 organize a meeting about the WRPO's role and responsibility at the province and district levels and the operation of the Xaysomboun WRPO sub-office among NNP1PC and the key persons, including the Chairman of the Xaysomboun Watershed and Reservoir Protection Committee (WRPC), the Head of Xaysomboun PAFO, the Vice District Governor of Hom and Thathom, the Head of DAFO of Hom and Thathom, and the Head of Xaysomboun WRPO.
c	Checkpoints in the NNP1 sub-catchment	Dec 2020 (original) Q2 2023 (new)	Delayed The head of Xaysomboun WRPO informed NNP1 EMO on 23 February 2024 that the local contractors are still preparing the material for construction as of the end of February 2024. The construction has not yet started as of

			the end of March 2024, and the Head of Xaysomboun WRPO could not provide any reasons for it.
d	TPZ demarcation in the NNP1 watershed	Jan 2022 (original) Q2 2023 (new)	Delayed • There were no further updates since last quarter's reporting.
e	Reservoir fishery management	Jan 2022 (original) Q2 2023 (new)	Delayed • NNP1 EMO is asking the Head of Xaysomboun PAFO to approve the FCMP within April 2024. NNP1 will also request support from the Chairman of the Xaysomboun Watershed and Reservoir Protection Committee (WRPC) for the fishery regulation approval meeting to be organized in April or May 2024, and the NNP1 EMO will revert to the draft regulation that was already agreed upon in 2020.

3.1.2 Preparation of Annual Implementation Plan (AIP) 2023

3.1.2.1 Xaysomboun WRPO

The Forest Protection Fund (FPF) of the Department of Forestry (DOF) of the Ministry of Agriculture and Forestry (MAF) submitted the official fund disbursement request for the Xaysomboun AIP2023 to NNP1PC on 4 January 2024. NNP1 EMO noted a missing document, and they returned it to NNP1 EMO on 8 January 2024. NNP1PC transferred the funds to FPF DOF-MAF on 25 January 2024 and requested Xaysomboun WRPO to closely follow up with FPF DOF-MAF. The FPF DOF-MAF informed that the funds were transferred to Xaysomboun WRPO on 22 March 2024.

3.1.2.2 Bolikhamxay WRPO

Bolikhamxay WRPO received the second two-quarter funds under the approved Bolikhamxay Annual Implementation Plan (AIP) 2023 from the FPF DOF-MAF on 20 October 2023, a total of 583,688,000 LAK, of which 163,490,000 LAK is from the NNP1 NNL source and 420,198,000 is from the GOL CA source.

3.1.3 Preparation of Annual Implementation Plan (AIP) 2024

3.1.3.1 Xaysomboun WRPO

NNP1 EMO noted during the monthly meeting on 16 January 2024 that the Head of Xaysomboun WRPO does not yet have a plan to discuss internally with his team to prepare their AIP2024. The Head of Xaysomboun WRPO did not confirm the AIP2024 preparation during the joint ADB-IAP-LTA mission on 24 January 2024. He was not available in February 2024 either.

NNP1 EMO proposed during the monthly meeting with Xaysomboun WRPO on 12 March 2024 to postpone the discussion on the AIP 2024 preparation until the Head of Xaysomboun WRPO has a clear plan to deal with outstanding issues. NNP1 EMO also pointed out the risk in fund utilization because more than 3 billion LAK remain in the budget from the AIP 2020, 2022, and 2023. The Head of Xaysomboun WRPO agreed with the proposal.

3.1.3.2 Bolikhamxay WRPO

The Bolikhamxay WRPO finalized their AIP2024 on 4 January 2024. NNP1 EMO translated it into English and submitted it to ADB and IAP on the same day. ADB and IAP confirmed during the discussion with NNP1PC on 22 January 2024 and the meeting with the Bolikhamxay WRPO that they will revert to NNP1 EMO after the joint mission of ADB-IAP-LTA. The IAP and ADB approved Bolikhamxay WRPO AIP2024 on 4 February and 5 March 2024, respectively. BLX WRPO submitted the fund disbursement request letter to FPF-DOF-MAF on 11 March 2024.

3.2 BIODIVERSITY OFFSET MANAGEMENT

3.2.1 Implementation of Biodiversity Offset Management Plan

Progresses on the implementation of activities by Component are described below:

a. Component 1 - Spatial Planning and Regulation

BSP-WCS shared the revised Participatory Land Use Planning (PLUP) report of Vangphieng Village to NNP1 EMO and BOMU on 29 November 2023. NNP1 EMO, BOMU, and BSP-WCS discussed the revised report in the third week of December 2023. The meeting to present the results to Bolikhamxay PAFO, Viengthong district and the three village authorities was organized on 19 January 2024. The results from the meeting are summarized as follows:

1. BOMU, with the technical support from BSP and NNP1-EMO, to work further with the Village Cluster Police to solve the pending issue of the shared village administrative boundary between Vangphieng and Na Gngang and Na Gang and Natan as soon as possible;
 2. The village authorities should raise awareness among the villagers on the allocated zoning relevant regulations, as well as take ownership in monitoring the land use and forest encroachment;
 3. The installation of signage for the zonings should be carried out as soon as possible after the village PLUP approval;
 4. Vangphieng village authorities proposed an additional area to be included in the village PLUP as a rice paddy field, the area is around 15-20 hectares and could serve as a rice paddy field for 15 families. However, the PLUP team will further check more detailed information about the area.
- The meeting noted that the Lao Landscape and Livelihood (LLL) project is also reviewing and updating the village PLUP in Viengthong and Xaychamphone. Thus, the PLUPs of LLL and NC-NX should be aligned, which means that either project can use the information from the other. In addition, both projects should organize regular progress-sharing meetings/discussions quarterly and biannually.

BOMU and BSP-WCS discussed the shared village administrative boundary issue with the village authorities of Vangphieng, Na Gngang, and Natan, and they all agreed to follow the village boundaries delineated under the PLUP in 2011. On 4 March 2024, BSP-WCS shared the PLUPs report of the three villages with BOMU and NNP1 EMO. NNP1 EMO provided comments and reverted to BSP-WCS on 7 March 2024.

b. Component 2 – Enforcement

The January, February, and March 2024 patrolling was conducted from 8 to 27 January 2024, 5 to 24 February 2024, and 4 to 23 March 2024, respectively, focusing on the TPZ's highest and high priority area. BOMU also conducted joint patrolling with the Pu Mat National Park team from 13 to 26 January 2024. BOMU is finalizing the patrolling data for March 2024, which is expected to be completed after the Lao New Year Holiday in the second week of April 2024. Therefore, the result will be elaborated on in the second quarter report.

The results of patrolling in during January and February 2024 are as follows:

Team	Patrolling Area/Distance	Observations/Actions Taken
1	8-27 January 2024 Along Lao-Vietnam border at the northern part of NC-NX Biodiversity Offset Site. (6 days and covered 36 Km distance on forest patrolling). 5-24 February 2024 TPZ highest priority area covering Nam Xi, Houay Pong, Houay Xay Gnai and mountain ridges close to and along LENS2 project boundary. (16 days and was able to cover 83 Km on distance forest patrolling).	8-27 January 2024 The team collected and destroyed five camps and four snare lines with a total of 69 small and two big wire snares. The team identified that the observed threats are from both Vietnam and Lao poachers. 5-24 February 2024 The team found and destroyed a fresh fishing camp at Nam Xi, an NTFP collection road and a camp, observed two villagers entering into TPZ area at Nam Xi to explore and collect NTFP, but the team stopped them and made written warnings to them including suggesting them to return.

Team	Patrolling Area/Distance	Observations/Actions Taken
2	8-27 January 2024 TPZ highest priority area covering Nam San, Nam Chouan, Houay Payang and Houay Kokhai. (16 days and was able to cover 64 Km on distance forest patrolling). 5-24 Feb 2024 TPZ highest priority area covering Nam San, Houay Phai and Houay Hree. (14 days and was able to cover 34 Km on distance forest patrolling).	8-27 January 2024 The team observed a group of eight people while they were surveying NTFP for collection at Nam Chouan but the group ran away and could not be arrested by the patrol team. 5-24 Feb 2024 The team observed three Na Gngang villagers while collecting NTFP (berberine) at Houay Hree (inside TPZ) and the team verbally warned them and recommended them to move out from TPZ boundary immediately. Three other people were observed close to Nam San (outside TPZ) while they were collecting NTFP, but they escaped and the team only observed some knives, axes, and NTFP (berberine) with a total of around 10 kg. At Nam San, a recent fireplace for NTFP collection was observed at north mountain ridge of Nam San and a trail for NTFP collection was recorded close to Nam Chouan (inside TPZ).
3	8-27 January 2024 Nam Ma TPZ high priority area covering Nam Ma, Nam Mong and Nam Pang. (16 days and was able to cover 53 Km on distance forest patrolling). 5-24 Feb 2024 TPZ highest priority area covering Nam Chouan, tributaries and some mountain ridges in the western of Nam Chouan close to the LENS2 project boundary. (14 days and was able to cover 64 Km on distance forest patrolling).	8-27 January 2024 The team observed and destroyed one hunting camp and one fireplace for fishing at Nam Pang, one fishing camp and one fireplace for fishing at Nam Ma. 5-24 Feb 2024 The team encountered two NTFP collection camps with two groups of nine people with two guns, a truck and a new road for NTFP collection along the mountain ridge between NC-NX TPZ and LENS2 project boundary. The team made two written warnings to them and recommended them to return or move out immediately. The team observed around 300 kg of cut berberine close to Nam Chouan, a Spent Cartridge and a few bamboo rafts at Nam Chouan (inside TPZ), two groups of five people and 280 kg of berberine in different locations at Nam Chouan and the team also made two written warnings to the groups and recommended them to return or move out from there immediately.
4	8-27 January 2024	8-27 January 2024

Team	Patrolling Area/Distance	Observations/Actions Taken
	TPZ highest priority area covering Nam Xi, Houay Pong, Houay Xay Gnai and Houay Xay Noi. (16 days and was able to cover 78 Km on distance forest patrolling). 5-24 Feb 2024 Nam Ma TPZ high priority area covering Nam Ma, Nam Phai and Nam Sa Nga. (14 days and was able to cover 72 Km on distance forest patrolling).	The team observed and recorded one hunting camp and two newly trails cut for NTFP collection at Nam Xi but did not observe any people. 5-24 Feb 2024 The team observed and destroyed one hunting camp at Nam Sa Nga, two trails cut for NTFP collection at Nam Ma and a hunter with the gun at Nam Phai but the hunter escaped and the patrol team only confiscated the gun.

