



NAM NGIEP1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Quarterly Environment Monitoring Report Third Quarter of 2023

July to September 2023

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ABBREVIATIONS / ACRONYMS

AIP	Annual Implementation Plan
ADB	Asian Development Bank
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
DD	Data Deficient of IUCN conservation status
DEB	Department of Energy and Business of the Ministry of Energy and Mine
DEMO	District Energy and Mine Office
DOF	Department of Forestry of Ministry of Agriculture and Forestry
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
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
kV	kilo-Volt
KGS	Khammany General Service (Canteen service provider)
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
O&M	Operation and Maintenance Team
ONC	Observation of Non-Compliance
OSOV	Owners' Site Office and Village
PAFO	Provincial Department of Agriculture and Forestry
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.
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 Q3 2023, 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 annual ISO14001:2015 Internal Audit for 2023 is scheduled for mid-October 2023, covering all NNP1PC work function areas. To prepare for this audit, several tasks have been accomplished including (i) announcement of the ISO Committee and ISO Internal Auditors, (ii) online refresher training on the ISO14001:2015 Internal Audit for 17 Internal Auditors by SGS (Lao) Sole Co., Ltd, and (iii) Internal meeting and coordination to prepare the detailed Internal Audit plan 2023.

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

During Q3 2023, EMO received one DWP & SS-ESMMPs for additional drainage works at the Main Dam from the contractor (KENBER GEOTECHNIC (THAILAND) CO., LTD) for review and approval.

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 waste management, NNP1 landfill operation, hazardous material and waste management and wastewater treatment system operation and maintenance. Some improvements were required for implementation such as additional soil backfilling of small holes at the former RCC plant to ensure stability, maintenance of wetland ponds at OSOV1 (WWTS), install a control valve on the outlet pipe of the hazardous storage facility to prevent accidental oil releases from the hazardous materials storage facility (LILAMA10). Waste compaction process at NNP1 landfill is still on hold waiting for ADM to finalize an arrangement for waste compaction.

All 31 rehabilitated areas were inspected. No evidence of erosion or instability were observed at any of the inspected sites. Just additional backfilling of small holes is required at the former RCC plant to ensure stability.

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

A total of 19.2 m³ solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, an decrease of 5.97 m³ compared with Q2 2023.

The environmental flow requirements have been monitored in accordance with the ESMMP-OP and the results show full compliance 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 5.3 mg/L and 8.6 mg/L. The monthly mean DO concentration at the intake level increased from 1.4 mg/L in July 2023, to 2.5 mg/L in August 2023 and 2.8 mg/L in September 2023. The DO concentrations in Nam Chian and Nam Phouan (main reservoir tributaries) were above 6 mg/L.

The DO concentrations at the surface level in the Re-regulation Reservoir (R07) were between 0.4 and 6.6 mg/L.

The DO levels in Nam Ngiep downstream the Re-regulation Dam (NNG05) during turbine discharge, DO levels in all the Nam Ngiep Downstream stations were less than 6 mg/L, except NNG08.

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) submitted the request for second two-quarter funds disbursement under the approved Bolikhamxay Annual Implementation Plan (AIP) 2023 to the Forest Protection Fund (FPF) office of the Department of Forestry (DOF) – Ministry of Agriculture and Forestry (MAF) at the end of June 2023. NNP1PC received the official request for funds disbursement from the FPF DOF-MAF on 28 July 2023. NNP1PC transferred the funds on 17 August 2023, totalling 583,688,000 LAK, of which 163,490,000 LAK is under NNP1 No Net Loss (NNL) and 420,198,000 is under GOL CA. Bolikhamxay WRPO did not implement any activities during Q3 2023 because they had not received the funds from the FPF-DOF-MAF as of the end of September 2023.

NNP1 EMO, Xaysomboun WRPO, and Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS) discussed the Law Enforcement Strategy (LES) and the finalization of the Xaysomboun AIP2023 after the response letter from FPF DOF-MAF was issued on 21 July 2023. The patrolling in the Total Protected Zone (TPZ), watershed forest, and reservoir was carried out from 28 August to 6 September 2023. The results were discussed during the monthly meeting among NNP1 EMO, Xaysomboun WRPO, and BSP-WCS on 21 September 2023. NNP1 EMO and BSP-WCS noted no change in the patrolling team arrangement to include the district military office, as discussed in April 2023. the patrol was carried out outside the target location agreed upon before commencing the patrolling, and the patrol team did not do proper documentation as per the training provided in May 2023. The patrol plan in October 2023 was agreed with the recommendation per experience in September 2023 patrolling. Xaysomboun WRPO organized a meeting with Thathom and Hom District on the Fishery Co-Management Plan (FCMP) on 22 and 29 August 2023, respectively, but did not follow the meeting plan as agreed under the AIP2019

and the Minute of the Meeting on 21 May 2020. Xaysomboun WRPO did not submit the improved draft fishery regulation to NNP1 EMO until the end of September 2023. The meeting to discuss the project development within the NNP1 watershed TPZ was organized on 22 September 2023. The meeting was chaired by Mr. Soutswad VONGPHOUMLET, Vice Governor of Xaysomboun Province, and participated by representatives from relevant GOL offices at central, provincial, and district levels. One of the conclusions is that Xaysomboun Province allowed the mining exploration and hydropower project to continue in the NNP1 watershed TPZ because it is aligned with Decree No. 414, which was issued by the Lao Prime Minister dated 10 December 2019 despite it conflicting with the CA between NNP1PC and the GOL. The Xaysomboun AIP2023 was finalized and submitted to ADB and IAP for review and approval on 16 August 2023. The plan was approved by ADB and IAP on 18 and 20 September 2023, respectively. Xaysomboun WRPO will obtain approval from the Head of Xaysomboun PAFO in the first week of October 2023 and submit it to FPF DOF-MAF afterward. NNP1 EMO expects to receive the official fund disbursement request from FPF DOF-MAF in the second week of October 2023.

Bolikhamxay Biodiversity Offset Management Unit (BOMU) conducted patrolling and snare removal activity during 7-26 July 2023 and 9-21 July 2023 respectively. BOMU planned to conduct patrolling and snare removal activity during 5-24 August and 11-25 August 2023, respectively. However, the activities were postponed after discussion among NNP1 EMO, BOMU, and BSP-WCS considering the safety aspect of accessing the area, difficulties in the logistic arrangement, and challenges in case of emergency under the continuous heavy rain in Viengthong. BOMU resumed patrolling and snare removal activity during 7-26 September and 9-23 September 2023, respectively. Bolikhamxay BOMU also progressed with the livestock farmer group establishment under the agreed Community Development Plan (CDP) for 2023 from 25 July to 11 August 2023. BSP-WCS shared the report with NNP1 EMO and BOMU on 15 August 2023. BOMU, with support from the Bolikhamxay PAFO livestock and fishery section, submitted the report and proposal to the District Agriculture and Forestry Office (DAFO) of Viengthong and Xaychamphone for the official farmer groups approval. After reviewing the documents, DAFO advised the team to provide supporting documents such as the farmer's regulations and the proposal from the farmer group. In this regard, BOMU and DAFO planned to conduct another field trip to all the villages from the third week of October 2023 and will submit the supporting document to DAFO for approval afterward. Bolikhamxay BOMU prepared the second two-quarter fund disbursement request under their approved AIP2023 and submitted it to FPF DOF-MAF at the end of July 2023. NNP1PC received the fund disbursement request from DOF-MAF on 5 September. NNP1PC transferred the fund on 18 September 2023, totalling 3,136,113,000 LAK, from which 1,830,995,000 LAK is under the GOL CA fund and 1,305,118,000 LAK is under the NNP1 NNL fund.

The dominant fish species by weight in the Q3 2023 catches include *Oreochromis niloticus*, *Channa striata* and three species group of *Mastacembelus*, *Hampala* and *Poropuntius* that are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species and *Oreochromis niloticus* is an exotic species. The recorded catch of threatened species includes one species that is classified as Endangered species (EN): *Probarbus labeamajor* and two species that are classified as Vulnerable species (VU): *Scaphognathops bandanensis*, and *Tor sinensis*.

1. INTRODUCTION

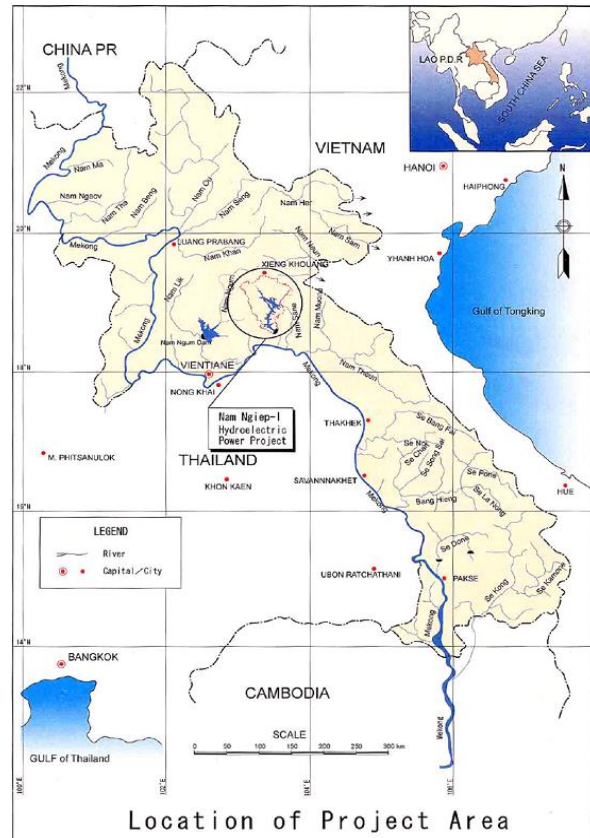
The Nam Ngiep originates in the mountains of Xiengkhouang Province, flowing through Khoun District into Thathom District of Xaysomboun Province, through Hom District and into Bolikhamxay Province. The Nam Ngiep meets the Mekong River just upstream from Pakxan in Bolikhamxay Province.

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 Q3 2023.

2.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

During Q3 2023, 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

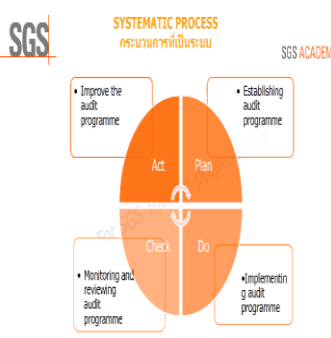
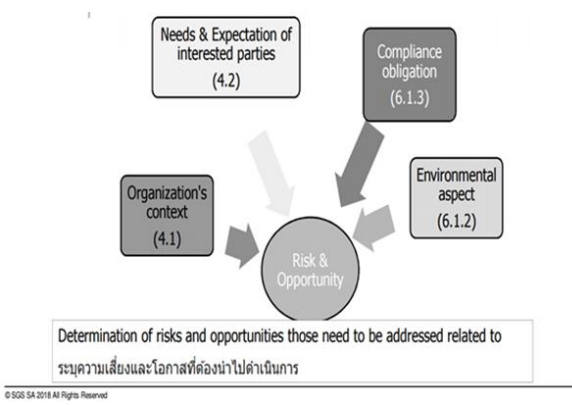
EMP No.	Activity Description	KPI	The EMP Evaluation Date	Implementation Progress
01/2023*	Providing HSE awareness training to NNP1PC staff and contractors	80% of NNP1PC staff and the Contractors are trained on Health, Safety and Environmental awareness during April 2023 to March 2024.	5 Oct 2023	Achieved 61% as of September 2023 – The training is scheduled to be continued in Q4 2023. – The next evaluation is planned for February 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.	5 Oct 2023	Achieved 20% as of October 2023 The next evaluation is scheduled for December 2023 and February 2024
03/2023*	Reducing the quantity of waste disposal at NNP1 Project Landfill	The quantity of waste disposed of y in the NNP1 landfill is reduced by 05% within one year compared with the previous 12 months.	3 Sept 2023	Achieved 11.4% The next evaluation is scheduled for December 2023 and February 2024
04/2023 [#]	Planting trees	Percentage of plant survival, the potential plantation fields in contributing to the environmentally sustainability objectives as specified in section 2.1.1, the tree planting event associated with EMP04-2023 occurred on 18 July 2023 at locations OSOV1, OSOV2, and along the perimeter	5 Oct 2023	Achieved 100% based on the latest assessment in October 2023 – The monitoring of plant survival is conducted on monthly routine – The next evaluation is scheduled for February 2024

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

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

2.1.1 Environmental Management Plan (EMP)

The annual ISO14001:2015 Internal Audit for 2023 is scheduled for mid-October 2023, covering all NNP1PC work function areas. To prepare for this audit, several tasks have been accomplished including (i) announcement of the ISO Committee and ISO Internal Auditors, (ii) online refresher training on the ISO14001:2015 Internal Audit for 17 Internal Auditors by SGS (Lao) Sole Co., Ltd, and (iii) Internal meeting and coordination to prepare the detailed Internal Audit plan 2023.

 ISO14001 Internal Audit Training	 ISO14001 Internal Audit Training
 	 Determination of risks and opportunities those need to be addressed related to ระบุความเสี่ยงและโอกาสที่ต้องนำไปดำเนินการ © SGS SA 2018 All Rights Reserved
Refresher online training on the ISO14001:2015 Internal Audit	Preparation for ISO14001:2015 Internal Audit 2023

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



On 15 September 2023, NNP1PC conducted care activities for the planted trees under the Environmental Management Plan (EMP04-2023) to achieve at least 50% survival by April 2024, including replacing dead and unhealthy trees and applying natural fertilizer to enhance growth. This is due to the first care activities following the mid-July 2023 planting, which focused on fertilizing and replacement unhealthy plants and the plant survival rate had not yet been evaluated.



2.2 CONTRACTOR SS-ESMMPs

EMO received one DWP & SS-ESMMPs from the contractor (KENBER GEOTECHNIC (THAILAND) CO., LTD) for review and approval. The document concerns additional drainage works at the Main Dam.

2.3 RESULTS OF COMPLIANCE INSPECTIONS AT CONSTRUCTION SITES

During Q3 2023, Three joint monthly site inspections were carried out among EMO, ADM and TD to follow up on the progress of corrective actions from the previous findings related to waste management, NNP1 landfill operation, hazardous material and waste management and wastewater treatment system operation and maintenance. Some improvements were required for implementation such as additional soil-rock backfilling of small holes at the former RCC plant to ensure stability, maintenance and weeding of wetland ponds at OSOV1 (WWTS), installation of a control valve on the outlet pipe of the storage facility to prevent accidental oil releases from the hazardous materials storage facility (LILAMA10). Waste compaction process at NNP1 landfill is still on hold waiting for ADM to finalize an arrangement for waste compaction.

The site inspection results are summarized in **Table 2-2**.

TABLE 2-2: SITE INSPECTION RESULTS DURING Q3 2023

	
Finding: ADB ES CAP no. 06: TD and EMO jointly inspected soil filling of the holes at the former RRC Plant. Soil filling and securely closing these identified holes was completed in early August 2023.	
	
OSOV1_Wastewater Treatment System	

Issue: It was observed that there is weed growth inside and around the edges of the wetland ponds. The weeds could potentially reduce the efficiency of wastewater treatment as they prevent sunlight from reaching the wetland and create increased competition with the wetland reeds. Moreover, the dense vegetation also serves as a breeding ground for mosquitoes and other poisonous animals including snakes.

Corrective Action: The ADM was instructed to remove the weeds to increase the efficiency of wastewater treatment and minimize the breeding grounds of vectors.

Next verification: The next monthly joint site inspection is scheduled for 18 October 2023.



NNP1 Landfill

Issue: Since the waste collection contract was completed in April 2023, maintenance activities at NNP1 Landfill, such as grass cutting, weekly waste cover, and fence maintenance, have been discontinued. Key observations from this joint inspection are as follows:

1. The growth of vegetation inside the waste cell could potentially block the flow of leachate from the waste cell to the treatment ponds, compromising leachate treatment efficiency.
2. Dense vegetation has developed along the access road and the perimeter of the landfill. This could pose a fire hazard during dry seasons, and potentially leading to landfill fires.

Corrective Action: The ADM was instructed to clear vegetation along the access road, around the landfill's boundaries, and within the waste cell, conduct waste compaction using machinery at least twice a year, considering the current monthly waste disposal average of approximately 9 m³.

Next verification: The next monthly joint site inspection is scheduled on 18 October 2023.

**LILAMA10_Hazardous Storage Facility**

Issue: The hazardous materials storage facility is not fully operational due to the “**absence of a control valve**” on the outlet pipe of the secondary containment. The mentioned valve is necessary for preventing accidental oil releases from the hazardous materials storage facility.

Corrective Action: The TD was instructed to take the following action:

- Install a control valve on the outlet pipe of the storage facility to prevent accidental oil releases from the hazardous materials storage facility.

Next verification: The next monthly joint site inspection is scheduled for 18 October 2023.

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

The mission made the following recommendations to NNP1PC:

- Continue implementing the E&S management measures according to the ESMMP-OP.
- Enhance the rehabilitation of sites by planting more local trees, where feasible, before handing over the site to the GOL;
- Maintain the submission of quarterly reports in the Lao language for review by DREI, PONRE, and DONRE.
- Review the existing Watershed Management Plan (WMP) regarding forest rehabilitation activity and include work progress in the quarterly reports.
- Continue conducting livelihood assessments and providing support to the project-affected communities.

- Ensure the timely disbursement of annual environmental monitoring funds to DREI, PONREs, and DONREs.
- Incorporate social monitoring into the EMU's environmental mission.
- NNP1PC proposed to initiate a discussion on the handover of the community solid waste management and Houay soup landfill during the upcoming EMU site visit in 2023.



2.4 SITE DECOMMISSIONING AND REHABILITATION

All 31 rehabilitated sites were inspected. No evidence of erosion or instability were observed at any of the inspected sites, except for the remaining deep holes at the RCC plant, identified by the LTA during the mission in May 2023. These holes were filled in August 2023.

2.5 WASTE MANAGEMENT AT THE OPERATION SITES

2.5.1 Waste Management at NNP1 Project Sites

A total of 19.2 m³ solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, a decrease of 5.97 m³ compared with Q2 2023. Since the waste collection contract was completed in April 2023, the general waste collection and disposal and NNP1 landfill operation have temporarily been carried out by the ADM staff while awaiting the recruitment of a new contractor. However, maintenance activities at NNP1 Landfill, such as grass cutting, weekly waste cover, and fence maintenance, have been discontinued. In addition, the waste compaction at NNP1 landfill is still on hold, waiting for ADM to finalize an arrangement for waste compaction.

The amount of recyclable waste managed on site during Q3 2023 is shown in **Table 2-3**.

TABLE 2-3: AMOUNTS OF RECYCLABLE WASTE DURING Q3 2023

Source and Type of Recyclables		Unit	Total in Q3 2023 (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	187	57	130
3	Aluminium Can	kg	0	0	0
4	Paper/Cardboard	kg	83	0	83
5	Glass	kg	192	0	192

Source and Type of Recyclables		Unit	Total in Q3 2023 (A)	Sold (B)	Remaining Amount (A - B)
7	Scrap metal	Kg	0	0	0
Sub-Total 2		kg	462.0	57	405.0
Grand Total (Sub-Total 1+2)		kg	462.0	57	405.0

2.5.2 Hazardous Waste Management

The amounts of hazardous waste and hazardous materials that were collected, stored and disposed of during Q3 2023 are shown in **Table 2-4**.

TABLE 2-4: HAZARDOUS MATERIAL AND HAZARDOUS WASTE RECORDED DURING Q3 2023

No.	Type of Hazardous Material	Unit	Total in Q3 2023	Used/ Disposed	Remaining
1	Diesel	Litre	12,987	12,577	410
2	Gasoline	Litre	1,975	1,414	561
3	Lubricant (Turbine oil)	Litre	85	13	72
4	Colour paint	Litre	39	0	39
5	Thinner	Litre	1	0	1
6	Grease oil	Litre	785	0	785
7	Gear Oil	Litre	16.5	0	16.5
8	Chlorine Liquid	Litre	90	0	90
9	HA Cut AF	Litre	3,925	0	3,925
10	HA Cut Cat AF	Litre	373	0	373
Type of Hazardous Waste					
13	Used Oil (Hydraulic + Engine)	Litre	355	0	355
14	Used oil mixed with water	Litre	0	0	0
15	Empty used oil drum/container (drum 200L)	Unit	53	0	53
16	Use Oil Filter	Unit	9	0	9
17	Contaminated soil, sawdust and textile material	M3	1.2	0	1.2
18	Used tyre	Drum	5	0	5
19	Empty used chemical drum/container (drum 20L)	Unit	44	0	44
20	Lead acid batteries	Unit	6	0	6
21	Empty paint and spray cans	Can	96	0	96
22	Halogen/fluorescent bulbs	Unit	414	0	414
23	Empty cartridge (Ink)	Piece	108	0	108
24	Clinic Waste	Kg	12.8	8.6	4.2
25	Expired Chlorine Powder	Kg	65	0	65

2.5.3 Animal Fodder (Pig Feed) Collection Programme

During Q3 2023, local villagers collected 720.4 kg of food waste from the Owner's Site Office and Village (OSOV) for feeding their animals. During the previous ISO14001 Internal Audit in January 2023, the canteen operator was instructed to minimise food waste in the food preparation

process (use all parts of fruits and vegetables as much as possible) and perform proper waste segregation. It has been monitored regularly to ensure that instructions are adequately implemented.

2.5.4 Community Solid Waste Management and Recycling Programme

In Q3 2023, NNP1 EMO has coordinated with the Bolikhan District Environment Management Unit or EMU on transferring the management of the communities' solid waste, recycle waste bank and Houay Soup Landfill to the local authorities. The EMU will initiate discussions involving NNP1PC, village and district authorities after receiving the 2022 monitoring funds, which NNP1 transferred to MONRE on 11 May 2023 following the fund disbursement request by MONRE on 20 April 2023.

2.5.5 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.

2.6 RESERVOIR OPERATIONS

2.6.1 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 2-1**.

During Q3 2023, the mean daily inflow to the main reservoir was 272 m³/s. The minimum daily inflow was 107 m³/s, maximum daily inflow was recorded at 918 m³/s, and 25th percentile of 158 m³/s and 75th percentile of 305 m³/s. As indicated in **Figure 2-1**, the inflow during Q3 2023 was higher compared to the same period in 2022.

The water level in the main reservoir increased with 1.29 m from El. 297.90 m asl. (01 July 2023) to El. 319.49 m) by the end of Q3 2023.

FIGURE 2-1: INFLOW TO THE MAIN RESERVOIR

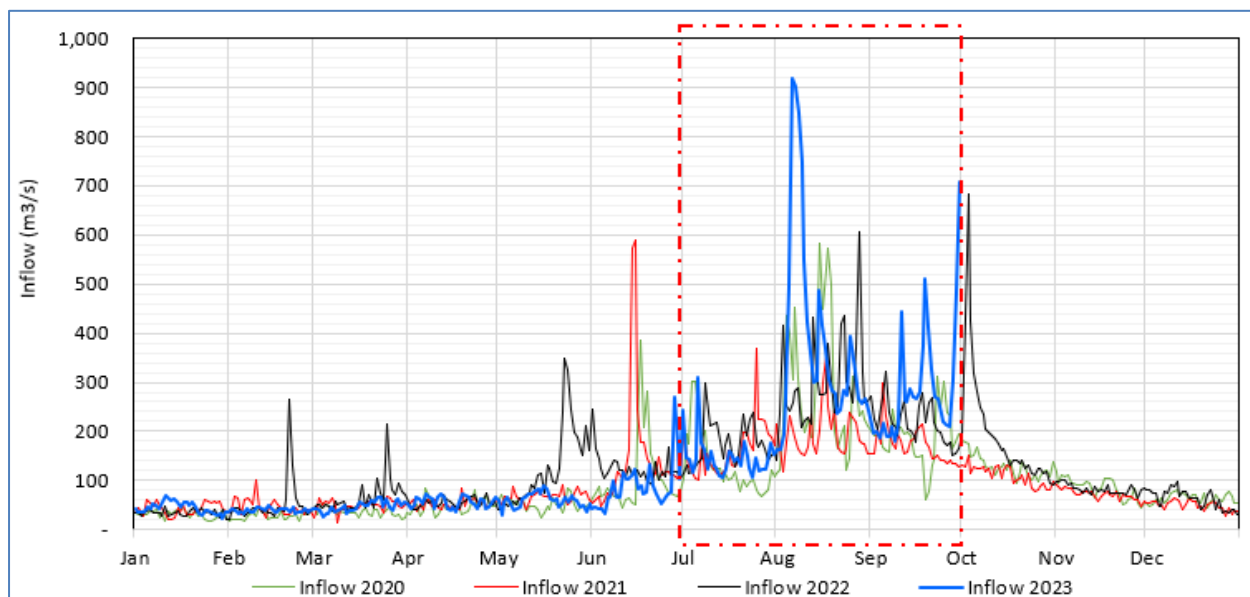
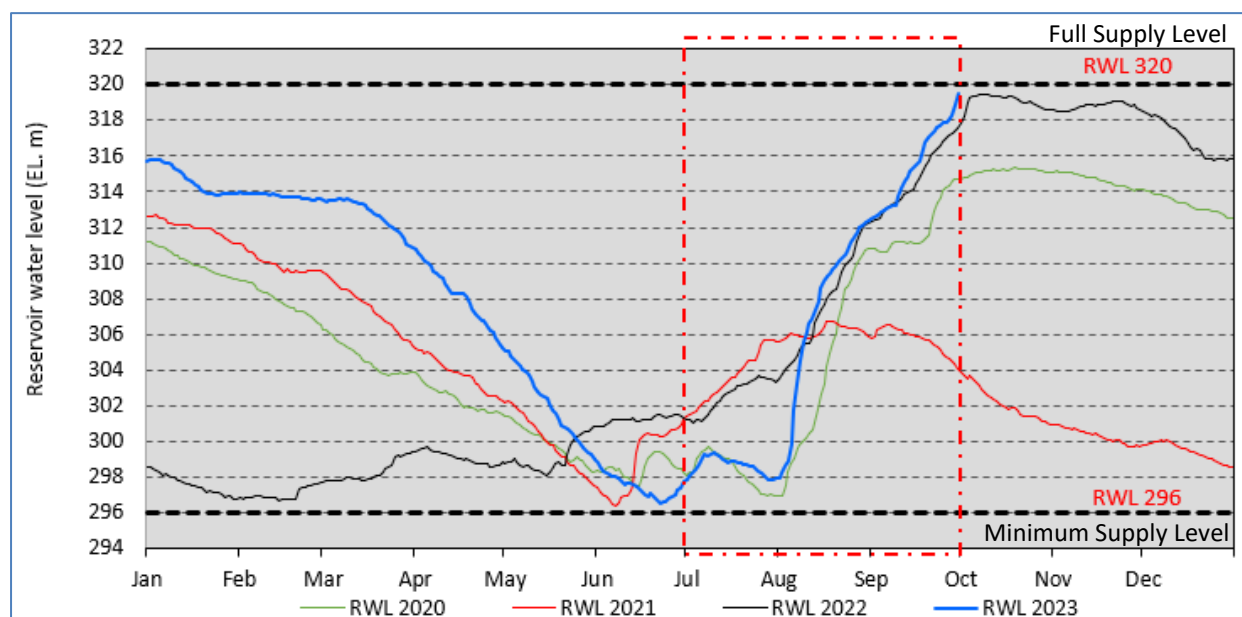


FIGURE 2-2: WATER LEVEL OF THE MAIN RESERVOIR

2.6.2 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).

The results of the EFR compliance monitoring during Q3 2023 are summarized in **Table 2-5**.

TABLE 2-5: SUMMARY OF EFRs COMPLIANCE MONITORING IN Q3 2023

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 Q3 2023 monthly thalweg monitoring missions only included monitoring of navigation difficulties and not water depth measurements, because the discharge from the re-regulation dam exceeded 90 m ³ /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 m ³ /s or greater, the water depth requirements are met and there are no problems with navigating the river.

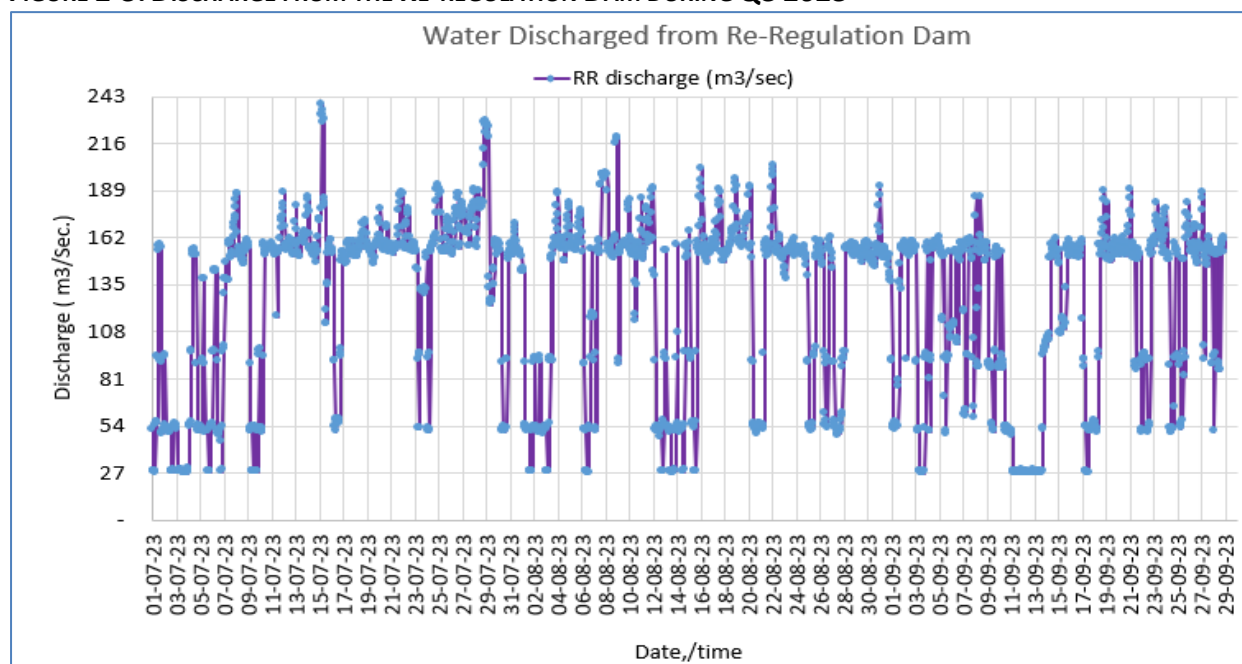
No	EFRs in the Downstream of the Re-regulation dam	EFRs compliance
		However, in Q4 October 2023, at the beginning of the dry season, NNP1PC will conduct interviews with inhabitants, who use boats, to gather and assess any complaints about boat navigation difficulties. Based on the feedback from the boat users, NNP1PC will consider officially proposing revisions to the monitoring programme in Q2 2024
3	Maximum rate of change (both rise and fall, separately) in stage of 0.6 m per hour	100% of hourly fluctuations comply
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)	100% of 24-hour fluctuations comply
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)	All 7-day fluctuations comply

2.6.2.1 Minimum Flow Requirements

The discharge monitoring data for the re-regulation dam during Q3 2023 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 2-3**.