FIGURE 3-2: MAP OF PATROLLING TRACK IN THE FIRST QUARTER 2024

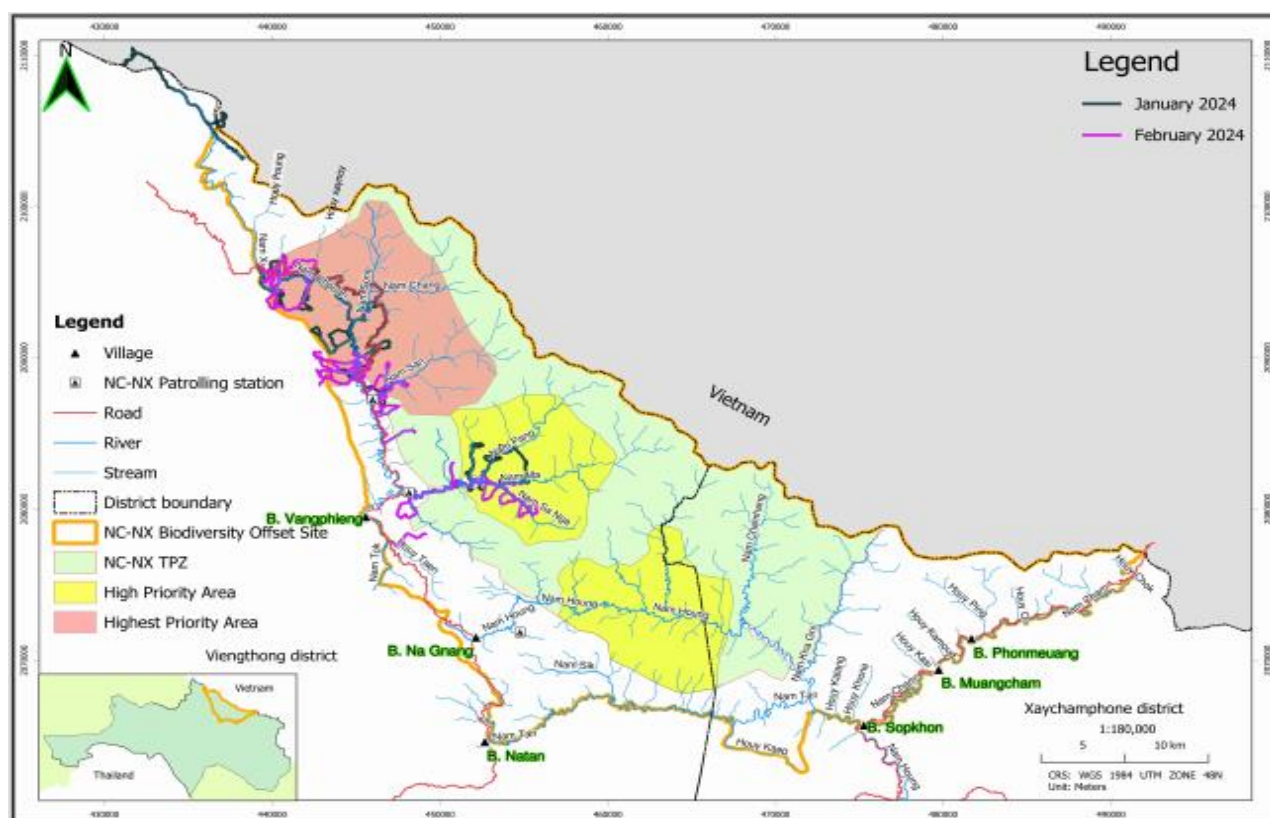


Figure 3-3: Map of threats in the First Quarter 2024

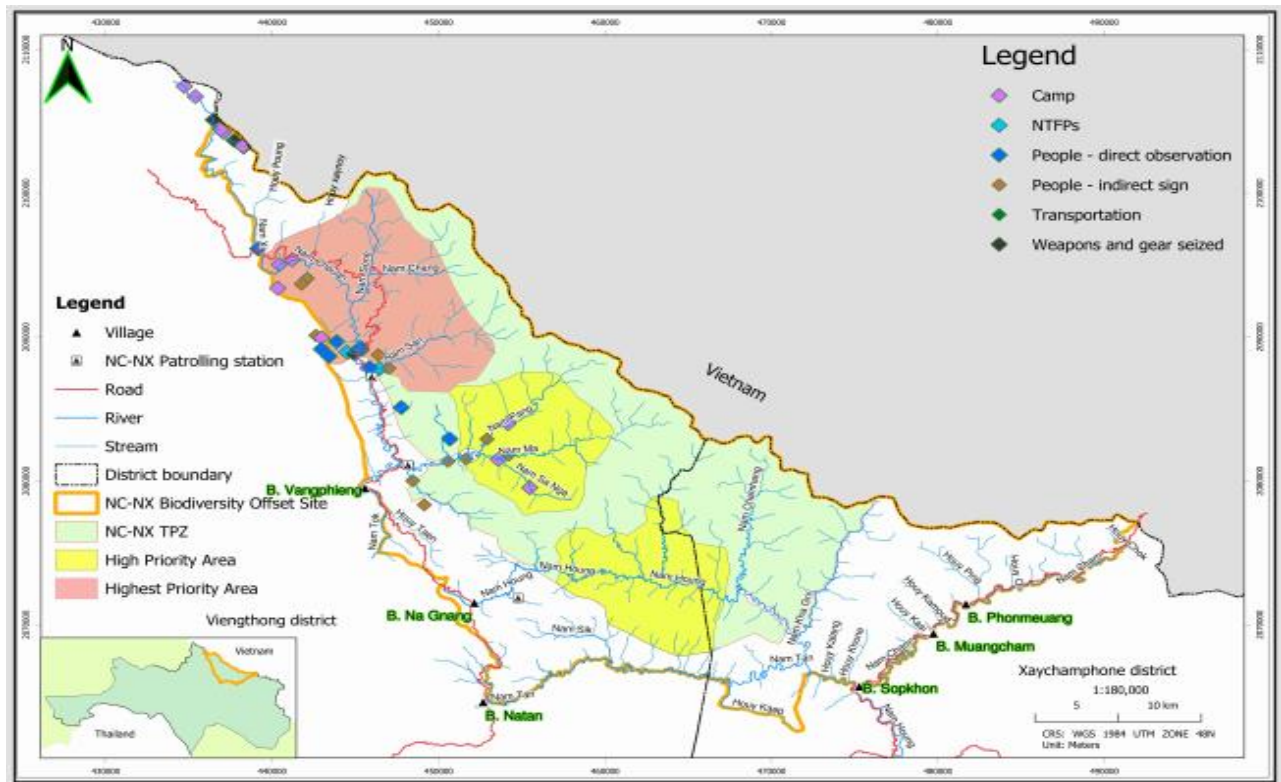
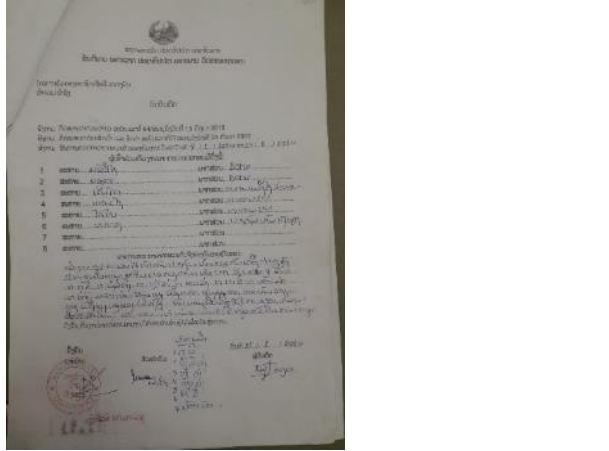
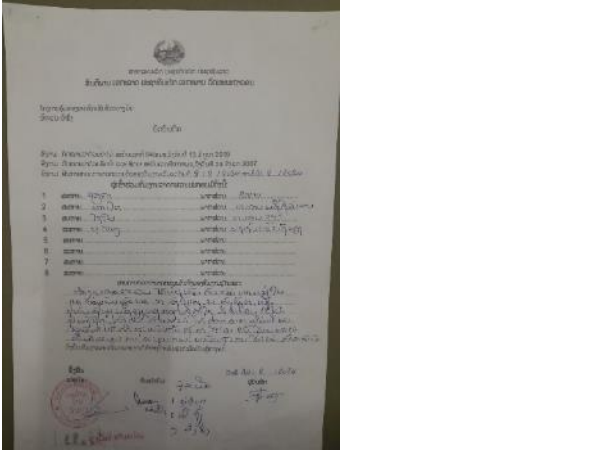


Figure 3-4: REPRESENTATIVE PHOTOS FOR MONTHLY PATROLLING IN THE FIRST QUARTER 2024



Snares collected by NC-NX and Pu Mat team	Fishing camp destroyed by Team 3 at Nam Ma
	
Written warning to villagers while they were entering NC-NX TPZ for NTFP collection at Nam Xi, found by team 1 in February 2024	An active NTFP collection camp at the west mountain ridge of Nam Xi (insite TPZ and close to LENS2 project boundary), found by team 1 in February 2024
	
Berberine at Nam San found by team 2 in February 2024	Three people collected berberine at Houay Hree found by team 2 in February 2024
	
Group of people collected berberine at mountain ridge (LENS2 boundary) found by team 3 in February 2024	Making a written warning to people collected berberine at mountain ridge (LENS2 boundary) by team 3 in February 2024

	
Hunting camp at Nam Sa Nga found by Team 4 in February 2024	A rifle found by Team 4 at Nam Phai in February 2024
	
Written warnings to the groups of people on the field in February 2024	

In March 2024, BOMU improved the Na Ghang substation by extending the structure's size and replacing the wall with wooden planks. The construction of the Nam Ma permanent substation was completed while all the materials of the Nam San permanent substation were transported to the site. The construction of the Nam San permanent substation is expected to be completed in April 2024.

		
Na Ghang sub-station	Nam Ma sub-station	Nam San sub-station

c. Component 3 – Conservation Outreach

BSP re-submitted the revised outreach report under the AIP2022 that was conducted in April 2023 to NNP1-EMO and BOMU on 24 January 2024, and it was finalized on 1 February 2024. BSP-WCS, BOMU and NNP1 EMO met Viengthong and Xaychamphone District Education and Sport Office

(DOES) on 8 and 9 February 2024, respectively, to present and discuss the concept for the school outreach program. The discussion is summarized as below:

- Both Viengthong and Xaychamphone District Education and Sports Offices are willing to support the program;
- It was agreed that the program should not be included in the school teaching-learning curriculum, so it does not need to obtain acknowledgment from the Ministry of Education and Sport (MOES);
- Once BSP has drafted the program, a meeting with relevant offices, including the Bolikhamxay Provincial Department of Education and Sport (POES), Viengthong and Xaychamphone DOES and the teachers from the target schools as needed. The objective of the meeting is to discuss and agree on the designed activities, materials, implementation, and monitoring.

BSP-WCS is still preparing the content and materials for the school outreach program as of the end of March 2024.

d. Component 4 – Conservation linked livelihood

Viengthong and Xaychamphone DAFOs have officially approved the livestock-raising groups. Training for them in Vangphieng, Na Gngang and Natan villages was conducted from 13-22 February 2024, and the training for Sopkhone, Meungcham and Phonmeung villages was conducted from 26 Feb-4 Mar 2024. NNP1 EMO observed that not many villagers attended the training because most of them were doing NTFP collection or cassava planting and harvesting. BOMU and BSP-WCS are preparing the training report as of the end of March 2024.

BSP-WCS shared the draft Community Conservation Agreement (CCA) with NNP1 EMO and BOMU on 7 February 2024. NNP1 EMO and BOMU reviewed the draft and provided some comments, which they reverted back to BSP on 24 February 2024. BSP-WCS is updating the draft as of the end of March 2024.

There was no monthly snare removal for January 2024 because of the rain and team's availability. The February 2024 monthly snare removal was conducted from 2 to 16 February 2024 at the upstream of Nam Sone. The March 2024 monthly snare removal was conducted from 7 to 21 March 2024 at Nam Chang.

e. Component 6 – Monitoring and reporting

The gibbon survey started on 11 December 2023 and was completed on 3 January 2024. Three teams completed all the planned listening posts, while one team could not complete one of the listening posts because one of the team members got sick, so the team had to return from the field earlier than expected. However, the team surveyed the incomplete listening post during the otter survey from 26-29 March 2024.

All camera traps were retrieved from 27 January to 14 February 2024. NNP1 EMO shared the compiled camera trap data with BSP-WCS at the end of March 2024 for analysis and reporting.

The otter survey training was conducted from 21-25 March 2024. The field survey started on 26 March 2024 and is expected to be completed on 8 April 2024.

3.2.2 Preparation of Annual Implementation Plan (AIP) 2024

BSP-WCS drafted the list of activities for the BOMU AIP2024 on 8 November 2023. NNP1 EMO reviewed it on 14 November 2023. BSP-WCS revised the list and shared it with BOMU on 14 November 2023. BOMU submitted the draft AIP2024 to NNP1 EMO on 19 February 2024 and it was reviewed by NNP1 EMO on 22 February 2024. The draft was discussed during the monthly meeting

on 29 February 2024. BOMU revised the draft AIP2024 two times on 4 March 2024 following the review by the NNP1 EMO and BSP-WCS. Another review and revision were made on 5 and 13 March 2024. The draft was finalized on 14 March 2024 and submitted to ADB and IAP for their review and approval on 19 March 2024.

4 FISHERY MONITORING

Three species groups and two species dominated the fish catch by weight in Q1 2024 as listed in **Table 4-1**. All species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species¹, except *Sikukia gudgeri* is classified as Data Deficient (DD) and *Oreochromis niloticus* is an exotic species.

TABLE 4-1: FISH SPECIES DOMINATING THE FISH CATCH IN Q1 2024

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Oreochromis niloticus</i>	ປານິນ	344.3	LC
<i>Hampala dispar</i> , <i>Hampala macrolepidota</i>	ປາສຸດ	295.8	LC
<i>Poropuntius normani</i> , <i>Poropuntius laoensis</i> , <i>Poropuntius carinatus</i>	ປາຈາດ	325.2	LC
<i>Sikukia gudgeri</i> , <i>Amblyrhynchichthys truncatus</i>	ປາຂາວຊາຍ	216.1	DD, LC
<i>Scaphiodonichthys acanthopterus</i>	ປາມ້ອມ	145	LC

The recorded catch of Threatened species (IUCN Red List classification) in Q1 2024 are presented in **Table 4-2**. The list includes two species are classified as Vulnerable species (VU).

Table 4-2: Threatened Species of Q1 2024 Fish Catch

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Scaphognathops bandanensis</i>	ປາປຽນ/ປາວຽນໄຟ	53	VU
<i>Tor sinensis</i>	ປາແດງ	27.2	VU

The occurrence of Threatened species in the fish catch by quarter since the start of species identification in Q1 2015 is displayed in **Table 4-3** based on the 7-day reported catch from the Daily Catch Logbook (DCL) survey. *Tor sinensis* was found in US, UR and DS areas and *Scaphognathops bandanensis* was found in DS. These two species have recorded from Q3 2015 to Q1 2024. This data is based on fish local name and linked to the scientific name that we recorded in our database and this table not include the data of Mekong zone. We also checked with the household who recorded it but we could not confirm that the fishers can identify correct or not. *Bangana behri* is recorded by fishers in Hat Gnuin where is the same as before (impoundment). Also, we requested them to take some photos and share us when they get next time for clarification. Others like *Probarbus labeamajor* and *Probarbus jullieni* are usually recorded by the fishers in the Mekong zone and they are found in Nam Ngiep, Downstream area that it is possible.

In addition to issues with identification by fishers and some species only reported from the Mekong zone, the occurrence of threatened species is declining across the Mekong basin, due to impacts from water management and human induced changes to key habitats. This will affect their occurrence in the DS area of Nam Ngiep basin except when there are breeding populations in the Nam Ngiep basin. The results indicate that three endangered species, *Luciocyprinus striolatus*, *Probarbus labeamajor* and *Probarbus jullieni* are no longer caught in the Nam Ngiep basin after

2017-2018. Possibly even earlier, because the most recent report for *Luciocyprinus striolatus* was based on a reported catch of a group of juveniles, which are difficult to identify with certainty. The population of *Luciocyprinus striolatus* was affected by the 2018 Nam Ao dam break when in the aftermath several individuals were found dead. Some vulnerable species seem to become rarer in the basin, while other species are still occasionally found, where breeding populations are likely, e.g. *Tor Sinensis*. This species, alongside *Scaphognathops bandanensis* and *Cirrhinus cirrhosis* (which by the way is an introduced species), are doing well in the basin and probably have breeding populations.

TABLE 4-3: OCCURRENCE OF THREATENED SPECIES IN THE FISH CATCH

Species	Q3 2015	Q4 2015	Q1 2016	Q2 2016	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022	Q2 2022	Q3 2022	Q4 2022	Q1 2023	Q2 2023	Q3 2023	Q4 2023	Q1 2024			
<i>Bangana behri</i> (VU)	+	+	+	+	+	+	+	+	+			+	+	+		+																		+				
<i>Cirrhinus cirrhosus</i> (VU)	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+		+	+	+		+		+	+	+	+	+	+	+	+		+				
<i>Datnioides undecimradiatus</i> *																+																						
<i>Epalzeorhynchos munense</i> (VU)												+																										
<i>Luciocyprinus striolatus</i> (EN)	+	+	+	+			+	+	+	+			+	+																								
<i>Pangasianodon hypophthalmus</i> (EN)	+																																					
<i>Probarbus jullieni</i> (EN)	+	+	+			+		+	+	+		+		+			+	+			+	+				+												
<i>Probarbus labeamajor</i> (EN)				+	+			+																										+				
<i>Scaphognathops bandanensis</i> (VU)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			
<i>Tor sinensis</i> (VU)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+			
* <i>Datnioides undecimradiatus</i> was caught in Mekong by DS households																																						

Species abundance and occurrence is based on the 7-day reported catch from the DCL survey in Q1 2024. The catch is divided in 3 areas including above the main dam, below the main dam and Mekong area. Main biodiversity indicators in Q1 2024 for above dam, below dam and Mekong area are presented in **Table 4-4** and the Shannon biodiversity index has been calculated (the higher the value, the higher the diversity of species).

TABLE 4-4: MAIN BIODIVERSITY INDICATORS FOR Q1 2024

Biodiversity Indicators	Mekong	Below dam	Above dam
Total species and groups	25	44	39
Single species	19	29	27
Species groups	6	15	12
Top 15 species (% total catch weight)	96.00%	80.29%	91.96%
Proportion for species groups	6.12%	55.29%	46.23%
Diversity index (Shannon)	2.1645	3.0508	2.5529

FIGURE 4-1 shows fish diversity index (Shannon) for above dam, below dam and Mekong area from July 2015 to March 2024.

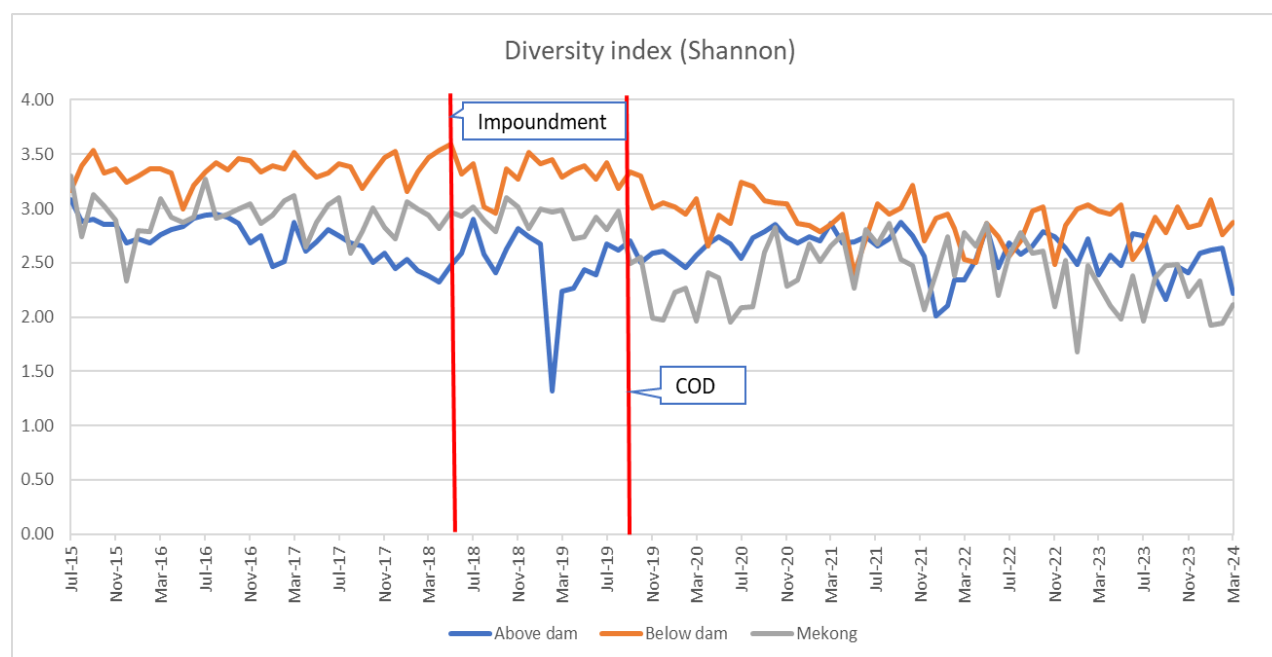


FIGURE 4-1: FISH DIVERSITY INDEX (SHANNON) BY FISHING ZONE FROM JULY 2015 TO MARCH 2024

The mean daily fish catch per household from July 2015 to March 2024 is displayed in **Figure 4-2** and the mean fish catch per household per fishing day for Q1 from 2016 to 2024 are shown in **Table 4-5**.