During Q3 2023, the mean discharge from the re-regulation dam was about 132 m³/s in July 2023 and about 129 m³/s and 118 m³/s in August and September 2023 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 2-3: DISCHARGE FROM THE RE-REGULATION DAM DURING Q3 2023

2.6.2.2 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 2-4**. 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 recommendation by 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 complaint has 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 Q3 2023 (see **Table 2-6**).

however, as the discharge exceeded 90 m³/s on all three missions, the thalweg water depths were not measured. There were no boat navigation difficulties during the missions.

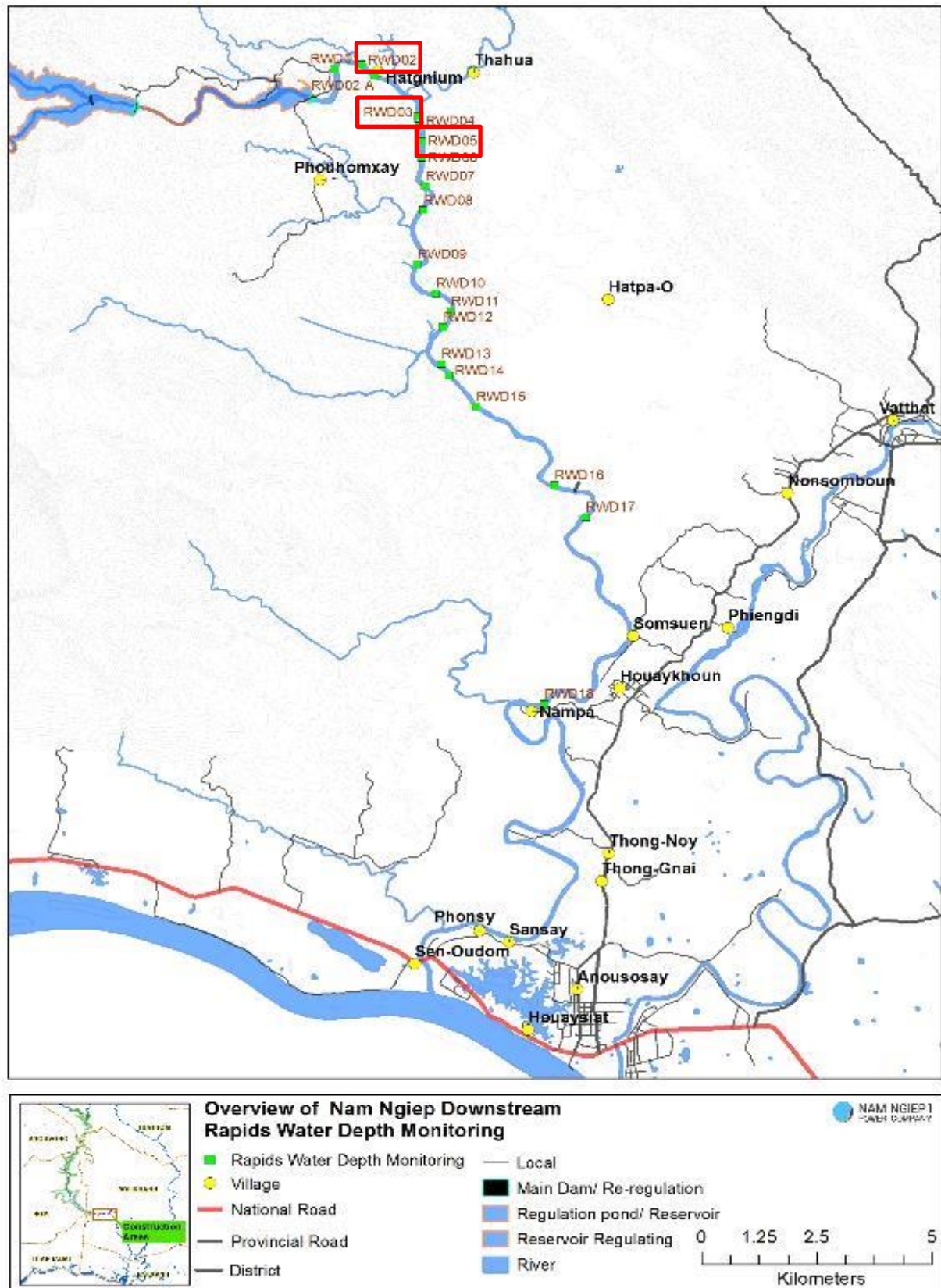
In Q4 2023, at the beginning of the dry season, NNP1PC will conduct interviews with inhabitants who use boats to gather and assess any complaints about boat navigation difficulties.

Based on the feedback from the boat users, NNP1PC will consider officially proposing revisions to the monitoring programme in Q2 2024.

TABLE 2-6: 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)
6-Jul-23	143	- 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. - Note: A few locations (RWD02, RWD 03, and RWD05) with shallow water depth less than 0.5 m have been previously identified, and are indicated by red rectangles on the map.																		
17-Aug-23	156																			
22-Sep-23	94																			

FIGURE 2-4: LOCATION MAP OF RIVER DEPTH MONITORING POINTS



2.6.2.3 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.

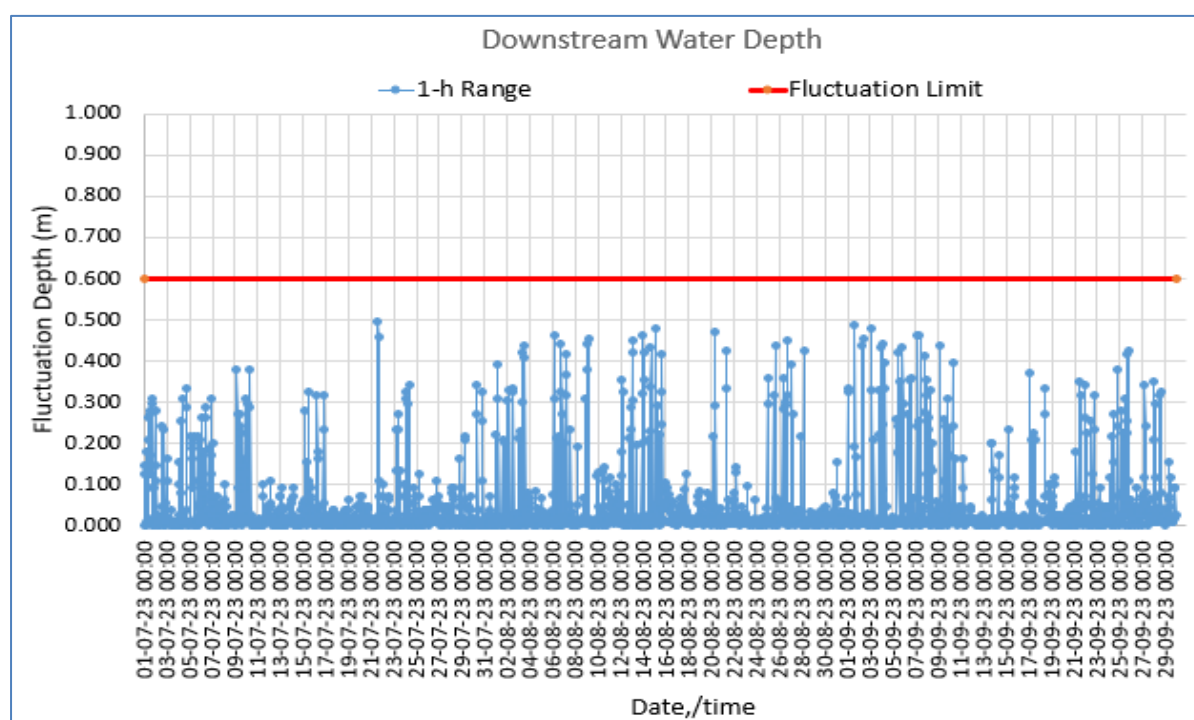
For the 0.6 m in 1-hour maximum fluctuation EFR, the cumulative rises and falls are calculated from the hourly water level recordings.

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 Q3 2023, the maximum rate of change of 0.6 m over 1-hour was complied with for 100% of the hourly fluctuations. The results are presented in **Figure 2-5**.

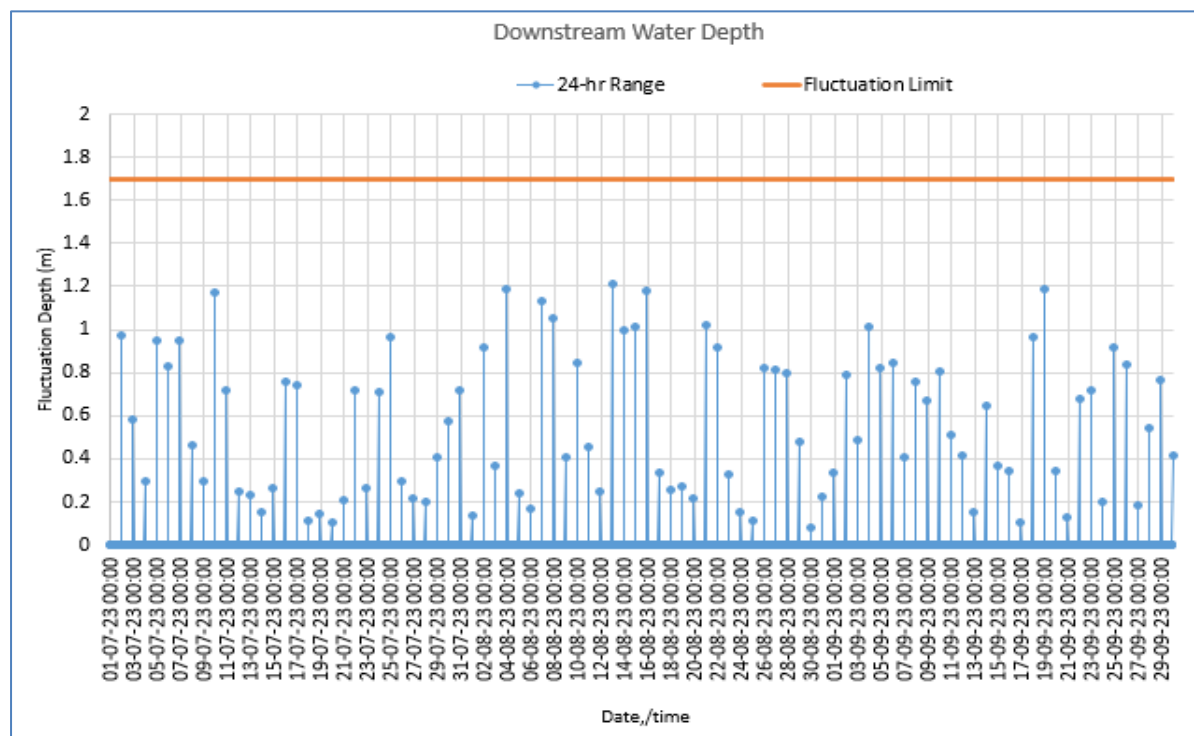
FIGURE 2-5: HOURLY STAGE HEIGHT FLUCTUATIONS DURING Q3 2023



During Q3 2023, the maximum range in stage of 1.7 m over 24-hour was complied with for all 24-hour periods (00:00 – 23:59).

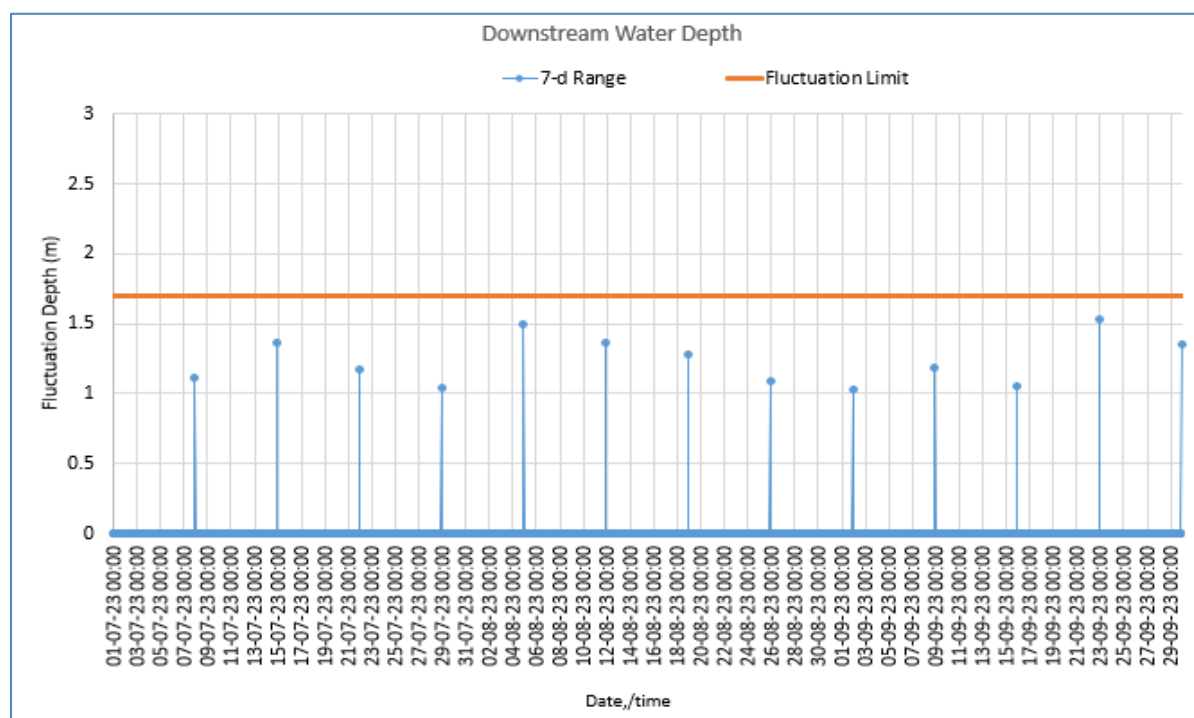
The results of the monitoring are presented in **Figure 2-6**.