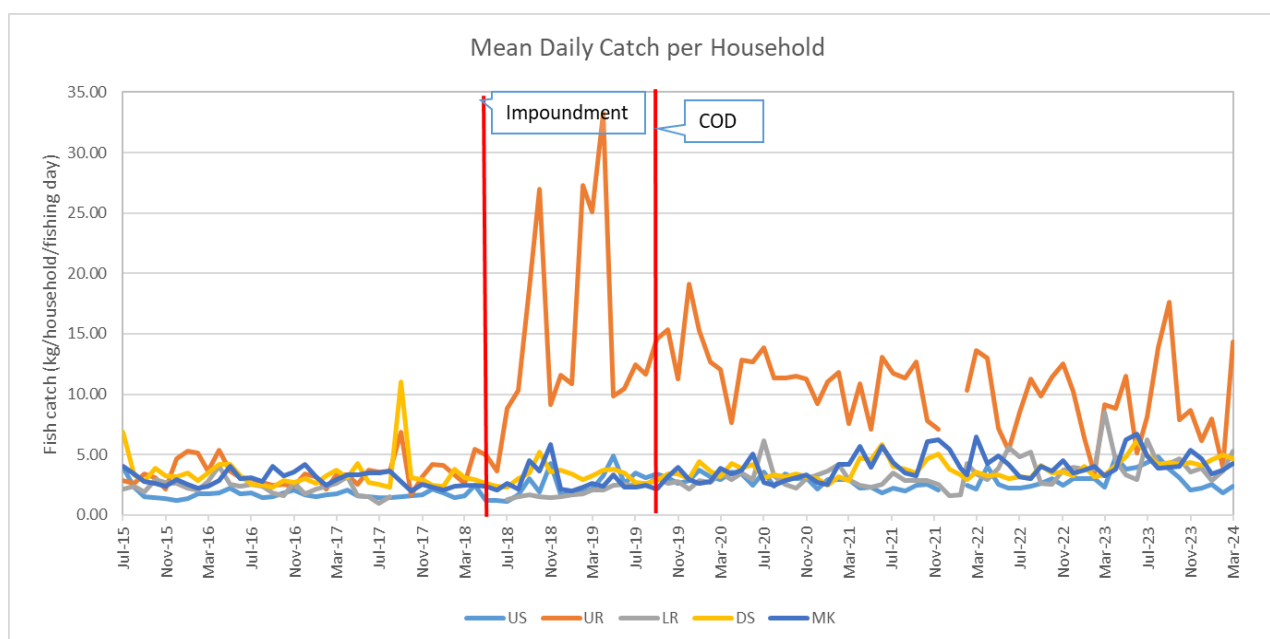


FIGURE 4-2: MEAN DAILY FISH CATCH PER HOUSEHOLD FROM JULY 2015 TO MARCH 2024

TABLE 4-5: MEAN DAILY FISH CATCH PER HOUSEHOLD FOR Q1 FROM 2016 TO 2024

Fishing Zone	Q1 2016 (kg)	Q1 2017 (kg)	Q1 2018 (kg)	Q1 2019 (kg)	Q1 2020 (kg)	Q1 2021 (kg)	Q1 2022 (kg)	Q1 2023 (kg)	Q1 2024 (kg)
Upstream	1.62	1.64	1.62	1.95	3.27	2.92	2.32	2.77	2.25
Upper reservoir	4.70	2.90	3.36	21.08	13.35	10.15	11.99	6.33	8.76
Lower reservoir	2.37	2.40	NA	1.85	3.01	3.58	3.11	5.38	3.95
Downstream	3.26	3.16	3.08	3.19	3.75	2.83	3.29	3.51	4.74
Mekong	2.36	2.86	2.32	2.30	3.11	3.63	4.57	3.66	3.80

The survey results in Q1 2024 indicate that Nam Ngiep is the main fishing habitat for the upstream and downstream zones, while the main fishing habitat for the upper reservoir, lower reservoir and Mekong zones are the reservoir, tributaries and streams, and Mekong respectively. The proportion of fishing habitats in Q1 2024 are displayed in **Table 4-6**.

Table 4-6: Proportion of the catch reported by main habitats (%) in Q1 2024

Habitats	US	UR	LR	DS	MK
Mekong	0.0%	0.0%	0.0%	3.3%	92.9%
Nam Ngiep	53.5%	25.6%	0.0%	48.0%	0.0%
Nam Xan	0.0%	0.0%	0.0%	0.0%	0.0%
Reservoir	7.8%	71.2%	12.2%	0.0%	0.0%
Tributary and stream	38.7%	3.2%	87.2%	44.2%	0.0%
Wetland	0.0%	0.0%	0.6%	4.1%	7.1%
Others	0.0%	0.0%	0.0%	0.3%	0.0%

OAA catch has reduced since 2018 when the fish catch has increased, so the proportion of OAA has declined. For DS, the total catch of fish and OAA not much different. It is mainly optics because of the presentation using percentage of the total fish + OAA catch. Still, OAA catch is more dependent on flooding circumstances, as most species are less mobile than fish. The trend for the reported amounts for US and LR seems to be downward and upward for DS. This could have to do with changes in discharge by dams or climate induced changes to precipitation. Total reported fish and other aquatic animal (OAA) catch (proportion of OAA) for the same 7-day period in Q1 from 2016 to 2024 are shown in **Figure 4-3**.

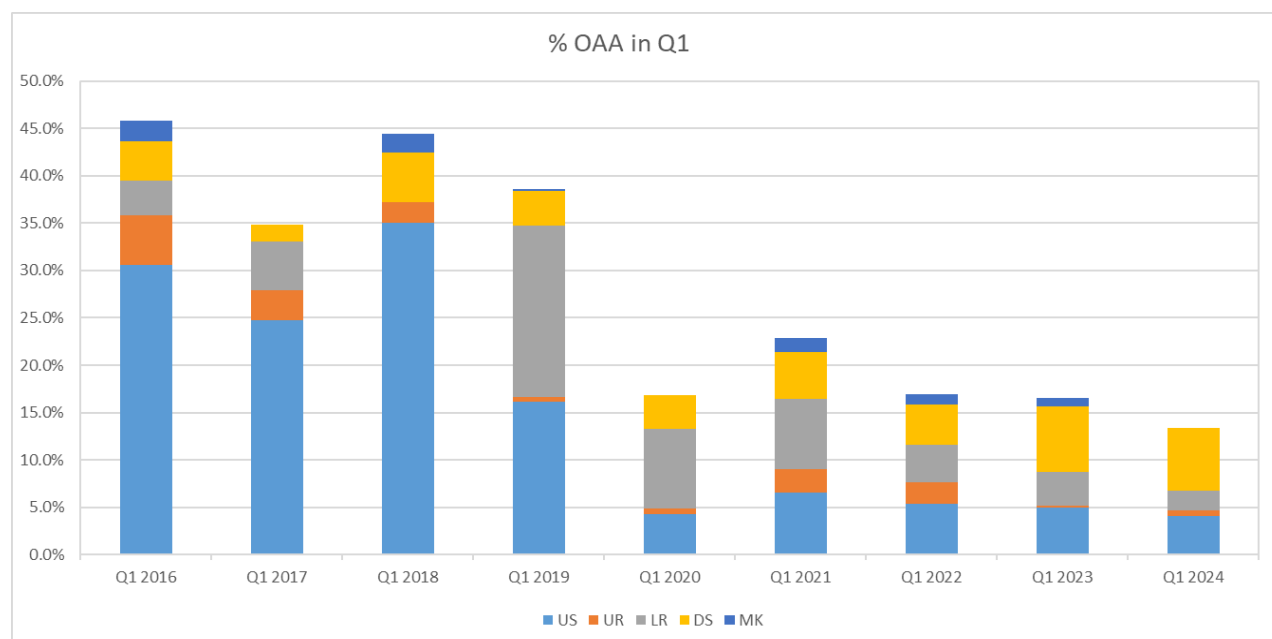


FIGURE 4-3: PROPORTION OF OAA TO THE TOTAL REPORTED KILOGRAM (KG) OF FISH AND OAA FOR A 7-DAY PERIOD BY FISHING ZONE IN Q1 FROM 2016 TO 2024

5 Health and Safety

5.1 RELATED TO NNP1PC HEALTH AND SAFETY

A summary of the safety incidents reported during the Construction Phase (up to the end of August 2019) are provided in the *Q4 2020 Environmental Monitoring Report (October to December 2020)*.

A summary of the safety incidents reported during the Operation Phase (September 2019 to March 2024) are provided in **TABLE 5-1**.

TABLE 5-1: SAFETY INCIDENTS REPORTED DURING THE OPERATION PHASE (SEPTEMBER 2019 TO MARCH 2024)

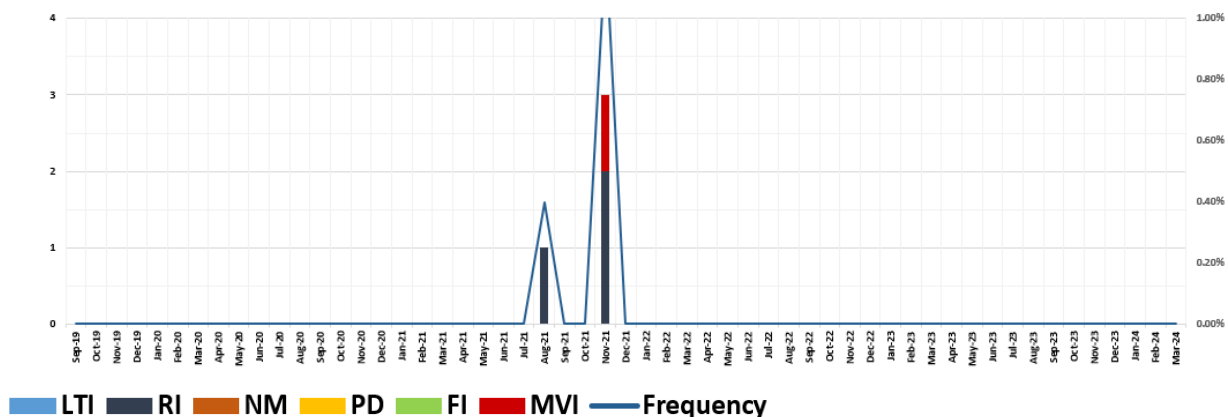
Type of Incidents	LTI	RI	NM	PD	FI	MVI	Total
No. of Incidents in Q1, 2024	0	0	0	0	0	0	0
Cumulative Total Incidents to 31 March 2024	0	3	0	0	0	1	4

LTI: Lost Time Incident; RI: Recordable Injury; NM: Near Miss; PD: Property Damage; FI: Fire Incident; MVI: Motor Vehicle Incident

There were no incidents or accident reported in Q1 2024.

The histogram below in **Figure 5-1** shows the number of reported incidents in each month since the start of the Operation Phase (September 2019) with the colour indicating the type of incident including near misses. The graph superimposed on the histogram shows the frequency of incidents, including reported near misses, with the number of incidents occurring each month expressed as a percentage of the total number of Project workers employed in each month being the total man-months.

All reported incidents that have involved the Owner and its Contractors and Subcontractors are included in the histogram and shown graphically below.



LTI: Lost Time Incident; RI: Recordable Injury; NM: Near Miss; PD: Property Damage; FI: Fire Incident; MVI: Motor Vehicle Incident

FIGURE 5-1: NUMBER, TYPE AND FREQUENCY OF SAFETY INCIDENTS FROM SEPTEMBER 2019 TO 31 MARCH 2024

The second histogram in **Figure 5-1** shows the number of persons who were injured, or lost their lives in the reported Lost Time Incidents.

Since Q4 of 2021, two cases of Recordable Injury (RI) and one case of Motor Vehicle Incident (MVI) have been recorded.

There were no health and safety incidents in Q1 2024.

5.1.1 Health and Safety Training and Emergency Drills in the Project site

Safety inductions were conducted in Q1 2024 for the contractor's newcomer staffs (XPC+DLC at 2UR, Xangphuak Clinic, PKCC, EGAT M, and HM-Hydro-LILAMA 10).

The main objectives of the safety induction are to let the contractor and local labours understand the general measures for safety and assistance, including awareness of high slopes, sharp bamboo or trees, dangers from snakes, bees and wasps, dehydration while working in heat weather, safe condition of hand tools, communication each other while working in difference level of ground while doing the work.

No emergency drill was conducted in Q1 2024.



FIGURE 5-2: REPRESENTATIVE PHOTOS OF THE SAFETY INDUCTION DURING Q1 2024

5.2 RELATED TO COVID-19

The country officially opened in September 2022. However, NNP1PC still encourages COVID-19 countermeasures which include basic precautions of personal hygiene practices by frequent washing hands with alcohol-based gel, mask wearing in the workplace as well as avoiding mass gathering.

5.2.1 NNP1PC COVID-19 Measures

General Instructions:

- All staff are requested to strictly follow preventative measures against COVID-19 such as:
 - keeping physical distance of at least 1 meter from others, even if they do not appear to be sick;
 - avoiding the 3Cs, spaces that are closed, crowded or involve close contact;

- wearing a properly fitted mask when physical distancing is not possible and in poorly ventilated settings;
- cleaning the hands frequently with alcohol-based hand rub or soap and water;
- covering the mouth and nose with a bent elbow or tissue when you cough or sneeze. Dispose of used tissues immediately and clean hands regularly; and
- self-isolating until recovery in case of any symptoms or tested positive for COVID-19.
- A disposable medical face mask will be provided for each staff every day and more as appropriate upon agreement by the supervisor for high-risk staff who need to be working with local communities/contact with external stakeholders. Appropriate disposal in the bin is required to avoid possible infection.

Specific Instructions:

Contractors inside and outside the Project areas are required to implement the followings at all times:

- (A) All contractors' personnel are required to strictly follow preventative measures against COVID-19 such as:
 - getting vaccinated as soon as possible following Governmental guidance on vaccination;
 - keeping physical distance of at least 1 meter from others, even if they do not appear to be sick;
 - avoiding the 3Cs, spaces that are closed, crowded or involve close contact;
 - wearing a properly fitted mask when physical distancing is not possible and in poorly ventilated settings;
 - cleaning your hands frequently with alcohol-based hand rub or soap and water;
 - covering your mouth and nose with a bent elbow or tissue when you cough or sneeze. Dispose of used tissues immediately and clean hands regularly; and
 - self-isolating until recovery in case of any symptoms or tested positive for COVID-19.
- (B) Relevant Division shall ensure that all contractors' personnel working for the NNP1 Project are regularly checked for body temperatures and use of face masks/hand gel in their camps and working places.
- (C) Contractors' personnel in OSOV1 or OSOV2 have to continuously check their body temperature using a thermometer provided at the entrance of OSOV1 and OSOV2 at least once a day.
- (D) If a contractors' personnel is found to have any symptoms of COVID-19 (i.e. dry cough, high fever, difficult breathing, sweats, chills, headaches), high temperature or flulike symptoms, the contractor shall inform NNP1PC of relevant information immediately.

5.2.2 General situation of COVID-19 in NNP1PC

There was no case COVID-19 infection in the first quarter 2024.

6 External missions and visits

The joint ADB-IAP-LTA mission was conducted from 22 to 27 January 2024. The mission reports were produced by the ADB, IAP, and LTA separately.

On 10 February 2024, the LTA submitted a draft of the January 2024 Site Mission Report, which outlines observation results and recommendations for measures, along with a new timeline, as detailed in **Appendix 2**.