FIGURE 2-6: 24-HOUR STAGE HEIGHT DIFFERENCE (M) DURING Q3 2023



During Q3 2023, the maximum range in stage of 1.7 m over 7-days was complied with for all 7-day periods. The results are presented in **Figure 2-7**.

FIGURE 2-7: 7-DAY STAGE HEIGHT DIFFERENCE (M) DURING Q3 2023



2.7 WATER QUALITY MONITORING

2.7.1 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 2** and all surface water quality data for Q3 2023 are listed in **Appendix 4.1**

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 2-8**, the DO long profile measurement as timeseries are presented in **Figure 2-9**, and the full set of DO surface water quality data are shown in **Table 2-7**.

The water temperature and DO depth profiles in the main reservoir at R05 during Q3 2022, Q2 2023 and Q3 2023 are presented in **Figure 2-11** to **Figure 2-13**.

FIGURE 2-8: DISSOLVED OXYGEN IMMEDIATELY UPSTREAM AND DOWNSTREAM OF THE MAIN DAM

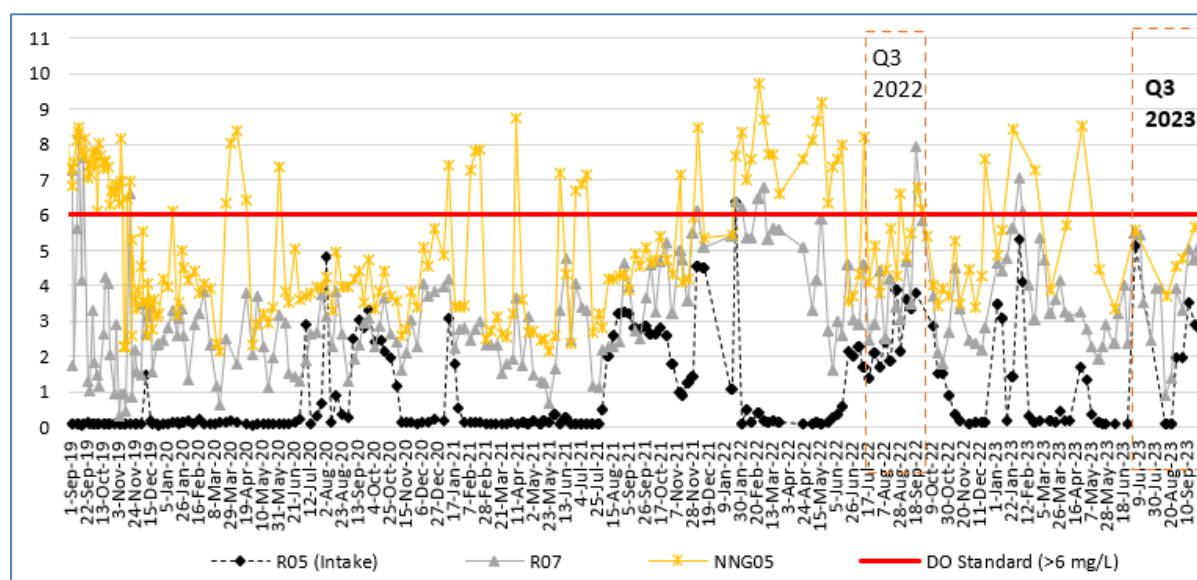
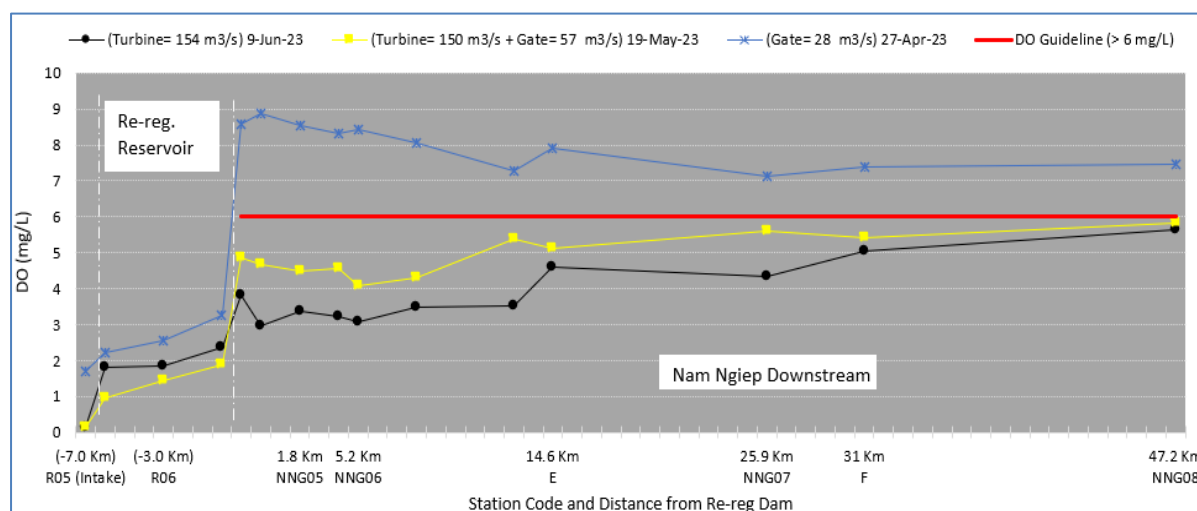
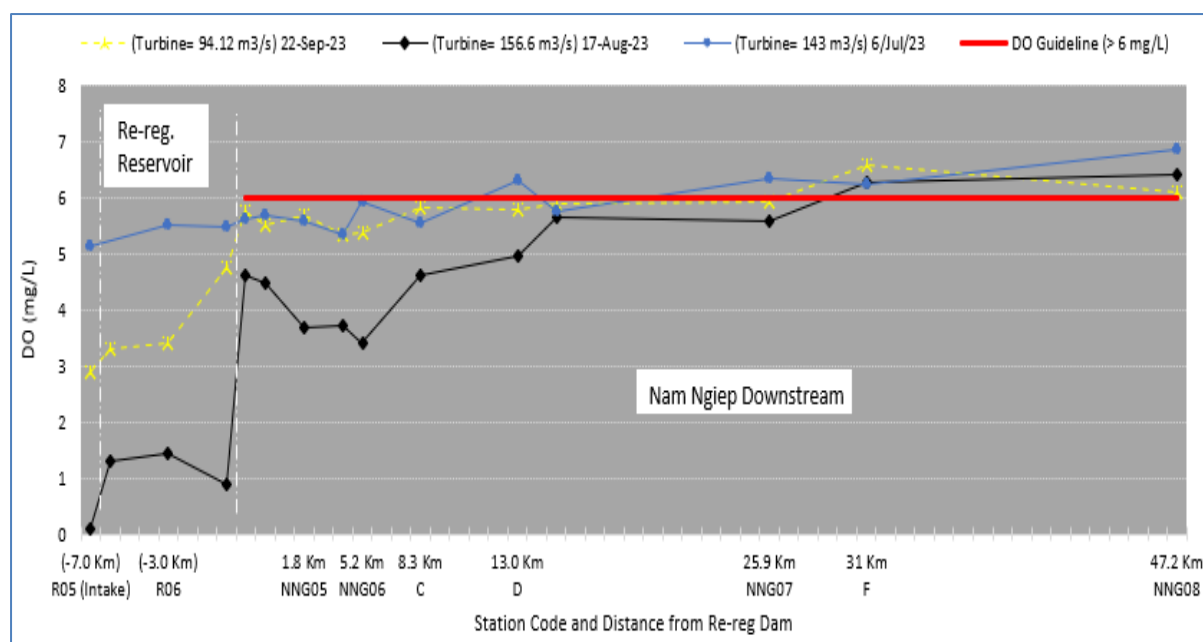


FIGURE 2-9: DISSOLVED OXYGEN LONG PROFILE MEASUREMENT FROM IMMEDIATELY UPPER MAIN DAM TO LOWER NAM NGIEP (Q2 2023 vs Q3 2023)





Main Reservoir

Figure 2-13 presents the DO and water temperature depth profile timeseries in the Main Reservoir (R04 and R05) from September 2018 to September 2023, 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 Q3 2023 indicates formation of thermoclines and oxyclines in the main reservoir at the monitored stations at different depths.

At R05, when comparing Q3 2023 with Q3 2022, overall, the thermocline and oxycline show a similar pattern.

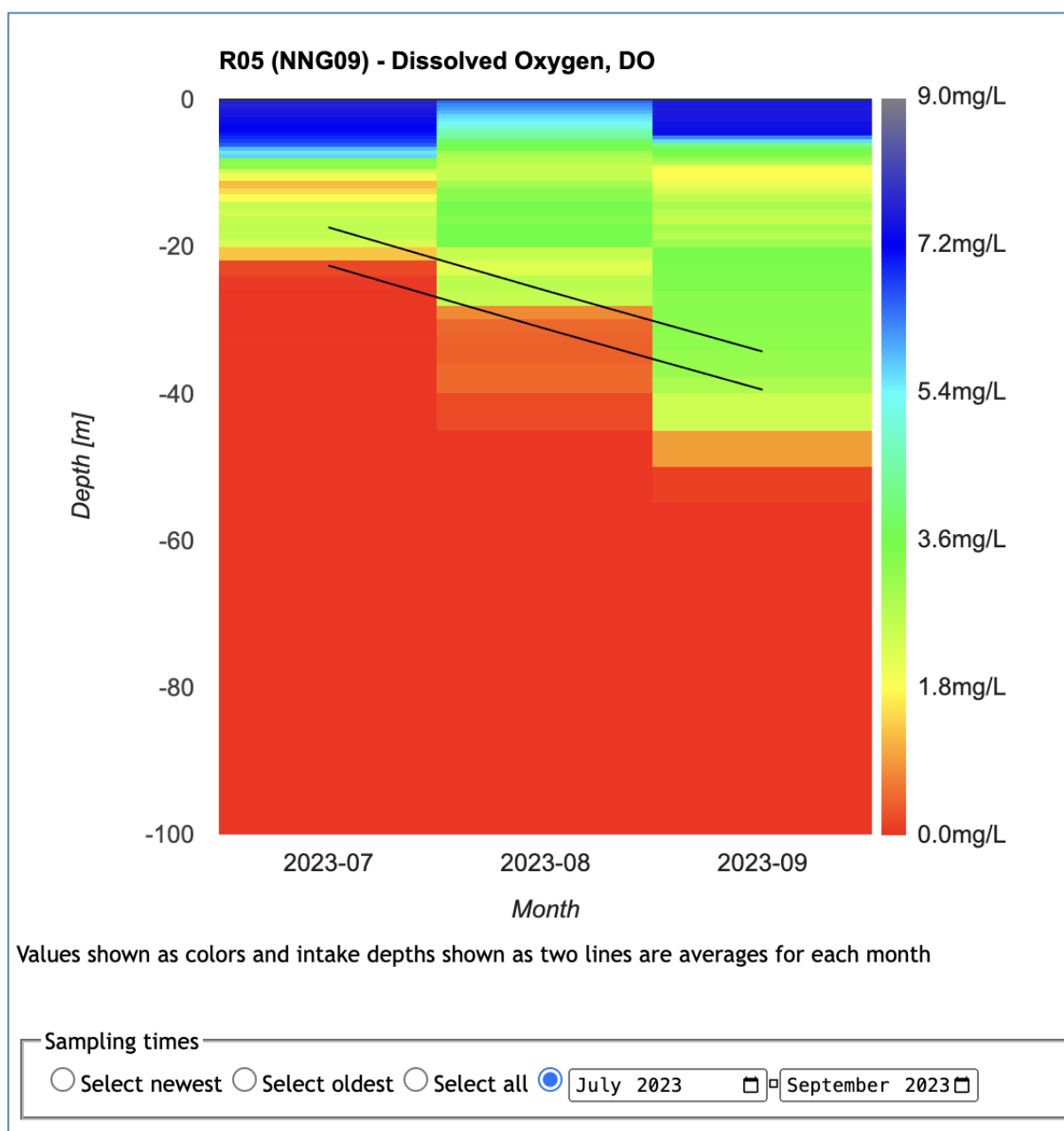
Figure 2-13 shows the average DO concentrations observed during Q3 2023. It reveals a minor improvement in the DO level near the water surface and no significant improvement at the intake level compared to the same period in Q3 2022.

At R05 (the station closest to the main dam), during Q3 2023, the thermocline and the oxycline occurred at about 8 m - 10 m depths with DO concentrations dropping from about 7 mg/L - 8 mg/L in the epilimnion down to 2 mg/L – 3 mg/L below the thermocline.

The monthly mean DO concentration at the intake level increased from about 1.4 mg/L in July 2023, to 2.8 mg/L in September 2023. Anoxic levels were found at increasing depths from about 25 m in July 2023 (approximately at the level of the intake) to 55 m in September 2023 (about 15 m below the intake sill) (see **Figure 2-10**).

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

FIGURE 2-10 MONTHLY MEAN CONCENTRATIONS OF DISSOLVED OXYGEN IN R05



At R02, during July and August 2023, DO concentrations entire water column varied between 4.1 mg/L and 9.4 mg/L with a mean of 6.8 mg/L. During the first two weeks of September 2023, the DO concentrations entire water column varied from 2.9 mg/L to 9.7 mg/L with a mean of 5.1 mg/L. During the last two weeks of May 2023, DO concentrations varied from 1.9 mg/L to 8.4 mg/L with a mean of 4.5 mg/L for the entire water column.

At R01, the mean DO concentration throughout the quarter was about 7.63 mg/L over the entire water column with no measurements below 5.2 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 2.53 mg/L in July, 2.4 mg/L in August to 2.96 mg/L in September 2023. A similar pattern was found at R07. The DO concentrations in R06 and R07 occasionally were slightly higher than the corresponding DO concentrations at or near the intake level in R05. 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, R01 in the upper end of the Main Reservoir, and the reservoir tributaries Nam Chian (NCH01) and Nam Phouan (NPH01) had DO concentrations above 6 mg/L during Q3 2023.

Downstream Stations

During Q3 2023, a total of three monitoring missions were conducted. All these three monitoring missions were undertaken during turbine discharges of greater than 90 m³/s (greater than minimum environmental flow requirement).