On 27 February 2024, the IAP submitted a Memo on Achieving No Net Loss for Nam Ngiep 1 Hydropower Project. the memo emphasized the need for the government to fulfill its commitments to biodiversity conservation to ensure continued investment in wildlife habitat projects. Immediate action is necessary to address challenges with the NNP1 Hydropower Project's No Net Loss (NNL) program. Additionally, should the situation improve, project plans should be updated to reflect current challenges and budgets, including revising and re-costing the Watershed Management Plan (WMP).

The action priorities recommended by ADB, IAP, and LTA during the mission in January 2024 are listed for further follow-up as shown in the **Appendix 2**.

APPENDICES

APPENDIX 1: THE SITE INSPECTION RESULTS DURING Q1 2024

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
1	ON-ADM-0001	28/09/2023	OSOV1's WWTS	It was observed that there is weed growth inside and around the edges of the wetland ponds. This weeds growth could potentially reduce the efficiency of wastewater treatment as it prevents sunlight from reaching the wetland and creates increased competition with the wetland reeds. Moreover, the dense vegetation also serves as a breeding ground for mosquitoes and other poisonous animals including snake.	The ADM was instructed to take the following actions regarding Weed Control: - Remove the weeds to increase the efficiency of wastewater treatment and minimize the breeding grounds of vectors.	12/10/2023	18/01/2024	Resolved (The corrective action was verified and accepted)
2	ON-ADM-0004	23/11/2023	OSOV1 (Recycle waste storage)	Improper housekeeping and arrangement at recycle waste storage area	The ADM was instructed to perform good housekeeping around the recycle waste storage area, re-arrange and tidy up the recycle waste for each partition to keep more space.	08/12/2023	18/01/2024	Resolved (The corrective action was verified and accepted)
3	ON-TD-0007	21/02/2024	Main Dam Powerhouse	During the joint inspection it was observed that the hazardous waste bin has been emptied with no known disposal record.	-TD and ADM were instructed to investigate the disappeared hazardous waste. It is important to	Immediately and 29/2/2024	21/03/2023	Pending

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
				Additionally, the recommendation from the previous joint inspection for TD to provide the spill response kits is still pending.	note that unknown disposal of hazardous waste may trigger the issuance of NCR ; -TD was instructed to provide the spill response kits for the hazardous waste storage area.			
4	ON-TD-0008	21/02/2024	Re-regulation Powerhouse	Pending removal of hazardous waste to the LILAMA10's hazardous storage facility and pending provision of spill response kits.	TD was instructed to remove hazardous waste to the LILAMA10's hazardous storage facility and provide spill response Kits at Regulation Dam Powerhouse Area.	29/2/2024	21/03/2023	Pending
5	ON-TD-0009	21/02/2024	LILAMA10's Storage Facility	Pending provision of spill response kits at the hazardous material and waste storage facility.	TD was instructed to provide the spill response kits at the Lilama10's hazardous material and waste storage facility to ensure effective control in the event of oil spill.	29/2/2024	21/03/2023	Pending
6	ON-ADM-0010	21/02/2024	OSOVS's Recycle	The recycle waste storage was full and not properly arrangement.	ADM was instructed to empty the recycle waste storage, followed by performing proper	29/2/2024	21/03/2023	Resolved (The corrective action was

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
			waste storage		recording and reporting in accordance with the waste management procedure.			verified and accepted)
7	ON-TD-0011	21/03/2023	OSOV1's Fuel Station	The inspection of the grounding system of the fuel station to mitigate the risk of fire emergencies could be clearly recorded.	TD and ADM were instructed to conduct the grounding system testing and recording. TD confirmed that the testing equipment is under purchasing	Within April 2024	21/03/2023	Newly opened
8	ON-ADM-0012	21/03/2023	OSOV1's Canteen	Inspection of the LPG gas pipeline at the canteen to examine for leaks, particularly at the joints, could be clearly recorded.	ADM were instructed to conduct the Inspection of the LPG gas pipeline at the canteen to examine for leaks, particularly at the joints. ADM confirmed that they will be conducting by early of April 2024.	Early of April 2024	21/03/2023	Newly opened
9	ON-ADM-0013	21/03/2023	Camp OSOV 1&2	Monitoring the generator inspection at OSOV1 and OSOV2 could be considered.	ADM were instructed to conduct the generator inspection at OSOV1 and OSOV2. ADM confirmed that they will be conducting by early of April 2024 and providing the record.	Early of April 2024	21/03/2023	Newly opened

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
10	ON-ADM-0014	21/03/2023	OSOVS & Main Dam Powerhouse	Clear posting of the hazard symbol on the chlorine tank could be considered.	TD and ADM were instructed to providing and posting of the relevant hazard symbol and MSDS on the chlorine tanks at OSOV2 and Main Dam Powerhouse. TD and ADM confirmed that they will be providing and posting the posters within March 2024 and providing the record.	Within April 2024	21/03/2023	Newly opened

APPENDIX 2: ENVIRONMENTAL MONITORING CORRECTIVE ACTIONS Q1 2024

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of March 2024)
1	EAP	HatGnuin: Muster point cannot be reached (private property), too far from village, access road flood-prone, may not be passable during rainy season: no realistic EAP for this village.	Identify realistic muster point (check suitability of two hills identified during May 2023 site visit). Conditions: sufficient elevation, as close as possible to village, accessible. Make muster point accessible (clear vegetation if required, no fences).	Q2 2024	<u>In progress:</u> - The drill was carried out in Hat Gniun village on 27 September 2023. - The muster point at Hat Gniun need to be rediscussed between the Bolikhan District Disaster Management Committee, Hat Gniun local authorities and the private landowners to allow access in case of an emergency - the conclusion of the meeting will be used for the drill in 2024 - In addition, the elevation of the hill must be checked to ensure that it could reach level 4. - In Q1 2024, Identification of a new muster points is impossible, an option to go back to the site originally identified was the best option. ESD planned to discuss with the Bolikhan District Special Taskforce who was assigned by the Bolikhan District Disaster Committee to conclude the selection of the Hat Gniun Muster points to make it accessible. The next steps to sign the minutes of the meeting with the land owners to certificate that impact from evacuation will be in charge by NNP1PC. Muster points sign posts will be developed to indicate the location.
		Thaheua: suitable muster point identified, but not accessible due to dense vegetation.	Make accessible (clear overgrown path, keep open by regular cutting).	Q2 2024	<u>In progress:</u> - Thahuea muster point is suitable for emergency evacuation, but not accessible due to dense vegetation. - The paths were cleared during December 2023 to make it accessible.

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of March 2024)
					The villagers are also persuaded to carry out routine clearing of overgrown paths and maintain convenient access at least two times per annum. In particular before and after the rainy season. The drill was carried out in Thaheua on 26 September 2023. - The drill will be carried out in Q2, 2024
			Both villages: carry out drill under realistic conditions (i.e., people actually reaching identified muster point. Situation Jan. 2024 Both villages: try to increase participation in drills (ideally: minimum of one person from each household).	Ongoing	<u>In progress:</u> ; - As mentioned above, NNP1PC agreed to conduct the drill in mid-August 2023. - The drill was carried out in Phouhomxay on 28 September 2023. - To be ongoing
		Houay Soup Noy dam (irrigation reservoir): spillway sufficient for evacuating even exceptional flood. Village not threatened in case of a dam break, however, people in the demonstration farm or working in	Confirm statements about spillway and exposure of village; check with Technical LTA. Include warning system and evacuation plan for farm and fields in EAP. Situation Jan.2024 Muster point identified. Maps of flood risk indicate that the village is not directly at risk from floods related to dam break.	Next Site Visit of Techn. LTA	<u>In progress:</u> - The inundation map in case of the irrigation dam break was created and is being studied. - The statement of evacuation plan in the EAP in case of the Dyke Break will be confirmed as the potential flood is in the same area in case of the irrigation dam break. Following a discussion with LTA on their visit in January 2024. The LTA observed that: • Muster point identified. Maps of flood risk indicate that the village is not directly at risk from floods related to dam break. • Opinion of Technical LTA on dimension and sufficiency of spillway not received yet.

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of March 2024)
		the fields would be at risk.	Opinion of Technical LTA on dimension and sufficiency of spillway not received yet.		- People in the Agriculture Extension and Demonstration Centre will be warned about the flood risks
2	Critical water depth	In Nam Ngiep downstream of the dam minimum water depth of 0.5 m cannot be kept during conditions of minimum flow. Identified as “not a problem”.	Confirm: if users of respective sites agree that there is no such problem, make official statement and stop monitoring. If there is a problem, take measures (deepening of passage, removal of barrier) and confirm effectiveness.	End of dry season 2024	<u>In progress:</u> In accordance with the LTA’ recommendation, NNP1PC (EMO and TD) has closely monitored water depth in the thalweg of the Nam Ngiep River downstream the reregulation dam when the discharge is approx. 27 m³/s to: - Monthly interviews were conducted with the downstream residents, who use boats. The interviews were continued to gather and assess any complaints about boat navigation difficulties. - During the interviews in this quarter there was no any concerns about boat navigation. NNP1PC will consider officially proposing revisions to the monitoring programme after Q2 2024.
3	Fisheries Management Plan	Still no Fisheries Management Plan. Main issue seems to be lack of commitment from Xaysomboun Province	Undertake every effort required for solving this issue.	Q2 2024	<u>Follow-up:</u> See Table 3-1 point 1 (e) on the FCMP progress
4	Watershed Management Plan	Excessive slash-and-burn activity around reservoir. Critical issue for biodiversity (NNL), but also leading to	Reinforce activities for protecting the watershed area (land use, fishing) according to contractual requirements.	Q2 2024	<u>Follow-up:</u> The Head of Xaysomboun WRPO informed the meeting on 12 March 2024 that he is still working on the TOR of the special task force to deal with the threats and could not clearly explain the structure of the special task force and operation plan. NNP1 EMO discussed this special task force with the Vice District Governor on

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of March 2024)
		massive sheet erosion.			27 March 2024. He recommended that NNP1 organize a meeting among NNP1PC and the key persons, including the Chairman of the Xaysomboun Watershed and Reservoir Protection Committee (WRPC), the Head of Xaysomboun PAFO, the Vice District Governor of Hom and Thathom, the Head of DAFO of Hom and Thathom, and the Head of Xaysomboun WRPO for this special task force. NNP1 EMO is preparing the MOM for 27 March 2024, communicating the MOM with NNP1 management and FPF DOF-MAF, and will discuss the plan for the meeting with key persons in Xaysomboun Province internally.
5	Irrigation system	Section with Category A damage.	Make reinforcement as soon as possible, before collapse of the section.	Issue solved	Completed: - Pump installed and working - The observed crack on brick wall and exposed surface on crossing concrete pipe line for sub -canal “C1” were repaired in April 2024. - NNP1PC decided to repair the collapsed wall immediately as the channel could cause serious problems for the entire irrigation system.
		Pump for providing irrigation water; installation work started.	Confirm operation of pump	Issue solved	In progress: - Pump install by NNP1PC and working. - NNP1PC plans to handover the irrigation system to the local authorities/water user group in June 2024.
6	Site rehabilitation	Site of former batching plant: two access holes to underground structure remain,	Eliminate risk, best is to remove the entire structure, but at least fill the cavity and securely close access holes. Clearly mention in handover document.	Q1 2024	Completed: with condition to continue to monitor throughout the wet season of 2024. - NNP1PC closed the two holes by filling the earth material in December 2023.

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of March 2024)
		not secured sufficiently.			- Continuous monitoring will be required throughout the wet season of 2024. Additional soil backfilling may be necessary during this period. - This will be clearly stated in the handover materials
7	Next joint ADB-LTA-IAP mission	Agree on the dates for the next mission.		-	<u>In progress:</u> ADB, IAP, and LTA environmental missions was conducted from 22 to 27 Jan 2024. ADB, IAP, and LTA confirmed for the social mission to be held in 20-25 May 2024. A virtual pre mission will be held on 3rd April 2024.
8	Community landfill	New issue in January 2024 Landfill pits severely damaged by removal of large segments of the impervious membrane. Landfill can no longer be used as it is. Seek alternative solution.	Transfer the waste material from the community landfill pit to the company landfill due to its small quantity, while also considering alternatives such as closing the community landfill gate, replacing the membrane if reused, and building new landfills closer to the villages, but ensuring that there are clear agreements on ownership and responsibility with future users before construction.	Q2 2024	<u>See section 2.6.4</u> Community Solid Waste Management and Recycling Programme

APPENDIX 3: SITE CODES, LOCATIONS, MONITORING PARAMETERS AND ITS MAP OF THE SURFACE WATER QUALITY MONITORING

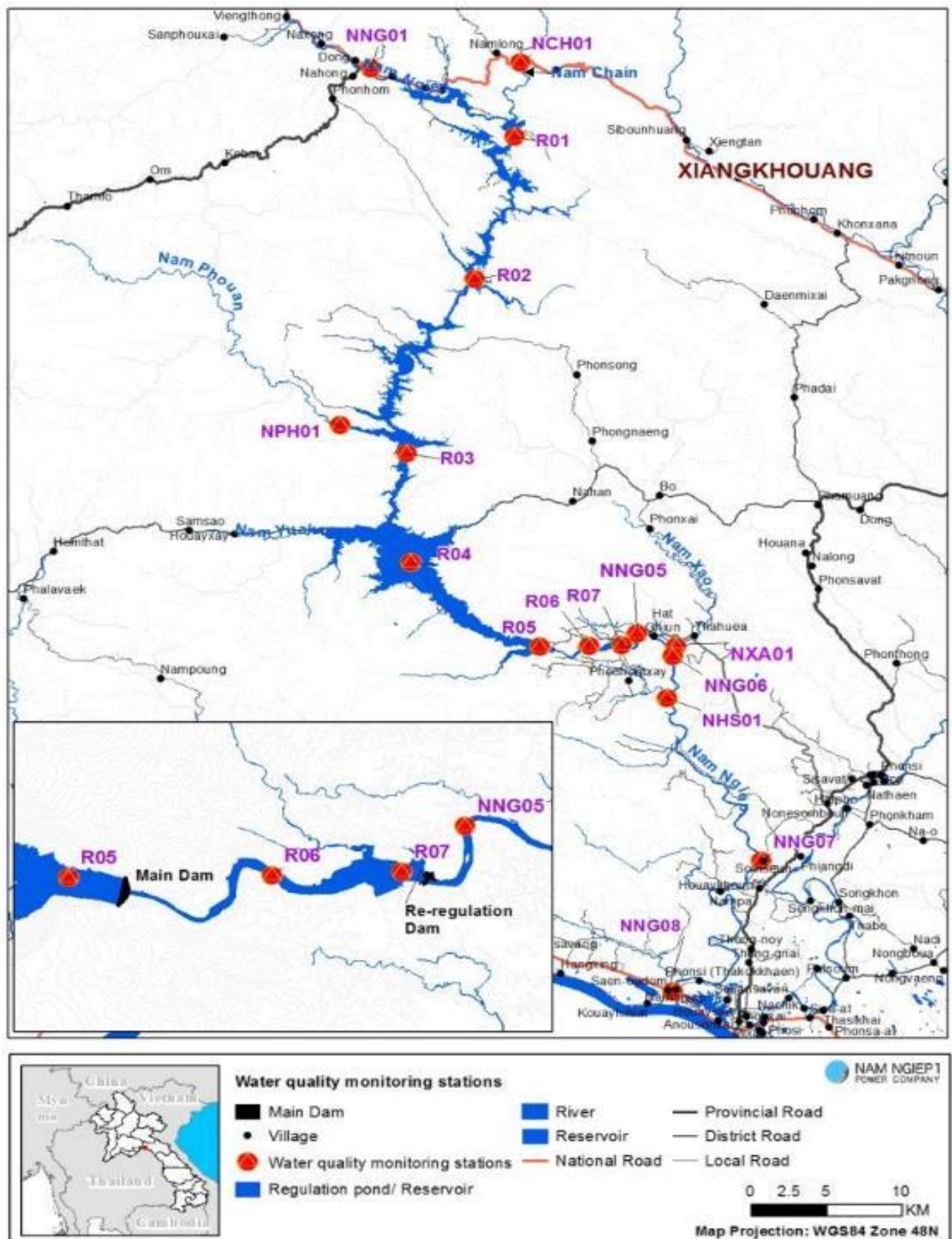
SITE CODES AND LOCATION STATION FOR SURFACE WATER QUALITY MONITORING

Site Code	Location station	Zone
NNG01	Nam Ngiep Upstream of Phiengta Village	Upstream Project Construction Site
R01	Main reservoir upstream main dam approx. 50 Km.	
R02	Main reservoir upstream main dam approx. 35 Km.	
NNG02/R03	Nam Ngiep Upstream of Nam Phouan Confluence / Main reservoir upstream main dam approx. 21 Km.	
NNG03/R04	Nam Ngiep Downstream of Sopyouak Village/ Main reservoir upstream main dam approx. 13 Km.	
NNG09/R05	Nam Ngiep Upstream Main Dam / Main reservoir upstream main dam approx. 0.5 Km	
NNG04 / R06	Nam Ngiep Downstream RT Camp (Middle Re-regulation Reservoir)	Within Project Construction Site
R07	Reservoir Upstream Re-Regulation Dam	
NNG05	Nam Ngiep Upstream of Hat Gniun Village	Downstream Project Construction Site
NNG06	Nam Ngiep Downstream of Nam Xao Confluence	
NNG07	Nam Ngiep at Somsuen Village	
NNG08	Nam Ngiep at the Bridge of Road 13	
NCH01	Nam Chiane at the Bridge of Road 1D	Tributaries Upstream of Project Construction Site
NPH01	Nam Phouan Upstream of Nam Ngiep Confluence	
NXA01	Nam Xao Upstream of Nam Ngiep Confluence	Tributaries Downstream of Project Construction Site
NSH01	Nam Houay Soup Upstream Nam Ngiep Confluence	