As indicated in Figure 2-9, periods with only turbine discharge have resulted in DO concentrations in the range of 3 mg/L to 5 mg/L over the first 5 km downstream the re-regulation and then gradually increasing to close to 6 mg/L (the National Surface Water Quality Standard) near the confluence with the Mekong River. Figure 2-9 also indicates that during periods with turbine discharge, the DO concentrations of Q3 2023 are increased comparing with only turbine discharge of Q2 2023, however, still below 6 mg/L at the first 26 Km. This corresponds well with a simple mass-balance calculation on the resulting DO concentration after mixing the turbine and gate streams.

No dead fish was observed in Nam Ngiep downstream during Q3 2023.

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 2-11: MAIN RESERVOIR DISSOLVED OXYGEN AT THE END OF Q3 2023

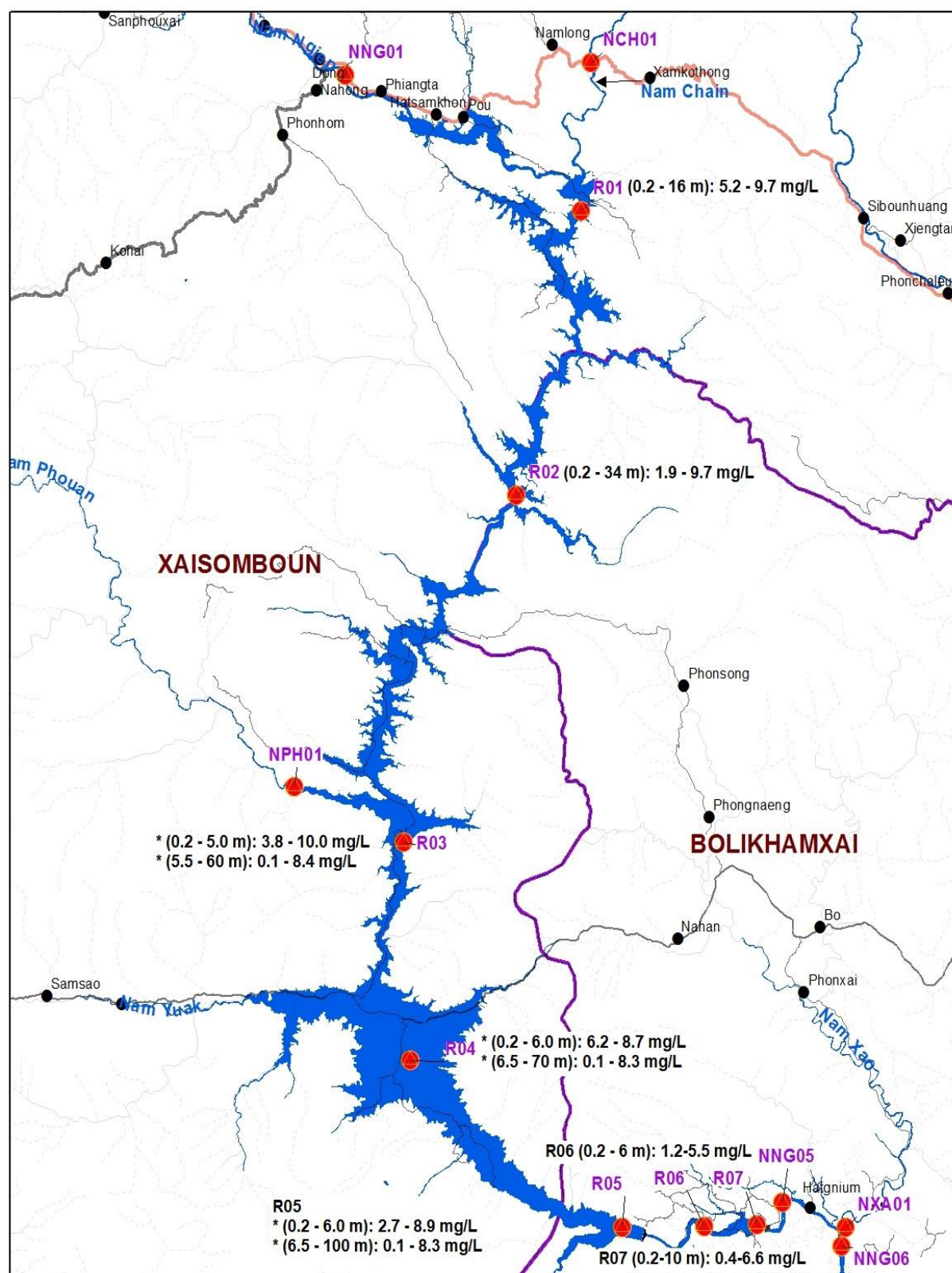


FIGURE 2-12: WATER TEMPERATURE AND DISSOLVED OXYGEN – DEPTH PROFILES IN THE MAIN RESERVOIR IMMEDIATELY UPSTREAM OF THE MAIN DAM (R05)

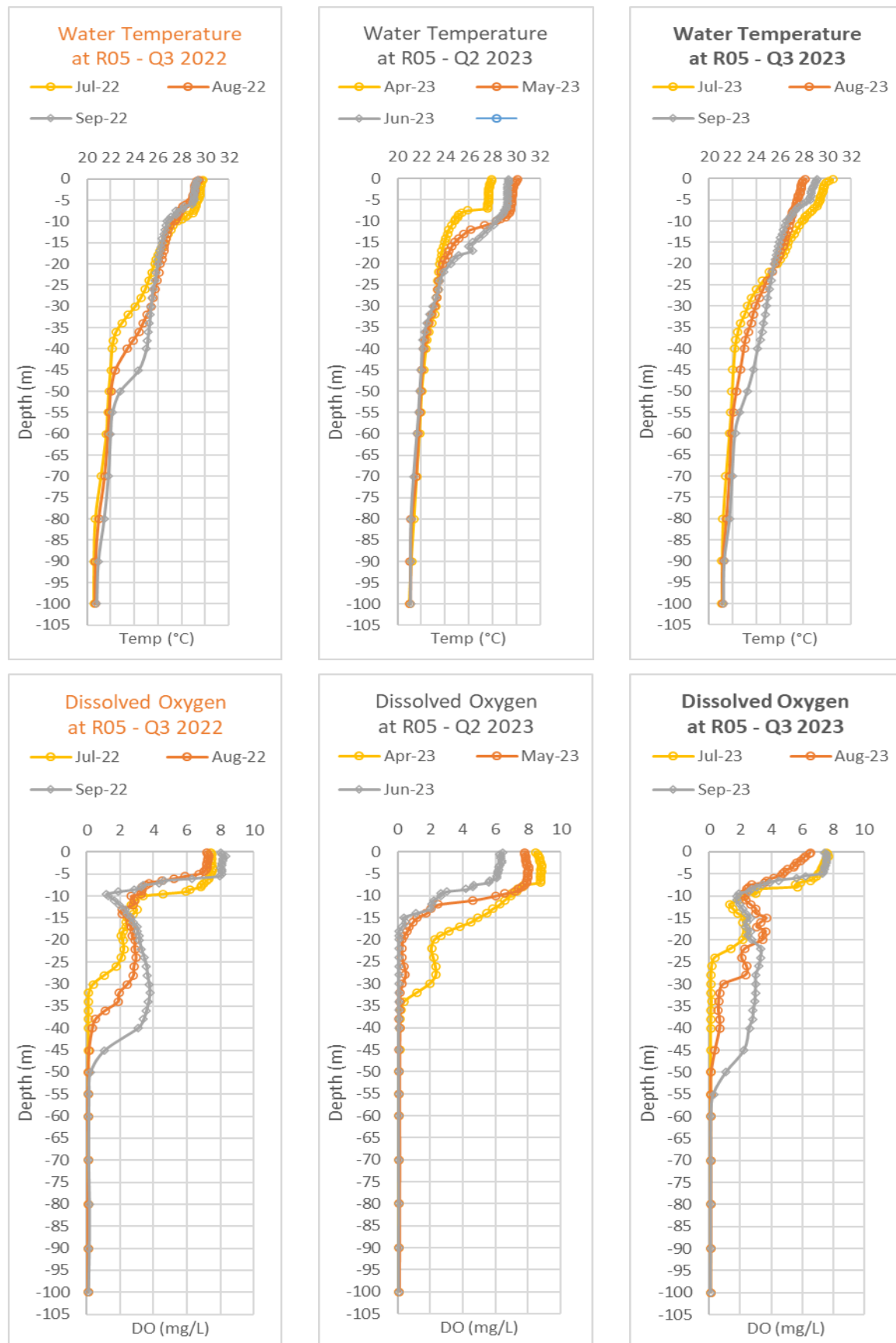


FIGURE 2-13: WATER TEMPERATURE AND DO DEPTH PROFILES IN THE MAIN RESERVOIR (R04 - R05), WITH POSITION OF INTAKE AT THE ACTUAL WATER LEVEL DURING SEPTEMBER 2018 – SEPTEMBER 2023

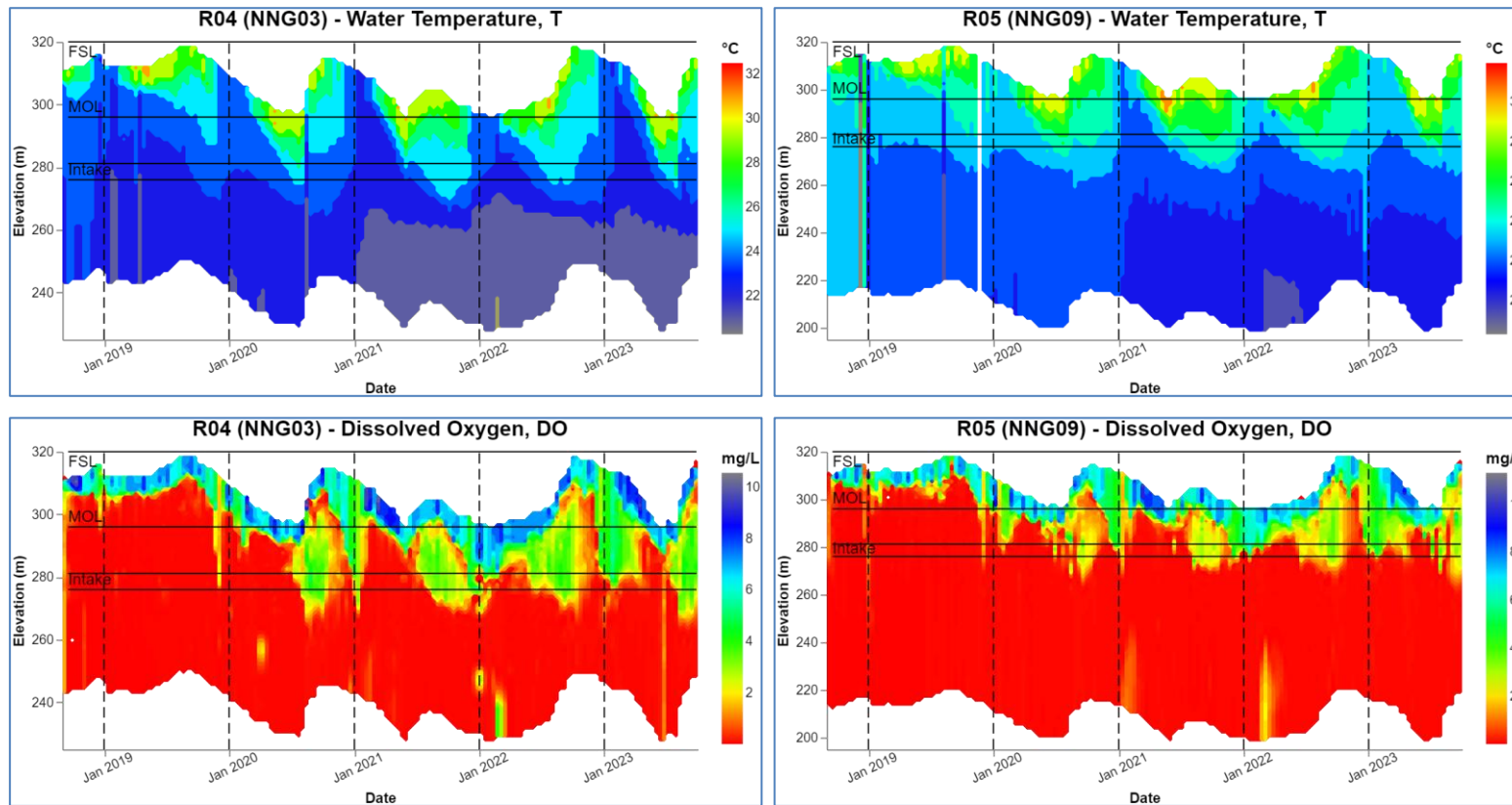


FIGURE 2-14: THE STRAIGHT-LINE GRAPH OF MONTHLY AVERAGED DO AND WATER TEMPERATURE AT R04 AND R05

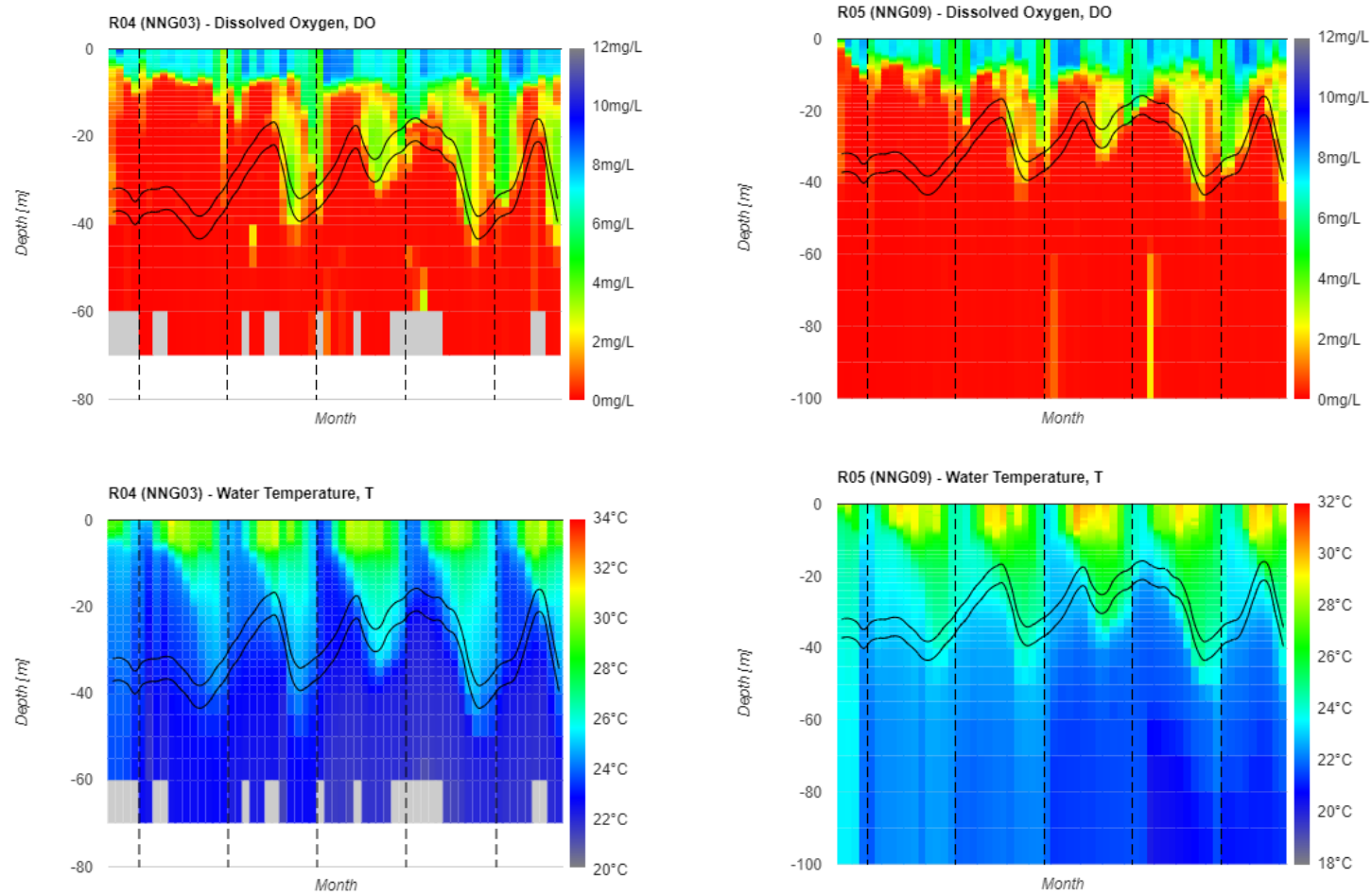


TABLE 2-7: DO (MG/L) RESULTS OF SURFACE WATER IN MAIN RESERVOIR, DO (MG/L) RESULTS OF R05 AT INTAKE DEPTH, RE-REGULATION RESERVOIR, NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q3 2023**(NATIONAL SURFACE WATER QUALITY STANDARD FOR DISSOLVED OXYGEN: ≥ 6 MG/L)**