MONITORING FREQUENCY FOR SURFACE WATER QUALITY PARAMETERS

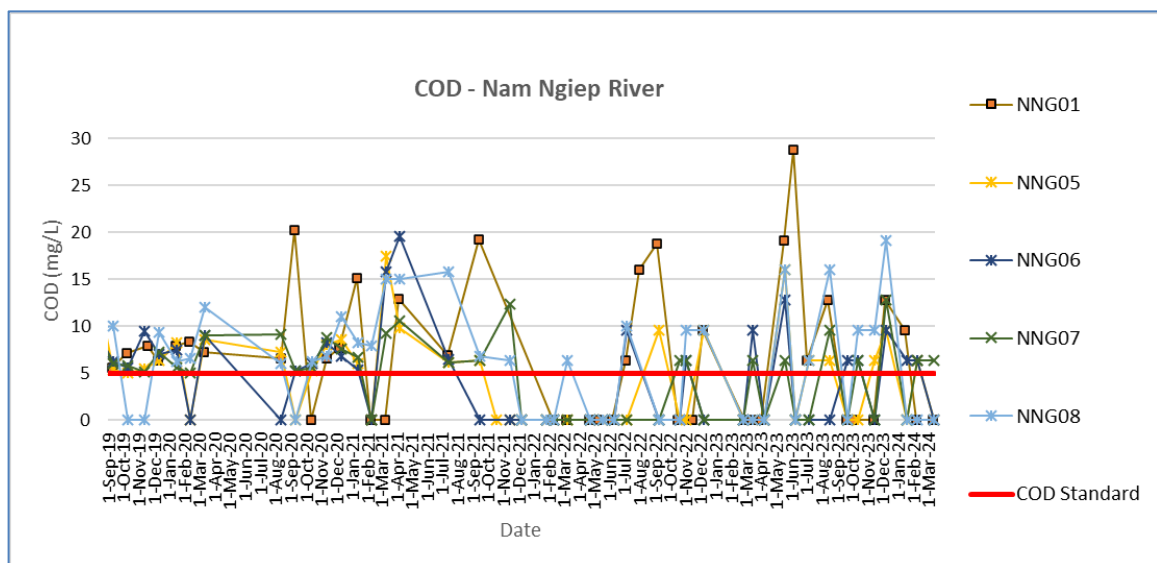
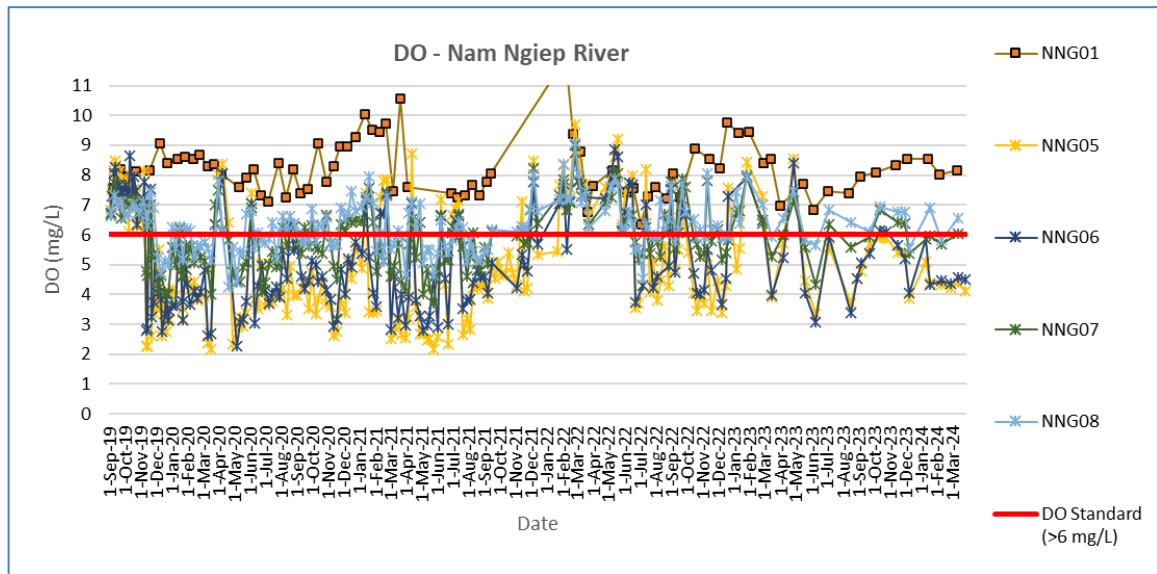
Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/L), Conductivity ($\mu\text{S}/\text{cm}$), Temperature ($^{\circ}\text{C}$), Turbidity (NTU).	- Main Reservoir: R01, R02, R03, R04, R05; - Re-regulation Reservoir: R06 and R07.
Monthly	pH, DO (%), DO (mg/L), Conductivity ($\mu\text{S}/\text{cm}$), Temperature ($^{\circ}\text{C}$), Turbidity (NTU).	- NNG01, NCH01, NPH01, NNG05, NNG06, NNG07, NNG08, NXA01 and NHS01
Monthly	TSS (mg/L), BOD ₅ (mg/L), COD (mg/L), NH ₃ -N (mg/L), NO ₃ -N (mg/L), total coliform (MPN/100 mL), faecal coliform (MPN/100 mL), Chlorophyll a, TOC and TKN.	As per ESMMP-OP. Noted: Hydrogen sulphide and Phytoplankton biomass remained in the analysis program for Q1 2023, but they were no longer monitored starting from Q2 2023.

SURFACE WATER QUALITY MONITORING LOCATIONS

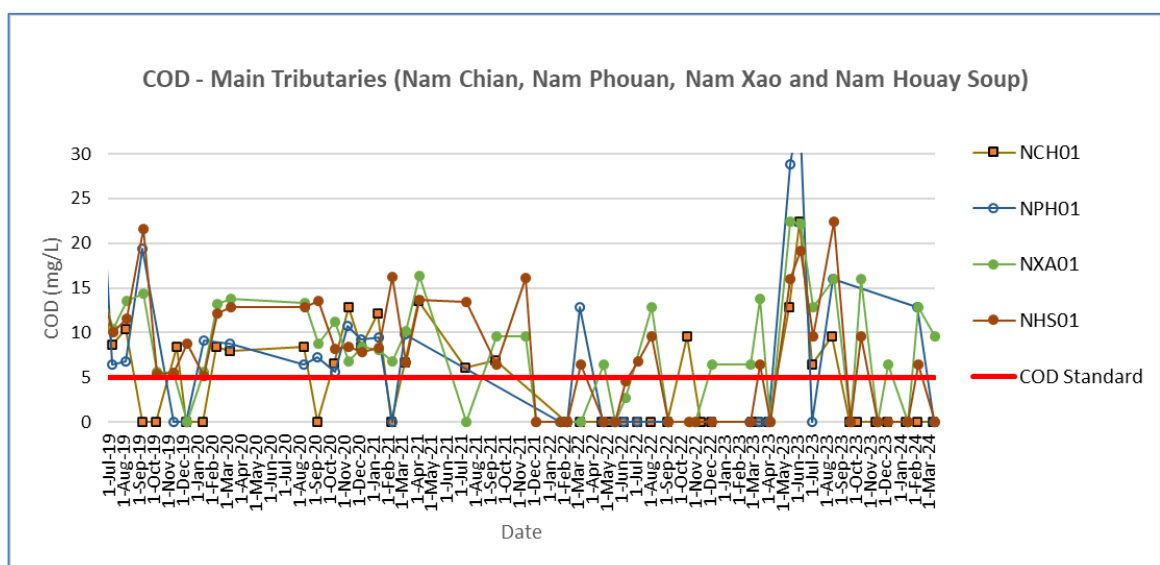
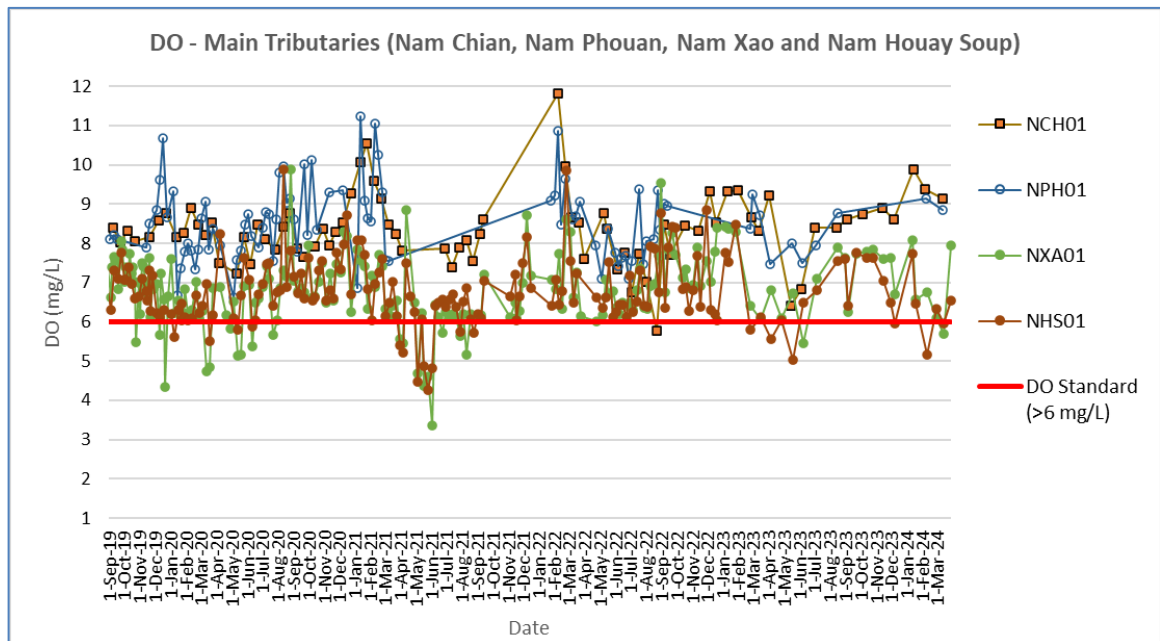


APPENDIX 4: KEY TRENDS OF WATER QUALITY MONITORING FROM JANUARY 2020 TO END OF MARCH 2024 (ONLY PARAMETERS THAT EXCEEDED THE STANDARDS)