Station Code	NNG01	R01	R02	R03	R04	R05 Intake	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
3-Jul-23	7.45													8.41			
4-Jul-23		7.34	7.49	7.41											7.95		
5-Jul-23					7.02	5.13	6.27	5.51	5.47								
6-Jul-23										5.58	5.92	6.33	6.84			7.1	6.81
11-Jul-23		8.7	9.14	9.57													
12-Jul-23					8.32	0.16	8.61	2.66	5.42								
17-Jul-23					7.76	0.1	7.97	2.11	3.52								
18-Jul-23		7.08	7.54	7.58													
27-Jul-23		6.64	6.67	7.06													
28-Jul-23					7.52	0.14	7.42	1.95	2.47								
3-Aug-23				7.18	6.54	5.32	6.05	3.48	3.92								
8-Aug-23		9.73	8.82	6.22													
9-Aug-23					6.84	5.05	6.17	3.5	3.93								
14-Aug-23	7.38													8.39			
15-Aug-23					8.02	0.1	5.33	1.45	0.9								
16-Aug-23		8.5	9.27	8.53											8.77		
17-Aug-23										3.69	3.4	5.57	6.4			7.9	7.56
22-Aug-23		7.53	8.42	8.39													

Station Code	NNG01	R01	R02	R03	R04	R05 Intake	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
23-Aug-23					7.82	0.1	7.09	2.41	1.39								
29-Aug-23		8.77	8.97	9.82													
30-Aug-23					8.56	1.96	8.01	2.27	3.91							7.62	7.59
4-Sep-23	7.94													8.62			
5-Sep-23		7.18	6.82	7.44													
6-Sep-23					7.35	1.97	8.04	2.31	3.31							6.25	6.42
14-Sep-23		6.58	9.14	8.31													
15-Sep-23					8.26	3.51	6.83	3.34	5.03								
20-Sep-23		6.96	7.41	7.25													
21-Sep-23					7.42	2.89	7.45	3.4	4.74								
22-Sep-23										5.68	5.38	5.92	6.1			7.73	7.77
26-Sep-23		8.09	8.44	7.94													
27-Sep-23					7.19	2.82	7.47	3.3	5.1								

Ammonia Nitrogen

In Q3 2023, Ammonia Nitrogen complied with the National Surface Water Quality Standard (<0.2 mg/L) in all monitored stations, except NNG01, however, these results are unrelated to the project.

TABLE 2-8: AMMONIA NITROGEN (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q3 2023

(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
3-Jul-23	<0.2												<0.2			
4-Jul-23		<0.2		<0.2										<0.2		
5-Jul-23					<0.2	<0.2										
14-Aug-23	0.3												<0.2			
15-Aug-23					<0.2	<0.2										
16-Aug-23		<0.2		<0.2										<0.2		
20-Sep-23		<0.2											<0.2			
21-Sep-23				<0.2	<0.2	<0.2								<0.2		
22-Sep-23													<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 Q3 2023 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 2-9: BOD₅ (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q3 2023

(NATIONAL SURFACE WATER QUALITY STANDARD FOR BOD₅: <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
3-Jul-23	<1												<1			
4-Jul-23		<1		<1										<1		
5-Jul-23					<1	<1	<1	<1								
6-Jul-23									<1	<1	<1	<1			<1	<1
14-Aug-23	<1												1.26			
15-Aug-23					<1	1	<1	<1								
16-Aug-23		<1		<1										<1		
17-Aug-23									<1	<1	<1				<1	<1
4-Sep-23	<1												<1			
20-Sep-23		<1		<1												
21-Sep-23					<1	<1	<1	<1								
22-Sep-23									<1	<1	<1	<1			<1	<1

Chemical Oxygen Demand (COD)

The COD measurements in Q3 2023 are presented in **Table 2-10**.

TABLE 2-10: COD (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q3 2023**(NATIONAL SURFACE WATER QUALITY STANDARD FOR COD: < 5 MG/L)**

Station Code	NNG 01	R0 1	R0 2	R0 3	R0 4	R0 5	R06	R0 7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
3-Jul-23	6.4												6.4			
4-Jul-23														<5		
5-Jul-23							9.6	19.2								
6-Jul-23									6.4	<5	<5	6.4			12.8	9.6
14-Aug-23	12.8												9.6			
15-Aug-23							9.6	16								
16-Aug-23														16		
17-Aug-23									6.4	<5	9.6	16			16	22.4
20-Sep-23	<5												<5			
21-Sep-23							<5	<5								
22-Sep-23															<5	<5

Faecal Coliform Bacteria

The results of the faecal coliform analyses in Q3 2023 are presented in **Table 2-11**.

Faecal coliform complied with the standard in all stations, except NNG01 (August 2023) and NPH01 (July and August 2023).

TABLE 2-11: FAECAL COLIFORMS (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q3 2023**(NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: <1,000 MPN/100 ML)**

Station Code	NNG0 1	R01	R02	R0 3	R0 4	R0 5	R0 6	R0 7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
3-Jul-23	280												350			
4-Jul-23														1,600		
6-Jul-23									130	350	540	920			920	110
14-Aug-23	1,600												540			
16-Aug-23														1,600		
17-Aug-23									2	7	5	7			23	130
4-Sep-23	920												920			
22-Sep-23									7	11	79	110			920	110

Total Coliform Bacteria

The results of measurements for total coliform bacteria are presented in **Table 2-12**. 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 2-12: TOTAL COLIFORM (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q3 2023**(NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: <5,000 MPN/100 ML)**

Station Code	NNG 01	R0 1	R0 2	R0 3	R0 4	R0 5	R0 6	R0 7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
3-Jul-23	350												1,600			
4-Jul-23														1,600		
6-Jul-23									920	1,600	1,600	1,600			1,600	920
14-Aug-23	1,600												540			
16-Aug-23														1,600		
17-Aug-23									140	540	1,600	540			1,600	1,600
4-Sep-23	1,600												1,600			
22-Sep-23									1,600	920	1,600	1,600			1,600	1,600

2.7.2 Compliance Monitoring of Effluents from Camps

A total of 03 sites discharged effluents in Q3 2023, including 02 camps (OSO V1 and OSO V2) and at the Wastewater Treatment System of the Main Powerhouse. The effluent monitoring location sites can be found in **Figure 2-15**.

The results are described in **Table 2-13** and the full data set is in **Appendix 4.2**.

The status of compliance as of 30 September 2023 can be summarized as follows:

- Non-compliance with Ammonia-Nitrogen, Total Nitrogen, Total Phosphorus for Wastewater Treatment Systems in the Main Powerhouse (EF19) and OSO V2 Camp (EF13);
- Non-compliance with Faecal Coliform and Total Coliform at Main Powerhouse (EF19), OSO V1 (EF01) and OSO V2 (EF13).

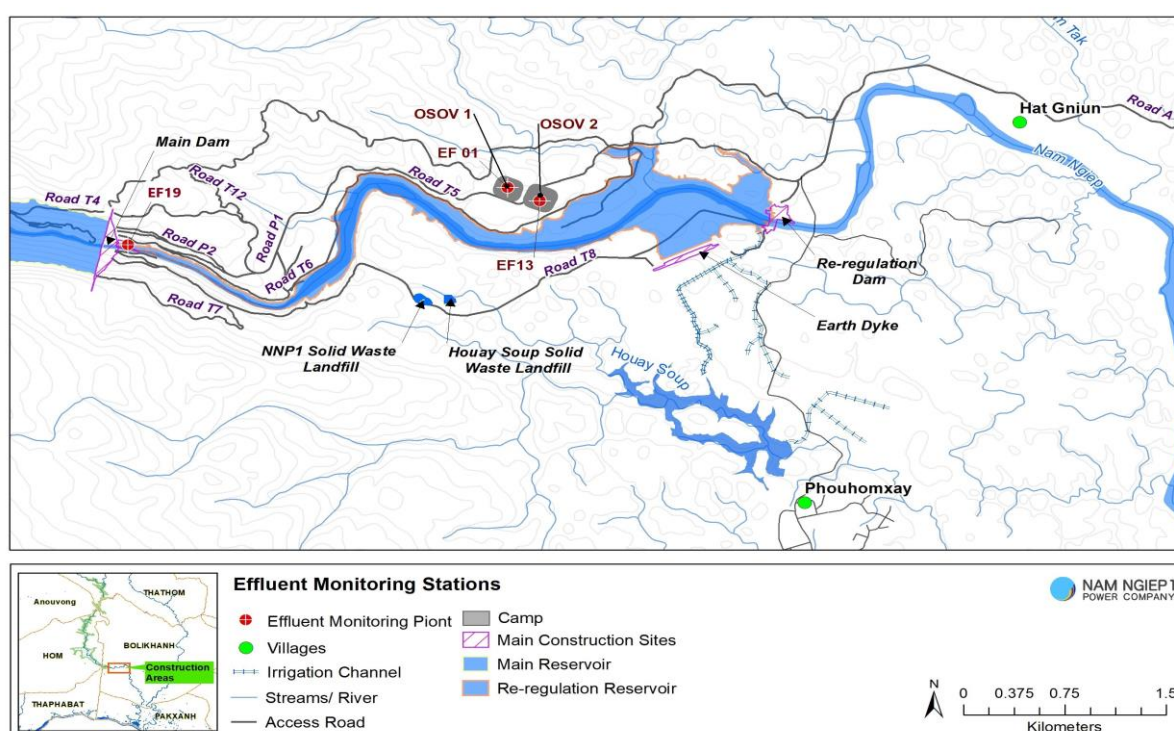
FIGURE 2-15: LOCATION OF EFFLUENT MONITORING POINTS

TABLE 2-13: RESULTS OF THE EFFLUENT WATER QUALITY MONITORING OF THE CAMPS IN Q3 2023 (NON-COMPLIANCE PARAMETERS ONLY)

		Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
13-Jul-23	COD (mg/L)	<125	<25	48.2	152
26-Jul-23	COD (mg/L)	<125	<25	26.0	152
11-Aug-23	COD (mg/L)	<125	<25	26.5	39
24-Aug-23	COD (mg/L)	<125	<25	34.0	45
28-Sep-23	COD (mg/L)	<125	<25	<25	32
13-Jul-23	NH ₃ -N (mg/L)	<10.0	<2	17.1	12.8
26-Jul-23	NH ₃ -N (mg/L)	<10.0	<2	13.8	13.1
11-Aug-23	NH ₃ -N (mg/L)	<10.0	2.1	14.2	22.7
24-Aug-23	NH ₃ -N (mg/L)	<10.0	<2	23.0	16.3
28-Sep-23	NH ₃ -N (mg/L)	<10.0	<2	13.9	8.2
13-Jul-23	Total Nitrogen (mg/L)	<10.0	1.0	19.2	14.4
26-Jul-23	Total Nitrogen (mg/L)	<10.0	1.8	14.3	15.8
11-Aug-23	Total Nitrogen (mg/L)	<10.0	2.5	15.1	23.7
24-Aug-23	Total Nitrogen (mg/L)	<10.0	4.9	24.7	19.4
28-Sep-23	Total Nitrogen (mg/L)	<10.0	2.5	15.6	9.6
13-Jul-23	Total Phosphorus (mg/L)	<2	0.97	1.5	7.7
26-Jul-23	Total Phosphorus (mg/L)	<2	1	0.3	3.4
11-Aug-23	Total Phosphorus (mg/L)	<2	1.07	1.2	6.2
24-Aug-23	Total Phosphorus (mg/L)	<2	1.4	2.1	5.7
28-Sep-23	Total Phosphorus (mg/L)	<2	1.36	1.1	5.3
13-Jul-23	Faecal Coliform (MPN/100 mL)	<400	350	3,500	130
26-Jul-23	Faecal Coliform (MPN/100 mL)	<400	70	16,000	0
11-Aug-23	Faecal Coliform (MPN/100 mL)	<400	1,100	16,000	0
24-Aug-23	Faecal Coliform (MPN/100 mL)	<400	94	2,400	0
28-Sep-23	Faecal Coliform (MPN/100 mL)	<400	79	280	220
13-Jul-23	Total coliform (MPN/100 mL)	<400	540	16,000	240
26-Jul-23	Total coliform (MPN/100 mL)	<400	94	16,000	0
11-Aug-23	Total coliform (MPN/100 mL)	<400	9,200	16,000	0
24-Aug-23	Total coliform (MPN/100 mL)	<400	1,600	5,400	0
28-Sep-23	Total coliform (MPN/100 mL)	<400	110	350	920