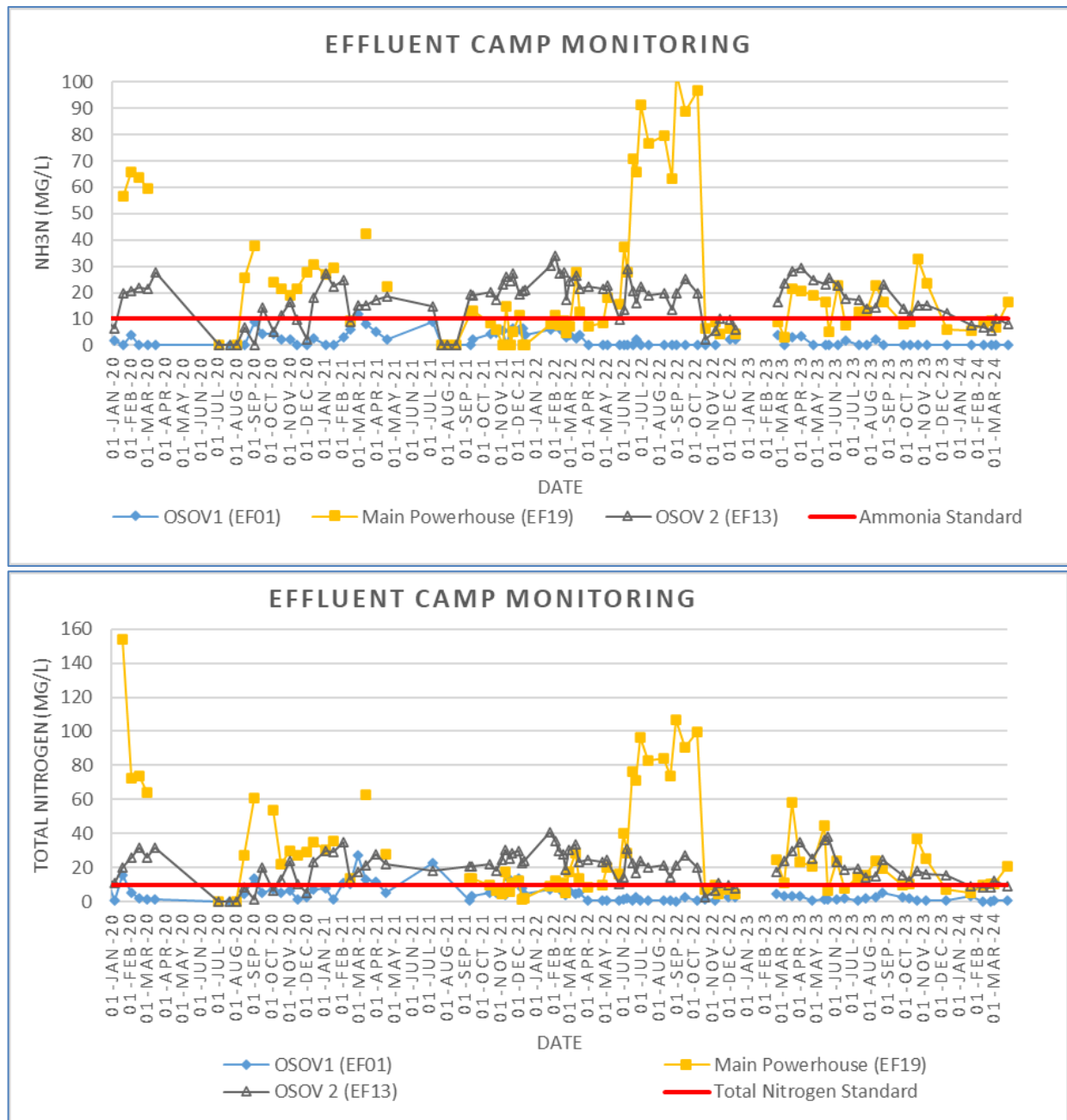
Nam Ngiep Surface Water

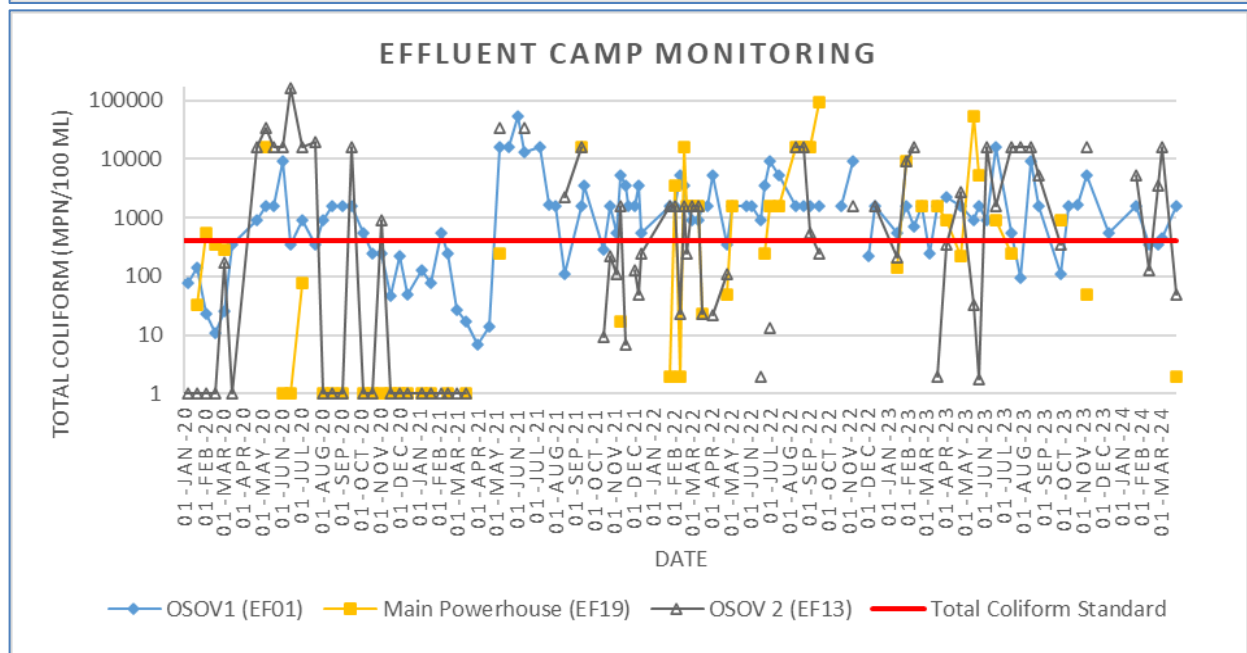
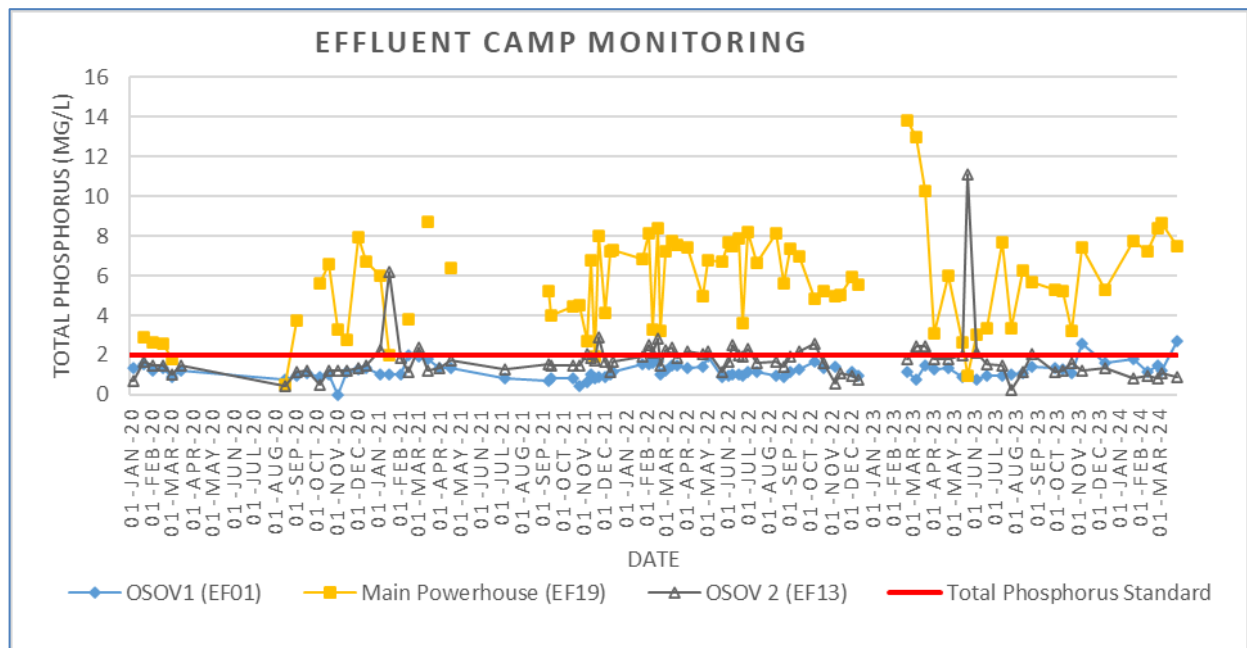


Key Water Quality Parameters for the Nam Ngiep Tributaries: Nam Chian, Nam Phouan, Nam Xao, Nam Houay Soup



Camps' Effluent Water Quality Trends (Since October 2019 – March 2024)





APPENDIX 5: WATER QUALITY MONITORING DATA**APPENDIX 5-1: SURFACE WATER QUALITY MONITORING – Q1 2024**

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
4-Jan-24	pH	5.0 - 9.0				6.7	6.65	6.59	6.54	6.5								
10-Jan-24	pH	5.0 - 9.0		6.81	6.72	6.6												
11-Jan-24	pH	5.0 - 9.0					6.71	6.81	6.54	6.59	6.72	6.77					6.93	7.02
15-Jan-24	pH	5.0 - 9.0	6.86												6.62			
16-Jan-24	pH	5.0 - 9.0		6.82	6.8	6.79												
17-Jan-24	pH	5.0 - 9.0					6.76	6.72	6.8	6.74								
18-Jan-24	pH	5.0 - 9.0									6.75	6.8	6.96	7.06			7.11	7.02
23-Jan-24	pH	5.0 - 9.0		6.56	6.48	6.6												
25-Jan-24	pH	5.0 - 9.0					6.4	6.51	6.7	6.78								
30-Jan-24	pH	5.0 - 9.0				6.6	6.64	6.62	6.68	6.66								
6-Feb-24	pH	5.0 - 9.0	6.54												6.92			
7-Feb-24	pH	5.0 - 9.0		6.6	6.55	6.68										6.83		
8-Feb-24	pH	5.0 - 9.0					6.69	6.75	6.6	6.64								
9-Feb-24	pH	5.0 - 9.0									6.81	6.79	6.74	6.67			7.1	6.97
14-Feb-24	pH	5.0 - 9.0		6.65	6.65	6.78												
15-Feb-24	pH	5.0 - 9.0					6.61	6.58	6.77	6.83								
21-Feb-24	pH	5.0 - 9.0		6.8	6.88	6.85												
22-Feb-24	pH	5.0 - 9.0					6.46	6.4	6.35	6.52								
27-Feb-24	pH	5.0 - 9.0		6.84	6.5	6.7												
28-Feb-24	pH	5.0 - 9.0					6.58	6.64	6.77	6.86	6.86	6.82					6.95	6.67
5-Mar-24	pH	5.0 - 9.0		6.83	6.79	6.7												
6-Mar-24	pH	5.0 - 9.0					6.46	6.53	6.5	6.61								
11-Mar-24	pH	5.0 - 9.0	6.56												6.93			

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
12-Mar-24	pH	5.0 - 9.0		6.84	6.6	8.82										7.1		
13-Mar-24	pH	5.0 - 9.0					6.7	6.78	6.53	6.55								
14-Mar-24	pH	5.0 - 9.0									6.85	6.79	6.76	6.76			6.99	7.18
19-Mar-24	pH	5.0 - 9.0		6.95	6.89	6.81												
20-Mar-24	pH	5.0 - 9.0					6.6	6.56	6.5	6.59								
27-Mar-24	pH	5.0 - 9.0		6.84	6.55	6.48												
28-Mar-24	pH	5.0 - 9.0					6.6	6.76	6.49	6.66	6.77	6.83					7.01	6.81
4-Jan-24	Sat. DO (%)					95.9	80.8	92	62.8	69.5								
10-Jan-24	Sat. DO (%)			117.8	98.4	104.1												
11-Jan-24	Sat. DO (%)						94.2	90.9	44.3	57.7	61.4	70.7					98.3	91.7
15-Jan-24	Sat. DO (%)		99.9												118.9			
16-Jan-24	Sat. DO (%)			112.9	108	116												
17-Jan-24	Sat. DO (%)						86.1	85.4	50.8	60.4								
18-Jan-24	Sat. DO (%)										52.4	51.6	71.3	82.4			76.9	73.8
23-Jan-24	Sat. DO (%)			97.9	79.1	96.8												
25-Jan-24	Sat. DO (%)						87.2	88	60.9	72.6								
30-Jan-24	Sat. DO (%)					52.2	74.3	61.9	49.4	53								
6-Feb-24	Sat. DO (%)		93.7												111.7			
7-Feb-24	Sat. DO (%)			94.2	82.3	93.9										100.8		
8-Feb-24	Sat. DO (%)						89.4	96.7	39.7	49.5								
9-Feb-24	Sat. DO (%)										51.4	52.5	66.9	68.7			79.8	60.9
14-Feb-24	Sat. DO (%)			85.2	65.3	74.3												
15-Feb-24	Sat. DO (%)						97.9	93.9	48.6	56.5								

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
21-Feb-24	Sat. DO (%)			105.9	108.9	106.1												
22-Feb-24	Sat. DO (%)						89.6	88.4	30.6	42.8								
27-Feb-24	Sat. DO (%)			102.8	116.3	111.2												
28-Feb-24	Sat. DO (%)						99.1	91	39.6	35.9	50.5	52					77.8	79.8
5-Mar-24	Sat. DO (%)			103.8	119.1	138.6												
6-Mar-24	Sat. DO (%)						88.6	86.6	29.9	33.6								
11-Mar-24	Sat. DO (%)		98.6												106.2			
12-Mar-24	Sat. DO (%)			95.9	108.4	110.9										109.1		
13-Mar-24	Sat. DO (%)						101.1	100.2	37.1	40.9								
14-Mar-24	Sat. DO (%)										52.6	55	73	78.9			71.9	74.9
19-Mar-24	Sat. DO (%)			81.4	99.5	101.7												
20-Mar-24	Sat. DO (%)						89.8	87.2	40.5	42.4								
27-Mar-24	Sat. DO (%)			91.6	104.7	103												
28-Mar-24	Sat. DO (%)						101.5	101.1	33.8	65.4	48.7	52.7					100.3	80.6
4-Jan-24	DO (mg/L)	>6.0				7.89	6.69	7.41	4.91	5.68								
10-Jan-24	DO (mg/L)	>6.0		9.52	8.01	8.51												
11-Jan-24	DO (mg/L)	>6.0					7.73	7.46	3.65	4.64							8.08	7.73
15-Jan-24	DO (mg/L)	>6.0	8.55												9.89			
16-Jan-24	DO (mg/L)	>6.0		9.11	8.65	9.54												
17-Jan-24	DO (mg/L)	>6.0					7.08	7.04	4.12	4.09								
18-Jan-24	DO (mg/L)	>6.0									4.41	4.34	5.97	6.89			6.56	6.47
23-Jan-24	DO (mg/L)	>6.0		8.03	6.47	7.97												

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
25-Jan-24	DO (mg/L)	>6.0					7.27	7.33	5.1	6.02								
30-Jan-24	DO (mg/L)	>6.0				4.36	6.18	5.14	4.16	4.43								
6-Feb-24	DO (mg/L)	>6.0	8.02												9.38			
7-Feb-24	DO (mg/L)	>6.0		7.68	6.74	7.54										9.15		
8-Feb-24	DO (mg/L)	>6.0					7.45	7.99	3.34	4.11								
9-Feb-24	DO (mg/L)	>6.0									4.34	4.45	5.67	5.83			6.76	5.17
14-Feb-24	DO (mg/L)	>6.0		6.95	5.35	6.15												
15-Feb-24	DO (mg/L)	>6.0					8.14	7.63	4.09	4.69								
21-Feb-24	DO (mg/L)	>6.0		8.39	8.77	8.61												
22-Feb-24	DO (mg/L)	>6.0					7.2	7.18	2.6	3.6								
27-Feb-24	DO (mg/L)	>6.0		8.04	9.16	8.62												
28-Feb-24	DO (mg/L)	>6.0					7.93	7.42	3.35	3.02							6.1	6.32
5-Mar-24	DO (mg/L)	>6.0		8.12	9.39	11.1												
6-Mar-24	DO (mg/L)	>6.0					7.15	7.01	2.5	2.8								
11-Mar-24	DO (mg/L)	>6.0	8.15												9.15			
12-Mar-24	DO (mg/L)	>6.0		7.66	8.6	8.82										8.85		
13-Mar-24	DO (mg/L)	>6.0					8.13	8.14	3.12	3.42								
14-Mar-24	DO (mg/L)	>6.0									4.4	4.58	6.05	6.54			5.7	5.97
19-Mar-24	DO (mg/L)	>6.0		6.5	7.8	7.98												
20-Mar-24	DO (mg/L)	>6.0					7.17	7.03	3.39	3.57								
27-Mar-24	DO (mg/L)	>6.0		7.26	8.11	8.08												
28-Mar-24	DO (mg/L)	>6.0					7.94	7.96	2.84	5.13							7.95	6.55

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
4-Jan-24	Conductivity (µs/cm)					80	78	79	86	85								
10-Jan-24	Conductivity (µs/cm)			90	87	81												
11-Jan-24	Conductivity (µs/cm)						77	79	87	86	88	90					173	58
15-Jan-24	Conductivity (µs/cm)		111												155			
16-Jan-24	Conductivity (µs/cm)			89	88	81												
17-Jan-24	Conductivity (µs/cm)						78	79	88	83								
18-Jan-24	Conductivity (µs/cm)										89	91	88	91			168	54
23-Jan-24	Conductivity (µs/cm)			89	87	81												
25-Jan-24	Conductivity (µs/cm)						79	80	89	89								
30-Jan-24	Conductivity (µs/cm)					80	79	81	87	87								
6-Feb-24	Conductivity (µs/cm)		121												107			
7-Feb-24	Conductivity (µs/cm)			88	85	81										79		
8-Feb-24	Conductivity (µs/cm)						78	79	87	87								
9-Feb-24	Conductivity (µs/cm)										88	89	88	87			190	69
14-Feb-24	Conductivity (µs/cm)			90	85	80												
15-Feb-24	Conductivity (µs/cm)						79	79	86	86								
21-Feb-24	Conductivity (µs/cm)			88	86	80												
22-Feb-24	Conductivity (µs/cm)						79	79	78	86								
27-Feb-24	Conductivity (µs/cm)			88	85	80												
28-Feb-24	Conductivity (µs/cm)						78	78	87	87	88	88					193	60
5-Mar-24	Conductivity (µs/cm)			90	89	80												
6-Mar-24	Conductivity (µs/cm)						79	79	86	86								
11-Mar-24	Conductivity (µs/cm)		109												43			
12-Mar-24	Conductivity (µs/cm)			99	88	81										81		
13-Mar-24	Conductivity (µs/cm)						79	79	84	84								