TABLE 2-14: COMPLIANCE STATUS OF EFFLUENT DISCHARGE FROM THE CAMPS IN Q3-2023

Site	ID	WWTS	Key Non-Compliance Issues ¹ in Q3-2023	Corrective Actions
OSOV 1 (Owner's Site Office and Village)	EF01	- Septic tanks (kitchen and black water) and wetland (grey water), discharge: 70 m ³ /day. - According to the WWTS assessment result in July 2023, the discharged effluent is completely absorbed/dried up within a distance of 120 m before reaching the re-regulation reservoir, (during the dry season).	- Faecal coliform (<400 MPN/100 mL): Non-compliance in 1 out of 5 samplings. Q3 mean 339 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 3 out of 5 samplings. Q3 mean 2,309 MPN/100 mL.	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 According to the WWTS assessment result in July 2023, the discharged effluent is completely absorbed/dried up within	- Ammonia-nitrogen (<10 mg/L): Non-compliance in all 5 samplings. Q3 mean 16.4 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in all 5 samplings. Q3 mean 17.8 mg/L. - Total Phosphorus (<2 mg/L): Non-compliance in 1 out of 5 samplings. Q3 mean 1.2 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 4 out of 5 samplings. Q3 mean 7,636 MPN/100 mL.	The installed WWTS does not eliminate nitrogen or phosphorus. However, there is no concern given the little discharge effluent quantity, which is completely absorbed/dried up within a distance of less

¹ The values in brackets indicate the applicable standard

Site	ID	WWTS	Key Non-Compliance Issues ¹ in Q3-2023	Corrective Actions
		a distance of 260 m after discharging (during the dry season).	- Total coliform (<400 MPN/100 mL): Non-compliance in 4 out of 5 samplings. Q3 mean 10,750 MPN/100 mL.	than 300 m 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 was flowed into Tailrace of Main Powerhouse and then Re-regulation Reservoir.	- COD (<125 mg/L): Non-compliance in 2 out of 5 samplings. Q3 means 84 mg/L. - Ammonia-nitrogen (<10 mg/L): Non-compliance in 4 out of 5 samplings. Q3 mean 14.6 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 4 out of 5 samplings. Q3 mean 16.6 mg/L. - Total Phosphorus (<2 mg/L): Non-compliance in all 5 samplings. Q3 mean 5.7 mg/L. - Total coliform (<400 MPN/100 mL): Non-compliance in 1 out of 5 samplings. Q3 mean 232 MPN/100 mL.	As above

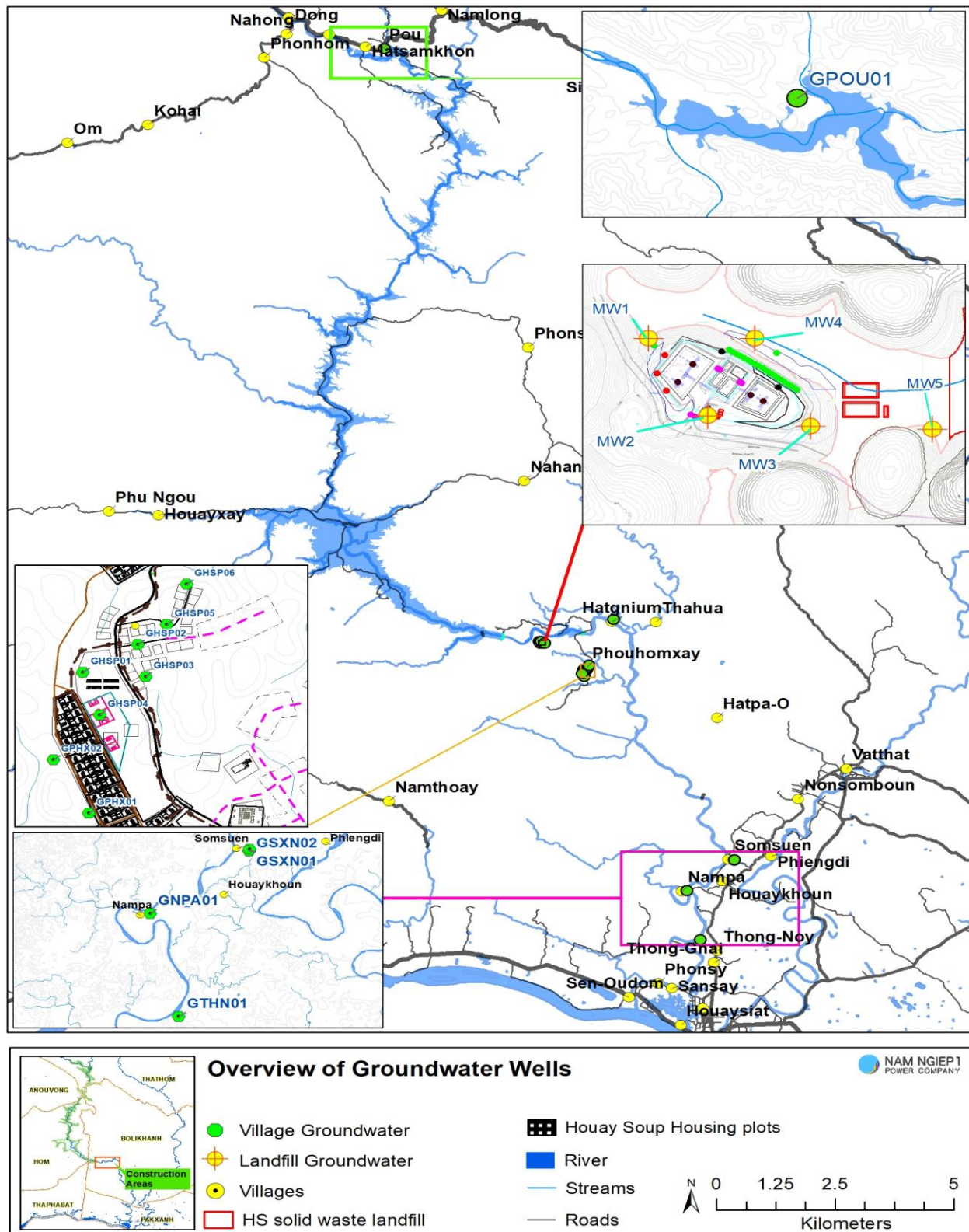
2.7.3 Groundwater Quality Monitoring

During Q3 2023, 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 (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 2-16** and the groundwater monitoring data is presented in **Appendix 4.3**.

FIGURE 2-16: GROUNDWATER SAMPLING LOCATIONS



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

Phouhomxay Village: all monitored parameters complied with the standard.

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

Somsuen Village: all monitored parameters complied with the standard, except faecal coliform and E. coli bacteria in July and September 2023.

NamPa Village: all monitored parameters complied with the standard, except faecal coliform and E. coli bacteria in July 2023.

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 Saat Systems (domestic water supply)** – provide water to rural areas that are not connected to Nam Papa systems. Nam Saat 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 Saat) 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 Saat 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 Saat (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 Saat) systems before drinking is a general practice in the rural areas of Lao PDR.

In September 2023, NNP1PC carried out landfill groundwater monitoring at NNP1 Solid Waste Landfill (only three monitoring wells due to water sampling equipment was stuck in monitoring well MW2) and at Houay Soup Solids Waste Landfill (one monitoring well). The lead

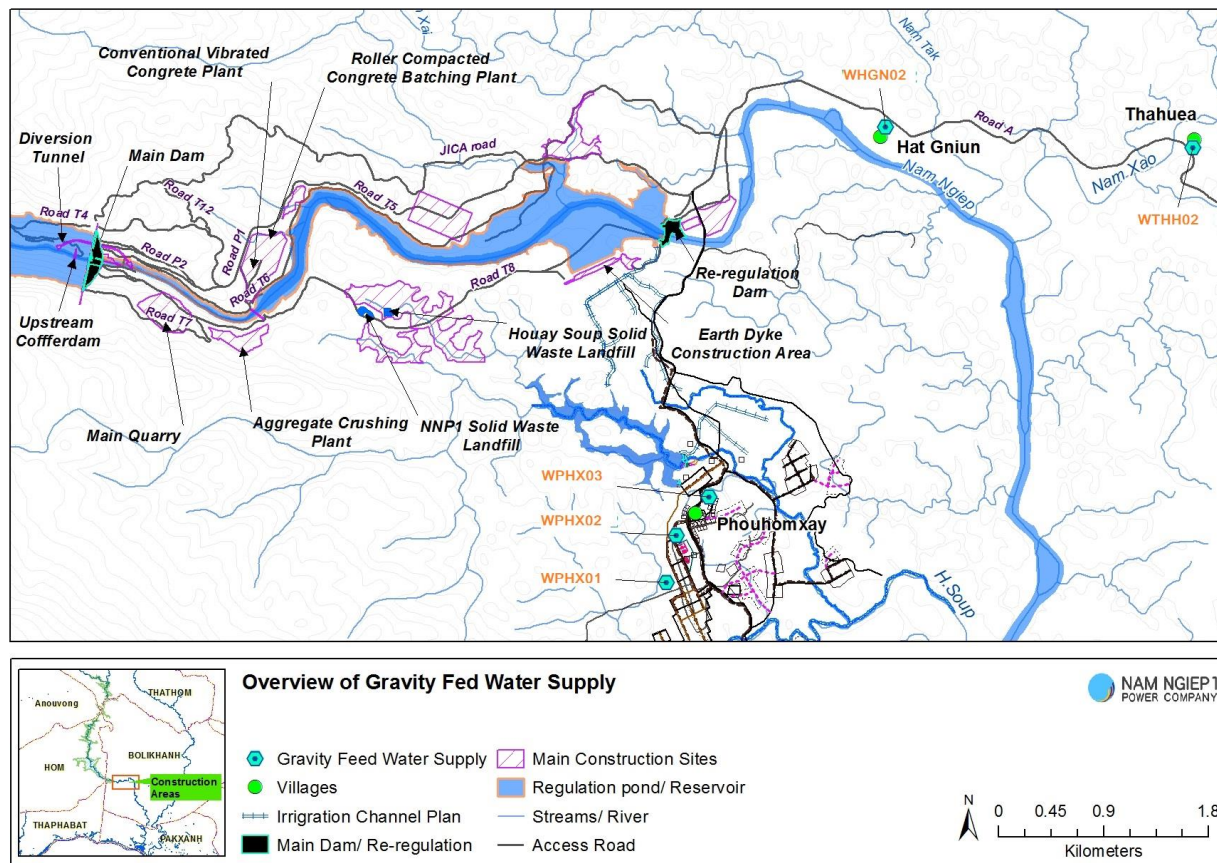
concentration exceeded the groundwater quality standard in monitoring wells MW1, MW3, MW4 and MW5. However, this is likely due to the natural background level. Lead has been detected in both upstream and downstream wells, and leachate from the treatment ponds did not contain lead. The landfills are HDPE lined to prevent leachate and the boreholes are over 50 m deep and not accessible to staff or villagers.

TABLE 2-15: THE LANDFILL GROUNDWATER MONITORING RESULT IN Q3 2023

		Site Name	NNP1 Landfill				Houay Soup Landfill
		Station	MW1	MW2	MW3	MW4	MW5
Date	Parameter (Unit)	Guideline					
28-Sep-23	pH		7.88		7.9	7.55	7.6
28-Sep-23	Sat. DO (%)		30.6		16.7	39.2	50.3
28-Sep-23	DO (mg/L)		2.48		1.35	3.13	3.94
28-Sep-23	Conductivity (µS/cm)		235		284	142	103
28-Sep-23	Temperature (°C)		26.49		26.42	27.31	27.99
28-Sep-23	Turbidity		11.2		3.64	12.9	23.1
28-Sep-23	Lead (mg/L)	<0.01	0.875		0.279	0.341	0.153
28-Sep-23	Faecal Coliform (MPN/100ml)		39		240	140	110
28-Sep-23	E. coli (MPN/100ml)		4.5		49	13	11
28-Sep-23	NH ₃ -N (mg/L)		0.43		0.49	0.27	0.62
28-Sep-23	Total Nitrogen (mg/L)		0.54		0.61	0.4	0.74
28-Sep-23	Copper (mg/L)	<1	0.005		<0.003	<0.003	0.004
28-Sep-23	Total Petroleum (mg/L)		<3		<3	<3	<3
28-Sep-23	Water level (m)		19.5	-	16.7	15.1	10.9

2.7.4 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 2-17: 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 2-16**. The full set of data is presented in **Appendix 4.4**.

TABLE 2-16: THE GFWS MONITORING RESULT IN Q3 2023

Date	Parameter (Unit)	Site Name	Thahuea Village	Hat Gniun Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
		Guideline				
20-Jul-23	Faecal Coliform (MPN/100 mL)	0	350	240	170	240
28-Aug-23		0	11	22	6.8	14
19-Sep-23		0	49	79	49	27
20-Jul-23	E.Coli Bacteria (MPN/100 mL)	0	220	130	130	130
28-Aug-23		0	8	14	4	4.5
19-Sep-23		0	49	79	22	27

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

Hat Gniun 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 pH, faecal coliform and *E.coli* in Q3 2023 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.

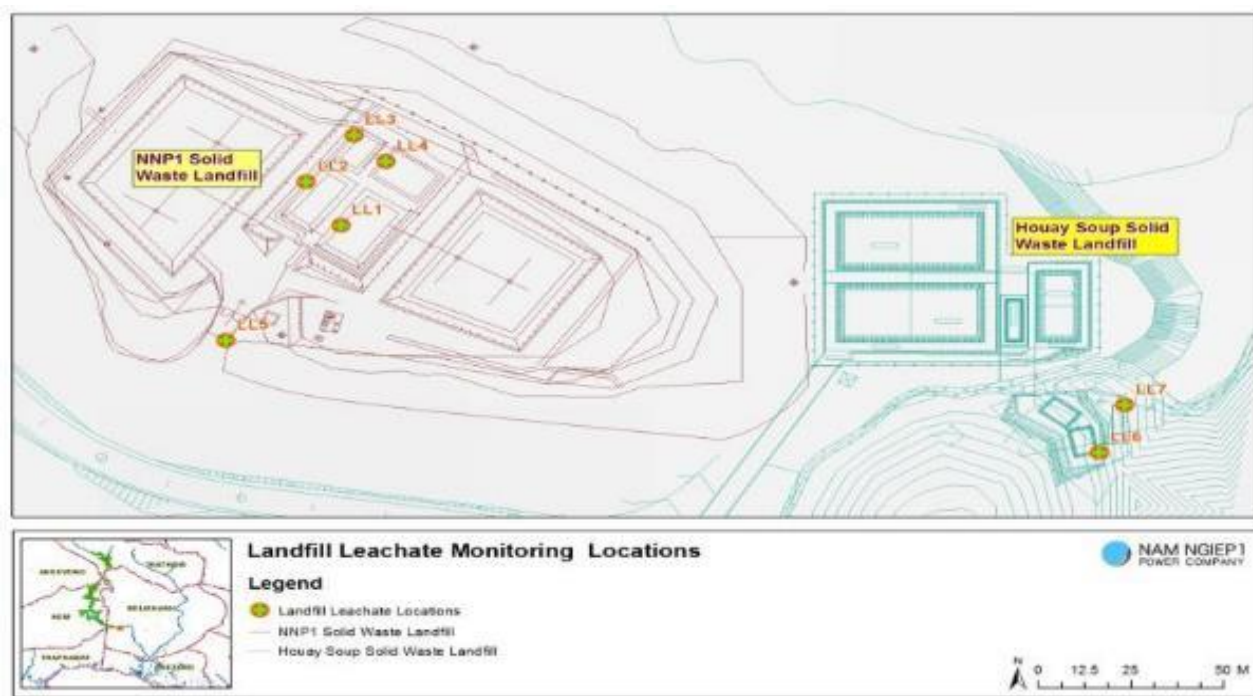
As mentioned in **section 2.7.3**, the gravity fed system is a domestic water supply managed by the Centre for Environmental Health and Water Supply (Nam Saat) under the Department of Hygiene and Health Promotion, Ministry of Health. It is well understood and agreed with the villagers that the water 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 Saat) before drinking is a general practice in the rural areas of Lao PDR.