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
14-Mar-24	Conductivity (µs/cm)										86	86	85	84			219	49
19-Mar-24	Conductivity (µs/cm)			111	92	81												
20-Mar-24	Conductivity (µs/cm)						77	78	83	83								
27-Mar-24	Conductivity (µs/cm)			115	88	80												
28-Mar-24	Conductivity (µs/cm)						78	78	83	84	84	85					121	27
4-Jan-24	Temperature (°C)					25.28	24.9	26.38	25.92	25.72								
10-Jan-24	Temperature (°C)			25.98	25.83	25.41												
11-Jan-24	Temperature (°C)						25.36	25.38	25.31	26.19	24.78	24.84					25.24	23.95
15-Jan-24	Temperature (°C)		23.09												24.58			
16-Jan-24	Temperature (°C)			26.58	25.7	25.46												
17-Jan-24	Temperature (°C)						25.19	25.06	25.9	25.96								
18-Jan-24	Temperature (°C)										24.12	24.01	24.06	24.4			23.4	22.28
23-Jan-24	Temperature (°C)			25.38	25.18	25.17												
25-Jan-24	Temperature (°C)						24.5	24.57	24.28	24.78								
30-Jan-24	Temperature (°C)					24.41	24.55	24.8	23.96	24.4								
6-Feb-24	Temperature (°C)		23.07												24			
7-Feb-24	Temperature (°C)			25.7	25.22	26.64										20.05		
8-Feb-24	Temperature (°C)						24.5	24.97	24.05	24.72								
9-Feb-24	Temperature (°C)										23.77	23.6	23.63	23.68			23.61	23.56
14-Feb-24	Temperature (°C)			26.14	25.43	24.8												
15-Feb-24	Temperature (°C)						24.58	25.81	23.95	24.71								
21-Feb-24	Temperature (°C)			27.38	26.63	26.07												
22-Feb-24	Temperature (°C)						26.45	25.92	23.9	24.65								
27-Feb-24	Temperature (°C)			28.05	27.47	28.53												
28-Feb-24	Temperature (°C)						26.64	25.67	23.91	23.96	24.6	24.6					28.04	27.34

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
5-Mar-24	Temperature (°C)			28.02	27.42	26.69												
6-Mar-24	Temperature (°C)						26.22	26.11	24	24.53								
11-Mar-24	Temperature (°C)		24.84												22.86			
12-Mar-24	Temperature (°C)			27.32	27.03	27.04										25.48		
13-Mar-24	Temperature (°C)						26.5	25.99	24.08	24.57								
14-Mar-24	Temperature (°C)										24.43	24.5	24.78	24.78			27.23	26.99
19-Mar-24	Temperature (°C)			26.2	27.87	27.86												
20-Mar-24	Temperature (°C)						26.87	26.37	23.97	23.98								
27-Mar-24	Temperature (°C)			27.4	28.6	27.91												
28-Mar-24	Temperature (°C)						28.01	27.58	24.55	28.01	25.12	25.8					26.22	28.01
4-Jan-24	Turbidity (NTU)					1.18	1.15	1.08	3.03	1.75								
10-Jan-24	Turbidity (NTU)			1.78	1.02	1.47												
11-Jan-24	Turbidity (NTU)						1.34	0.88	1.22	2.22	1.73	1.63					5.88	4.01
15-Jan-24	Turbidity (NTU)		21												7.8			
16-Jan-24	Turbidity (NTU)			1.94	1.93	1.33												
17-Jan-24	Turbidity (NTU)						1.63	0.86	2.1	3.75								
18-Jan-24	Turbidity (NTU)										2.35	2.9	4.98	14.6			4.71	5.51
23-Jan-24	Turbidity (NTU)			2.32	1.54	1.19												
25-Jan-24	Turbidity (NTU)						0.88	0.72	2.67	2.57								
30-Jan-24	Turbidity (NTU)					1.24	0.98	0.68	2.12	1.62								
6-Feb-24	Turbidity (NTU)		17.3												2.77			
7-Feb-24	Turbidity (NTU)			2.47	1.31	1.59										6.62		

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
8-Feb-24	Turbidity (NTU)						1.64	1.09	1.68	1.59								
9-Feb-24	Turbidity (NTU)										1.52	2.91	2.31	3.3			3.15	2.36
14-Feb-24	Turbidity (NTU)			3.64	1.03	1.38												
15-Feb-24	Turbidity (NTU)						1.63	0.82	1.33	1.52								
21-Feb-24	Turbidity (NTU)			3.45	1.79	1.3												
22-Feb-24	Turbidity (NTU)						1.87	1.67	1.67	1.46								
27-Feb-24	Turbidity (NTU)			8.04	1.55	1.44												
28-Feb-24	Turbidity (NTU)						1.98	1.14	1.17	1.2	1.21	1.24					3.09	3.91
5-Mar-24	Turbidity (NTU)			4.87	2.01	1.85												
6-Mar-24	Turbidity (NTU)						2.52	1.74	1.27	1.85								
11-Mar-24	Turbidity (NTU)		50.7												2.7			
12-Mar-24	Turbidity (NTU)			15.4	1.95	1.79										8.28		
13-Mar-24	Turbidity (NTU)						2.09	1.37	0.96	1.26								
14-Mar-24	Turbidity (NTU)										1.45	1.11	1.77	2.33			3.75	3.8
19-Mar-24	Turbidity (NTU)			18.4	2.18	1.84												
20-Mar-24	Turbidity (NTU)						2.98	1.63	1.06	1.51								
27-Mar-24	Turbidity (NTU)			23.6	2.43	1.54												
28-Mar-24	Turbidity (NTU)						2.09	1.9	1.1	1.33	1.4	1.77					2.34	2.02
15-Jan-24	TSS (mg/L)		22.6												<5			
16-Jan-24	TSS (mg/L)			<5		<5												
17-Jan-24	TSS (mg/L)						<5	<5	<5	<5								
18-Jan-24	TSS (mg/L)										<5	<5	<5	19.64			<5	<5

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
6-Feb-24	TSS (mg/L)		13.78												1			
7-Feb-24	TSS (mg/L)			2.1		1.3										8.9		
8-Feb-24	TSS (mg/L)						1.4	1.2	1	0.9								
9-Feb-24	TSS (mg/L)										1.6	1.6	2.4	3.69			2.1	1.2
11-Mar-24	TSS (mg/L)		35												<5			
12-Mar-24	TSS (mg/L)			134		<1										67.5		
13-Mar-24	TSS (mg/L)						<5	<5	<5	<5								
14-Mar-24	TSS (mg/L)										<5	<5	<5	<5			<5	<5
15-Jan-24	BOD ₅ (mg/L)	<1.5	1.58												<1			
16-Jan-24	BOD ₅ (mg/L)	<1.5		<1		<1												
17-Jan-24	BOD ₅ (mg/L)	<1.5					<1	<1	<1	<1								
18-Jan-24	BOD ₅ (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
6-Feb-24	BOD ₅ (mg/L)	<1.5	<1												<1			
7-Feb-24	BOD ₅ (mg/L)	<1.5		<1		<1										<1		
8-Feb-24	BOD ₅ (mg/L)	<1.5					<1	<1	<1	<1								
9-Feb-24	BOD ₅ (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
11-Mar-24	BOD ₅ (mg/L)	<1.5	<1												<1			
12-Mar-24	BOD ₅ (mg/L)	<1.5		<1		<1										1.07		
13-Mar-24	BOD ₅ (mg/L)	<1.5					<1	<1	<1	<1								
14-Mar-24	BOD ₅ (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
15-Jan-24	COD (mg/L)	<5.0	9.6												<5			
17-Jan-24	COD (mg/L)	<5.0							<5	<5								

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
18-Jan-24	COD (mg/L)	<5.0									<5	6.4	<5	<5			<5	<5
6-Feb-24	COD (mg/L)	<5.0	<5												<5			
7-Feb-24	COD (mg/L)	<5.0														12.8		
8-Feb-24	COD (mg/L)	<5.0							<5	9.6								
9-Feb-24	COD (mg/L)	<5.0									6.4	6.4	6.4	<5			12.8	6.4
11-Mar-24	COD (mg/L)	<5.0	<5												<5			
12-Mar-24	COD (mg/L)	<5.0														<5		
13-Mar-24	COD (mg/L)	<5.0							6.4	<5								
14-Mar-24	COD (mg/L)	<5.0									<5	<5	6.4	<5			9.6	<5
15-Jan-24	NH3-N (mg/L)	<0.2	<0.2												<0.2			
16-Jan-24	NH3-N (mg/L)	<0.2		<0.2		<0.2												
17-Jan-24	NH3-N (mg/L)	<0.2					<0.2	<0.2										
6-Feb-24	NH3-N (mg/L)	<0.2	<0.2												<0.2			
7-Feb-24	NH3-N (mg/L)	<0.2		<0.2		<0.2										<0.2		
8-Feb-24	NH3-N (mg/L)	<0.2					<0.2	<0.2										
11-Mar-24	NH3-N (mg/L)	<0.2	<0.2												<0.2			
12-Mar-24	NH3-N (mg/L)	<0.2		<0.2		<0.2										<0.2		
13-Mar-24	NH3-N (mg/L)	<0.2					<0.2	<0.2								<0.2		
15-Jan-24	NO3-N (mg/L)	<5.0	0.11												0.08			
16-Jan-24	NO3-N (mg/L)	<5.0		<0.02		<0.02												
17-Jan-24	NO3-N (mg/L)	<5.0					<0.02	<0.02										
6-Feb-24	NO3-N (mg/L)	<5.0	0.16												0.19			
7-Feb-24	NO3-N (mg/L)	<5.0		0.09		0.08										0.09		

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
8-Feb-24	NO ₃ -N (mg/L)	<5.0					0.08	0.07										
11-Mar-24	NO ₃ -N (mg/L)	<5.0	0.18												0.11			
12-Mar-24	NO ₃ -N (mg/L)	<5.0		0.09		0.07										0.09		
13-Mar-24	NO ₃ -N (mg/L)	<5.0					0.11	0.11										
15-Jan-24	Faecal coliform (MPN/100 mL)	<1,000	540												4			
18-Jan-24	Faecal coliform (MPN/100 mL)	<1,000									13	7	33	17			26	540
6-Feb-24	Faecal coliform (MPN/100 mL)	<1,000	170												17			
8-Feb-24	Faecal coliform (MPN/100 mL)	<1,000													14			
9-Feb-24	Faecal coliform (MPN/100 mL)	<1,000									17	14	17	27			240	350
11-Mar-24	Faecal coliform (MPN/100 mL)	<1,000	350												540			
12-Mar-24	Faecal coliform (MPN/100 mL)	<1,000														540		
14-Mar-24	Faecal coliform (MPN/100 mL)	<1,000									49	79	110	350			240	540
15-Jan-24	Total Coliform (MPN/100 mL)	<5,000	920												14			
18-Jan-24	Total Coliform (MPN/100 mL)	<5,000									22	11	79	33			70	920
6-Feb-24	Total Coliform (MPN/100 mL)	<5,000	540												49			
8-Feb-24	Total Coliform (MPN/100 mL)	<5,000														22		
9-Feb-24	Total Coliform (MPN/100 mL)	<5,000									33	70	170	240			1,600	920
11-Mar-24	Total Coliform (MPN/100 mL)	<5,000	1,600												1,600			
12-Mar-24	Total Coliform (MPN/100 mL)	<5,000														1,600		
14-Mar-24	Total Coliform (MPN/100 mL)	<5,000									1,600	920	1,600	920			920	1,600
15-Jan-24	TKN		<1.5												<1.5			
16-Jan-24	TKN			<1.5		<1.5												

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
17-Jan-24	TKN						<1.5	<1.5										
6-Feb-24	TKN		<1.5												<1.5			
7-Feb-24	TKN			<1.5		<1.5										<1.5		
8-Feb-24	TKN						<1.5	<1.5										
11-Mar-24	TKN		<1.5												<1.5			
12-Mar-24	TKN			<1.5		<1.5										<1.5		
13-Mar-24	TKN						<1.5	<1.5										
15-Jan-24	TOC (mg/L)		1.66												1.01			
17-Jan-24	TOC (mg/L)								0.86	1.39								
18-Jan-24	TOC (mg/L)										1	1.07	1.02	1.5			1.72	1.81
6-Feb-24	TOC (mg/L)		1.13												0.63			
7-Feb-24	TOC (mg/L)															0.9		
8-Feb-24	TOC (mg/L)								0.98	0.92								
9-Feb-24	TOC (mg/L)										0.97	1.04	1.02	1.04			1.52	1.01
11-Mar-24	TOC (mg/L)		1.45												0.81			
12-Mar-24	TOC (mg/L)															1.41		
13-Mar-24	TOC (mg/L)								0.82	0.8								
14-Mar-24	TOC (mg/L)										0.97	0.88	0.9	0.92			1.7	1.97
15-Jan-24	Total Phosphorus (mg/L)		0.02												<0.01			
16-Jan-24	Total Phosphorus (mg/L)			0.01		<0.01												
17-Jan-24	Total Phosphorus (mg/L)						<0.01	<0.01										
6-Feb-24	Total Phosphorus (mg/L)		0.01												<0.01			
7-Feb-24	Total Phosphorus (mg/L)			<0.01		0.01										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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
				Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)			Guideline																
8-Feb-24	Total Phosphorus (mg/L)							<0.01	<0.01											
11-Mar-24	Total Phosphorus (mg/L)				0.01									<0.01						
12-Mar-24	Total Phosphorus (mg/L)					<0.01		<0.01							<0.01					
13-Mar-24	Total Phosphorus (mg/L)							<0.01	<0.01											
15-Jan-24	Total	Dissolved	Phosphorus (mg/L)		<0.01															
16-Jan-24	Total	Dissolved	Phosphorus (mg/L)			<0.01		<0.01												
17-Jan-24	Total	Dissolved	Phosphorus (mg/L)					<0.01	<0.01											
6-Feb-24	Total	Dissolved	Phosphorus (mg/L)		<0.01									<0.01						
7-Feb-24	Total	Dissolved	Phosphorus (mg/L)			<0.01		<0.01							0.01					
8-Feb-24	Total	Dissolved	Phosphorus (mg/L)					<0.01	<0.01											
11-Mar-24	Total	Dissolved	Phosphorus (mg/L)		<0.01									<0.01						
12-Mar-24	Total	Dissolved	Phosphorus (mg/L)			<0.01		<0.01							<0.01					
13-Mar-24	Total	Dissolved	Phosphorus (mg/L)					<0.01	<0.01											
16-Jan-24	Turbidity (NTU)-bottom						1.09													
17-Jan-24	Turbidity (NTU)-bottom							1.31	2.11											
7-Feb-24	Turbidity (NTU)-bottom						3.08													
8-Feb-24	Turbidity (NTU)-bottom							1.38	1.83											
16-Jan-24	TSS (mg/L)-bottom						<5													
17-Jan-24	TSS (mg/L)-bottom							16.8	13.11											
7-Feb-24	TSS (mg/L)-bottom						1.5													

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
8-Feb-24	TSS (mg/L)-bottom						23.2	1.97										
12-Mar-24	TSS (mg/L)-bottom					8.16												
13-Mar-24	TSS (mg/L)-bottom						26.8	11.4										
16-Jan-24	BOD ₅ (mg/L)-bottom					<1												
17-Jan-24	BOD ₅ (mg/L)-bottom						5.74	<1										
7-Feb-24	BOD ₅ (mg/L)-bottom					<1												
8-Feb-24	BOD ₅ (mg/L)-bottom						<1	<1										
12-Mar-24	BOD ₅ (mg/L)-bottom					5.1												
13-Mar-24	BOD ₅ (mg/L)-bottom						<1	<1										
16-Jan-24	NH ₃ -N (mg/L)-bottom					<0.2												
17-Jan-24	NH ₃ -N (mg/L)-bottom						0.77	0.6										
7-Feb-24	NH ₃ -N (mg/L)-bottom					<0.2												
8-Feb-24	NH ₃ -N (mg/L)-bottom						1	0.6										
16-Jan-24	NO ₃ -N (mg/L)-bottom					<0.02												
17-Jan-24	NO ₃ -N (mg/L)-bottom						<0.02	<0.02										
7-Feb-24	NO ₃ -N (mg/L)-bottom					0.1												
8-Feb-24	NO ₃ -N (mg/L)-bottom						0.09	0.07										
16-Jan-24	TKN-bottom					<1.5												
17-Jan-24	TKN-bottom						<1.5	<1.5										
7-Feb-24	TKN-bottom					<1.5												
8-Feb-24	TKN-bottom						<1.5	<1.5										
16-Jan-24	Total Dissolved Phosphorus (mg/L)-bottom					<0.01												
17-Jan-24	Total Dissolved Phosphorus (mg/L)-bottom						<0.01	0.04										

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
7-Feb-24	Total Dissolved Phosphorus (mg/L)-bottom					0.01												
8-Feb-24	Total Dissolved Phosphorus (mg/L)-bottom						<0.01	0.02										
16-Jan-24	Total Phosphorus (mg/L)-bottom					<0.01												
17-Jan-24	Total Phosphorus (mg/L)-bottom						0.01	0.07										
7-Feb-24	Total Phosphorus (mg/L)-bottom					0.02												
8-Feb-24	Total Phosphorus (mg/L)-bottom						<0.01	0.03										
16-Jan-24	Chlorophyll-A-bottom					2.65												
17-Jan-24	Chlorophyll-A-bottom						3	3.41										
7-Feb-24	Chlorophyll-A-bottom					2.18												
8-Feb-24	Chlorophyll-A-bottom						4.96	1.77										
12-Mar-24	Chlorophyll-A-bottom					1.3												
13-Mar-24	Chlorophyll-A-bottom						3.6	1.77										
16-Jan-24	Chlorophyll-A			3.54		4.37												
17-Jan-24	Chlorophyll-A						3.48	3.48										
7-Feb-24	Chlorophyll-A			1.7		1.3												
8-Feb-24	Chlorophyll-A						1.76	2.24										
12-Mar-24	Chlorophyll-A			4.55		1.77												
13-Mar-24	Chlorophyll-A						1.77	1.7										
4-Jan-24	pH	5.0 - 9.0				6.7	6.65	6.59	6.54	6.5								
10-Jan-24	pH	5.0 - 9.0		6.81	6.72	6.6												
11-Jan-24	pH	5.0 - 9.0					6.71	6.81	6.54	6.59	6.72	6.77					6.93	7.02
15-Jan-24	pH	5.0 - 9.0	6.86												6.62			
16-Jan-24	pH	5.0 - 9.0		6.82	6.8	6.79												
17-Jan-24	pH	5.0 - 9.0					6.76	6.72	6.8	6.74								

		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						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
18-Jan-24	pH	5.0 - 9.0									6.75	6.8	6.96	7.06			7.11	7.02
23-Jan-24	pH	5.0 - 9.0		6.56	6.48	6.6												
25-Jan-24	pH	5.0 - 9.0					6.4	6.51	6.7	6.78								
30-Jan-24	pH	5.0 - 9.0				6.6	6.64	6.62	6.68	6.66								
6-Feb-24	pH	5.0 - 9.0	6.54												6.92			
7-Feb-24	pH	5.0 - 9.0		6.6	6.55	6.68										6.83		
8-Feb-24	pH	5.0 - 9.0					6.69	6.75	6.6	6.64								
9-Feb-24	pH	5.0 - 9.0									6.81	6.79	6.74	6.67			7.1	6.97
14-Feb-24	pH	5.0 - 9.0		6.65	6.65	6.78												

APPENDIX 5-2: EFFLUENT CAMP MONITORING RESULTS – Q1 2024

		Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
22-Jan-24	pH	6.0 - 9.0	7.5	7.67	7.65
12-Feb-24	pH	6.0 - 9.0	6.8	7.4	7.48
26-Feb-24	pH	6.0 - 9.0	6.84	7.5	7.35
04-Mar-24	pH	6.0 - 9.0	6.66	6.83	6.88
26-Mar-24	pH	6.0 - 9.0	6.59	6.84	6.84
22-Jan-24	Sat. DO (%)		30.8	93	68.1
12-Feb-24	Sat. DO (%)		26.1	75.6	41.7
26-Feb-24	Sat. DO (%)		39.6	67.8	61.2
04-Mar-24	Sat. DO (%)		43	100.1	56.2
26-Mar-24	Sat. DO (%)		27.3	91.9	46.6
22-Jan-24	DO (mg/L)		2.52	7.57	4.95
12-Feb-24	DO (mg/L)		2.17	6.14	3.35
26-Feb-24	DO (mg/L)		3.14	5	4.71
04-Mar-24	DO (mg/L)		3.41	8	4.32
26-Mar-24	DO (mg/L)		2.13	7	3.49
22-Jan-24	Conductivity (µs/cm)		375	364	1097
12-Feb-24	Conductivity (µs/cm)		338	410	1130
26-Feb-24	Conductivity (µs/cm)		365	349	1329
04-Mar-24	Conductivity (µs/cm)		350	348	1497
26-Mar-24	Conductivity (µs/cm)		367	382	1148
22-Jan-24	Turbidity (NTU)		1.39	4.76	8.43
12-Feb-24	Turbidity (NTU)		0.78	11.2	6.46
26-Feb-24	Turbidity (NTU)		1.71	3.99	1.1
04-Mar-24	Turbidity (NTU)		2.78	4.38	8.69
26-Mar-24	Turbidity (NTU)		1.31	7.67	8.88
22-Jan-24	TSS (mg/L)	<50	<5	6.6	11
12-Feb-24	TSS (mg/L)	<50	<5	<5	7.8
26-Feb-24	TSS (mg/L)	<50	<5	<5	16.67
04-Mar-24	TSS (mg/L)	<50	<5	<5	7.83
26-Mar-24	TSS (mg/L)	<50	7.6	8.16	14.21
22-Jan-24	BOD ₅ (mg/L)	<30	<6	<6	<6
12-Feb-24	BOD ₅ (mg/L)	<30	<6	<6	<6
26-Feb-24	BOD ₅ (mg/L)	<30	7.2	13.8	<6
04-Mar-24	BOD ₅ (mg/L)	<30	<6	<6	<6
26-Mar-24	BOD ₅ (mg/L)	<30	<6	<6	<6
22-Jan-24	COD (mg/L)	<125	<25	<25	<25
12-Feb-24	COD (mg/L)	<125	<25	<25	27.3
26-Feb-24	COD (mg/L)	<125	<25	<25	57.8
04-Mar-24	COD (mg/L)	<125	<25	<25	27.0
26-Mar-24	COD (mg/L)	<125	<25	27.4	55.4
22-Jan-24	NH ₃ -N (mg/L)	<10.0	<2	7.5	5.5
12-Feb-24	NH ₃ -N (mg/L)	<10.0	<2	7.0	8.7
26-Feb-24	NH ₃ -N (mg/L)	<10.0	<2	5.5	9.2
04-Mar-24	NH ₃ -N (mg/L)	<10.0	<2	10.0	7.0
26-Mar-24	NH ₃ -N (mg/L)	<10.0	<2	7.9	16.3
22-Jan-24	Total Nitrogen (mg/L)	<10.0	3.1	9.1	5.0

		Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
12-Feb-24	Total Nitrogen (mg/L)	<10.0	0.1	8.5	9.8
26-Feb-24	Total Nitrogen (mg/L)	<10.0	0.4	8.2	10.7
04-Mar-24	Total Nitrogen (mg/L)	<10.0	0.6	12.0	10.6
26-Mar-24	Total Nitrogen (mg/L)	<10.0	0.9	9.0	20.7
22-Jan-24	Total Phosphorus (mg/L)	<2	1.8	0.9	7.8
12-Feb-24	Total Phosphorus (mg/L)	<2	1.1	1.0	7.2
26-Feb-24	Total Phosphorus (mg/L)	<2	1.5	0.8	8.4
04-Mar-24	Total Phosphorus (mg/L)	<2	1.2	1.1	8.7
26-Mar-24	Total Phosphorus (mg/L)	<2	2.7	0.9	7.5
22-Jan-24	Oil & Grease (mg/L)	<10.0	<1	<1	<1
12-Feb-24	Oil & Grease (mg/L)	<10.0	<1	<1	<1
26-Feb-24	Oil & Grease (mg/L)	<10.0			
04-Mar-24	Oil & Grease (mg/L)	<10.0	<1	<1	<1
26-Mar-24	Oil & Grease (mg/L)	<10.0			
22-Jan-24	Total coliform (MPN/100 mL)	<400	1600	5400	0
12-Feb-24	Total coliform (MPN/100 mL)	<400	350	130	0
26-Feb-24	Total coliform (MPN/100 mL)	<400	350	3500	0
04-Mar-24	Total coliform (MPN/100 mL)	<400	460	16000	0
26-Mar-24	Total coliform (MPN/100 mL)	<400	1600	49	2
22-Jan-24	Faecal Coliform (MPN/100 mL)	<400	110	920	0
12-Feb-24	Faecal Coliform (MPN/100 mL)	<400	70	0	0
26-Feb-24	Faecal Coliform (MPN/100 mL)	<400	33	1600	0
04-Mar-24	Faecal Coliform (MPN/100 mL)	<400	70	16000	0
26-Mar-24	Faecal Coliform (MPN/100 mL)	<400	540	2	0
22-Jan-24	Residual Chlorine (mg/L)	<1.0	N/A	0.00	0.90
12-Feb-24	Residual Chlorine (mg/L)	<1.0	N/A	0.37	1.13
26-Feb-24	Residual Chlorine (mg/L)	<1.0	N/A	0.05	1.10
04-Mar-24	Residual Chlorine (mg/L)	<1.0	N/A	0.01	0.34
26-Mar-24	Residual Chlorine (mg/L)	<1.0	N/A	0.21	1.22

APPENDIX 5-3: COMMUNITY GROUNDWATER QUALITY MONITORING RESULTS – Q1 2024

Month Year	Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	NamPa Village	Thong Noy Village	Pou Village	
		Station	GPHX 01	GPHX 02	GSXN01	GNPA01	GTHN01	GPOU 01	GPOU 02
		Guideline							
15-Jan-24	pH	6.5 - 9.2						6.5	6.6
29-Jan-24	pH	6.5 - 9.2	6.5	6.5	7.5	7.2	6.5		
06-Feb-24	pH	6.5 - 9.2						6.61	6.7
19-Feb-24	pH	6.5 - 9.2	6.72	6.68	6.7	6.52	6.67		
11-Mar-24	pH	6.5 - 9.2						6.6	6.72
26-Mar-24	pH	6.5 - 9.2		6.61	6.6	6.56	6.62		
15-Jan-24	Sat. DO (%)							86.9	58.4
29-Jan-24	Sat. DO (%)		46.9	22.9	79.9	98.9	72.2		
06-Feb-24	Sat. DO (%)							78	77.6
19-Feb-24	Sat. DO (%)		42.8	18.6	88	93.5	66.6		
11-Mar-24	Sat. DO (%)							88.5	80.2
26-Mar-24	Sat. DO (%)			70.9	81.7	91.9	80.6		
15-Jan-24	DO (mg/l)							7.34	4.94
29-Jan-24	DO (mg/l)		3.91	1.93	6.81	8.15	6.04		
06-Feb-24	DO (mg/l)							6.62	6.4
19-Feb-24	DO (mg/l)		3.44	1.53	6.98	7.47	5.32		
11-Mar-24	DO (mg/l)							7.2	6.58
26-Mar-24	DO (mg/l)			5.73	6.21	7.16	6.18		
15-Jan-24	Conductivity (µS/cm)							23	279
29-Jan-24	Conductivity (µS/cm)		257	514	507	483	449		
06-Feb-24	Conductivity (µS/cm)							26	356
19-Feb-24	Conductivity (µS/cm)		244	515	511	474	459		
11-Mar-24	Conductivity (µS/cm)							24	295
26-Mar-24	Conductivity (µS/cm)			512	442	456	468		
15-Jan-24	Temperature (°C)							23.85	24.01
29-Jan-24	Temperature (°C)		24.4	23.99	23.26	25.02	24.24		
06-Feb-24	Temperature (°C)							23.56	25.18
19-Feb-24	Temperature (°C)		25.12	25.15	27.15	26.81	26.72		
11-Mar-24	Temperature (°C)							25.83	25.56
26-Mar-24	Temperature (°C)			26.04	29.98	28.09	28.93		
15-Jan-24	Turbidity (NTU)	<20						4.05	2.31
29-Jan-24	Turbidity (NTU)	<20	19.8	10.4	0.52	0.37	1.46		
06-Feb-24	Turbidity (NTU)	<20						3.37	1.25
19-Feb-24	Turbidity (NTU)	<20	3.62	16	1.82	0.51	1		
11-Mar-24	Turbidity (NTU)	<20						3.99	1.27

Month Year	Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	NamPa Village	Thong Noy Village	Pou Village	
		Station	GPHX 01	GPHX 02	GSXN01	GNPA01	GTHN01	GPOU 01	GPOU 02
		Guideline							
26-Mar-24	Turbidity (NTU)	<20		7.11	0.51	0.52	2.03		
15-Jan-24	Fecal coliform (MPN/100ml)	0						0	0
29-Jan-24	Fecal coliform (MPN/100ml)	0	4	2	4.5	0	27		
06-Feb-24	Fecal coliform (MPN/100ml)	0						0	0
19-Feb-24	Fecal coliform (MPN/100ml)	0	0	0	0	0	130		
11-Mar-24	Fecal coliform (MPN/100ml)	0						0	0
26-Mar-24	Fecal coliform (MPN/100ml)	0		0	0	4.5	27		
15-Jan-24	E.coli Bacteria (MPN/100ml)	0						0	0
29-Jan-24	E.coli Bacteria (MPN/100ml)	0	2	4.5	0	0	7.8		
06-Feb-24	E.coli Bacteria (MPN/100ml)	0						0	0
19-Feb-24	E.coli Bacteria (MPN/100ml)	0	0	0	0	0	7.8		
11-Mar-24	E.coli Bacteria (MPN/100ml)	0						0	0
26-Mar-24	E.coli Bacteria (MPN/100ml)	0		0	0	0	14		

APPENDIX 5-4: GRAVITY FED WATER SUPPLY QUALITY MONITORING RESULTS – Q1 2024

		Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline				
29-Jan-24	pH	6.5 - 8.5	6.28	6.18	6.21	6.2
19-Feb-24	pH	6.5 - 8.5	6.86	6.9	6.28	6.2
26-Mar-24	pH	6.5 - 8.5	7	6.94	6.45	6.49
29-Jan-24	Sat. DO (%)		102.8	109.4	104.1	99.5
19-Feb-24	Sat. DO (%)		93	100.5	96	86.7
26-Mar-24	Sat. DO (%)		96.6	94.9	96.6	83.8
29-Jan-24	DO (mg/L)		9.1	9.68	9.17	8.91
19-Feb-24	DO (mg/L)		7.68	8.22	7.83	7.07
26-Mar-24	DO (mg/L)		7.65	7.3	7.7	6.6
29-Jan-24	Conductivity (µS/cm)	<1,000	70	110	20	20
19-Feb-24	Conductivity (µS/cm)	<1,000	78	110	23	23
26-Mar-24	Conductivity (µS/cm)	<1,000	78	114	32	27
29-Jan-24	Temperature (°C)	<35	21.4	21.39	21.67	20.75
19-Feb-24	Temperature (°C)	<35	25	25.53	25.68	25.72
26-Mar-24	Temperature (°C)	<35	27.22	28.96	26.92	27.69
29-Jan-24	Turbidity (NTU)	<10	4.12	5.29	1.58	1.49
19-Feb-24	Turbidity (NTU)	<10	3.81	9.78	0.94	0.91
26-Mar-24	Turbidity (NTU)	<10	1.95	2.27	2.05	0.94
29-Jan-24	Faecal Coliform (MPN/100 mL)	0	240	130	79	240
19-Feb-24	Faecal Coliform (MPN/100 mL)	0	13	170	130	170
26-Mar-24	Faecal Coliform (MPN/100 mL)	0	8	49	33	7.8
29-Jan-24	E.coli Bacteria (MPN/100 mL)	0	49	33	22	33
19-Feb-24	E.coli Bacteria (MPN/100 mL)	0	14	4.5	7.8	34
26-Mar-24	E.coli Bacteria (MPN/100 mL)	0	5	23	13	4.5