2.7.5 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 the less rain occurred during the Quarter, the leachate flow into the treatment system of NNP1 Project landfill was not reached the last treatment pond. Therefore, no water sampling taken for this site. The monitoring locations are presented in the **Figure 2-18**.

FIGURE 2-18: LANDFILL LEACHATE MONITORING LOCATION

The monitoring results in Q3 2023 indicate compliance with the applicable standards for all monitored parameters, except for faecal coliform and total coliform for NNP1 Landfill Leachate (July 2023) and Houay Soup Landfill Leachate (July and August 2023). The monitoring data can be found in **Appendix 5.6**.

2.7.6 Water Quality Compliance Monitoring

The water quality non-compliance issues in Q3 2023 are summarized in **Table 2-17**.

TABLE 2-17: NON-COMPLIANCES RELATING TO WATER QUALITY MONITORING IN Q3 2023

No	Non-compliance Issues	Corrective Actions	Status
1	During turbine discharge (Q3 2023), 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 is ongoing 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	In July, August and September 2023, EMO, ADM and TD conducted a monthly joint	- Closely monitoring the system operation and maintenance.

No	Non-compliance Issues	Corrective Actions	Status
	(WWTS) at OSOV1, OSOV2 and the Main Dam exceeded the National Effluent Standard Guideline for some parameters	inspection for the operation and maintenance of the WWTS: - All 17 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 (Thong Noy, Som Seun and Nam Pa 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, Hat Gnuin,	- Site observations were conducted during the routine water sampling, it was observed that livestock was roaming around the water intake areas and faeces	- The villagers generally use tap water for washing and cleaning, and

No	Non-compliance Issues	Corrective Actions	Status
	and Phouhomxay Village) were not complied with the National Drinking Water Quality Standard on Faecal Coliform and <i>E.coli</i> parameters.	from livestock and birds may contribute to the presence of bacterial contamination. It is not feasible for fencing off the upstream water course due to 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.	were encouraged to boil water before drinking. - Continue monitoring.
5	Non-compliance on total coliform parameter in Houay Soup Landfill leachate.	- The leachate is still contained in the leachate ponds without being discharged to the environment. - Continue monitoring.	- Continue monitoring.
6	Non-compliance on lead parameter in Landfill groundwater.	- Continue monitoring.	- 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 until the end of September 2023 are summarized below:

- The Xaysomboun PAFO agreed to provide updates about the mining exploration and Nam Phouan Hydropower Project development in the NNP1 watershed Totally Protected Zone (TPZ) 15 working days after the meeting. The Head of Xaysomboun WRPO informed NNP1 EMO on 12 July 2023 that the Xaysomboun Provincial Department of Planning and Investment (PDPI) has requested the Xaysomboun WRPO to provide comments on the draft MOU for the extension of mining exploration activity by the **Boualaïy Mangkone Thong**. NNP1 EMO advised Xaysomboun WRPO to refer to the CA between NNP1PC and GOL about Biodiversity Offset and No Net Loss (NNL) requirement as well as the Xaysomboun Provincial Governor agreement on the NNP1 watershed management. NNP1 EMO met with the Head of Hom District Energy and Mine Office (DEMO) on 1 August 2023. He informed NNP1 EMO that the MOU for the first phase of the mining company, Boualay Mangkone Thong, was expired, and the extension for the second phase is being processed at the Provincial level. Hom DEMO received the draft MOU extension from the Xaysomboun Province Planning and Investment Office (PPIO) in July 2023. He noted that the province is considering a 1-year

extension, but he is unsure about the decision from the Xaysomboun Provincial management. He also informed NNP1 EMO that the Company did not cooperate with the Hom District Level until now, particularly with the progress report and the detailed activity plan. However, Hom DEMO agreed with the MOU extension, but the company shall report the progress and collaborate with the district level. He also informed NNP1 EMO on the possibility of the Nam Phouan HEP construction even though DEMO does not have detailed documents. He noted that Nam Phouan HEP Company had collected soil or rock samples and crest dam data. The Company has stopped surveying and drilling in the rainy season, and they will return to continue drilling and surveying the reservoir area after the rainy season. NNP1 EMO also met with the Xaysomboun Provincial Department of Energy and Mines (PDEM) representative on 3 August 2023. The staff clarified to NNP1 EMO that the continuation of mining exploration by Boualay Mangkone Thong Company is subject to the review and consideration of the MOU extension by the Xaysomboun Provincial management. The staff also explained that the Prime Minister's Office (PMO) issued a suspension notification for Nam Phouan HEP in the last quarter of 2022 because the owner of the Project did not follow the obligation or requirement to further negotiate the Concession Agreement (CA), particularly on the detailed Feasibility Study, Environmental and Social Management Plan, funding sources, and the power purchase plan. The meeting to discuss the project development within the NNP1 watershed Totally Protected Zone (TPZ) was organized on 22 September 2023. See **section 3.1.1.3** for further details.

- The Xaysomboun PAFO agreed to update the NNP1 EMO team 15 working days after the meeting. Xaysomboun WRPO did not share the detailed meeting agenda with NNP1 EMO and organized the meeting with Thathom and Hom District on 22 and 29 August 2023, respectively. NNP1 EMO was not invited to the meeting at Thathom District. EMO noted that Xaysomboun WRPO did not discuss with Thathom District the organizations' roles and responsibilities of the FCMP and review the draft FCMP and fishery regulation for approval. Instead, they discussed developing new fishery regulations. NNP1 EMO was invited to the meeting in the Hom District. NNP1 EMO noted that the head of XSB PAFO, XSB WRPO, Thathom DAFO, and Hom DAFO proposed to adapt fishery management regulations of Nam Ngum 2 for the NNP1 fishery management. NNP1 EMO recommended reviewing the existing draft fishery management regulations instead to ensure the alignment with NNP1 WMP, draft FCMP, and the MOM on 21 May 2020. XSB WRPO confirmed that they will review the fishery management regulations and will share it with the NNP1 EMO prior to further approval process. 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. After a series of follow-ups, including during a monthly meeting on 21 September 2023, NNP1 EMO did not receive the draft fishery regulation from Xaysomboun WRPO until the end of September 2023.
- The Head of Xaysomboun PAFO agreed to review the patrol team establishment to have the district military personnel engaged in the patrolling work. A meeting among the NNP1 EMO, Xaysomboun WRPO, and Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS) on the Law Enforcement Strategy (LES) was organized on 24 July 2023. NNP1 EMO requested Xaysomboun WRPO to submit an official letter on the new patrol team establishment including the assignment of staff to be based in the Xaysomboun WRPO sub-

office before implementing the patrolling work, once the WRPO has received the AIP2022 funds. NNP1 EMO, Xaysomboun WRPO, and BSP-WCS discussed on 8 August 2023 the schedule, target patrolling area, and the arrangement of the patrol teams comprised of TPZ, Forest, and reservoir teams. The patrol will focus on NNP1 TPZ1, the northern part of the watershed forest within Hatsamkhone, Phiangta, Nahong and Phonhom village, and reservoir zone 3 (TPZ area). NNP1 EMO noted that Xaysomboun did not review and take further action on the team re-establishment as discussed during the meeting on 26 April 2023 to involve the district military personnel in the patrolling activities. This contributes to the ineffective implementation of patrolling efforts to address the alarming threats in the NNP1 watershed and TPZ, as reported by ADB and IAP during their May 2023 mission. Xaysomboun WRPO and BSP-WCS discussed further on 15 August 2023 about using field equipment and data recording. Xaysomboun WRPO proposed that the TPZ patrolling be conducted only for 13 days in August 2023 because the rain caused difficulties and challenges in accessing the target area, and most of the team members have less experience in patrolling and doing the fieldwork in the forest. BSP-WCS agreed with the proposal, and it will be evaluated at the next monthly meeting. Three patrol teams started patrolling on 22 August 2023, and another three patrol teams started on 26 August 2023. The patrolling was completed on 6 September 2023. NNP1 EMO, Xaysomboun WRPO, and BSP-WCS organized a monthly meeting on 21 September 2023. NNP1 EMO and BSP-WCS noted that the team did not patrol according to the plan including: patrolling outside the target area, lesser days for the field work, and poor recording. The plan for the next patrol was agreed among NNP1 EMO, Xaysomboun WRPO patrol team, and BSP-WCS with conditions for improvement as discussed during the meeting.

- The site visit to check the Xaysomboun WRPO sub-office at Hom District was conducted on 20 June 2023. The Minutes of the Meeting (MOM) was signed on 23 June 2023. Xaysomboun WRPO reported the inspection results to the Head of Xaysomboun PAFO including the schedule and budget for fixing and purchasing some items. The Head of Xaysomboun WRPO shared the budget plan to fix the Xaysomboun WRPO sub-office on 21 August 2022. NNP1 EMO reviewed the plan and communicated it with Xaysomboun WRPO for improvement on 22 August 2023. NNP1 EMO also requested Xaysomboun WRPO to issue the official assignment for the staff to be based in the sub-office in September 2023 as a condition to fix the sub-office and its operation. However, there was no further update from Xaysomboun WRPO despite a series of follow up including during the monthly meeting on 22 September 2023. NNP1 EMO noted that the Head of Xaysomboun WRPO was occupied for another project.
- The Head of Xaysomboun WRPO informed that Xaysomboun WRPO has sent an invitation letter to the Contractor to construct two reservoir check points on 9 June 2023 for the discussion on 12 June 2023. The Contractor was not available in June 2023. The Head of Xaysomboun WRPO informed NNP1 EMO that he had a discussion with the Contractor but there was no official MOM for this discussion. He informed the NNP1 EMO on 24 July 2023 that the construction will start in August 2023. However, The Head of Xaysomboun WRPO informed NNP1 EMO during the meeting on 21 September 2023 that the Contractor still could not be contacted. He consulted with the Head of Xaysomboun PAFO and they planned to call the contractor in October 2023. The construction work is still delayed until then.

3.1.1.2 Bolikhamxay Watershed and Reservoir Protection Office (WRPO)

Bolikhamxay WRPO conducted forest and reservoir patrolling from 28 June to 7 July 2023. Bolikhamxay WRPO also completed the village land use data collection at the end of June 2023 without consultation or participation of NNP1 EMO and Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS). The patrolling and village land use data collection reports were shared with NNP1 EMO on 21 July 2023.

Bolikhamxay WRPO will resume patrolling and implement other activities during the remaining months of 2023 after receiving the second two quarters funds of AIP 2023 from FPF DOF-MAF. Please refer to **section 3.1.3.2** on the fund disbursement of Bolikhamxay AIP2023. Bolikhamxay WRPO shared the financial summary of the AIP fund utilization until the end of June 2023. NNP1 EMO requested some clarification on the expenditures that appeared not in line with the approved AIP and had not been discussed with NNP1 EMO. NNP1 EMO also recommended to comply with the approved NNP1 FMM to improve the financial practice.

3.1.1.3 NNP1PC EMO

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

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

NNP1 EMO discussed with the Hom District Agriculture and Forestry Office (DAFO) on 21 August 2023 the work plans for the farmer groups in PhouNgou and Houayxay Village under the 5 years

action plan for strengthening the capacity of local producers and market linkages of Hom District. The key discussion points are summarized as follows:

- Hom DAFO shall replace the production group license issued by the Hom District Governor in 2021 referring to the revised policy of MAF on the role and responsibility of the production group.
- Hom DAFO confirmed that the official letter to replace the existing license will be issued after the production group regulations are developed.
- Hom DAFO agreed to prepare a work plan and budget for establishing the production group at Ban Phou Ngou and Houayxai.
- After the head of Hom DAFO approves the regulation, the meeting on disseminating production group regulation at the village level shall be organized.
- Hom DAFO requested technical support from NNP1 EMO to record the total area of pineapple and orange plantation of the production groups.

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

- Two households have continued the activity since last year and one household stopped the activity in November 2022 because the plastic cover was broken in October 2022.
- They are interested in continuing the activity and three more households are interested in participating in it.
- They requested NNP1 to continue providing support, including materials for greenhouse structure and crop species, because this activity increases their income and support their own consumption.

NNP1 EMO discussed with Thathom DAFO on 31 August 2023 the work plan for the agriculture extension service in Phonhom and Nahong Village that the activity was scheduled for mid to late September 2023.

The key discussion points are summarized as follows:

- Thathom DAFO and NNP1 EMO agreed to continue the greenhouse vegetable activity at Ban Phonhom and the activity at Ban Nahong will be considered in 2024.
- Thathom DAFO agreed with the NNP1 EMO recommendation that their request for the office supplies and vehicle for implementing Activity 6.1 and 6.2 of the NNP1 WMP will be further discussed and included in 2024.
- Thathom DAFO agreed with NNP1 EMO that the establishment of Kai Noy Rice and Weaving groups will be discussed in 2024.

Hom DAFO and NNP1 EMO agreed and finalized the work plan and budget for the activities to strengthen the capacity of local producers and market linkages from September to December 2023. The first activity, drafting the farmer group regulations, was conducted on 25-27 September 2023. Thathom DAFO and NNP1 EMO also agreed and finalized the work plan and budget for the Phonhom and Nahong Village agriculture extension service. The first activity, revisiting the greenhouse vegetable garden, was scheduled for the first week of October 2023.

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

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

DEB-MEM informed NNP1PC at the end of August 2023 that the planned meeting with the relevant GOL parties on the risks and challenges in achieving the No Net Loss (NNL) is expected to be organized within September 2023 because more information about the existing development projects in the NNP1 Watershed TPZ has to be discussed internally considering the information provided by the related Xaysomboun provincial offices and it also subjects to the availability of Deputy Director General (DDG) of DEB.

The meeting with relevant GOL parties on the risks and challenges in achieving the No Net Loss (NNL) was organized on 22 September 2023. The meeting was chaired by Mr. Soutswad VONGPHOUMLET, Vice Governor of Xaysomboun Province, and participated by around 40 people comprised of the representatives from the Department of Energy and Business (DEB) of the Ministry of Energy and Mine (MEM), Division of Policy and Planning of the MEM, Ministry of Natural Resource and Environment (MONRE), Ministry of Planning and Investment (MPI), DOF-MAF, Xaysomboun Province Energy and Mine, Xaysomboun Province Office of Natural Resource and Environment (PONRE), Xaysomboun Province Agriculture and Forestry Office (PAFO), district management and district Agriculture and Forestry Office (DAFO) of Hom, Thathom, and Anouvong, NNP1PC, and BSP-WCS.

NNP1 EMO noted the key points concluded by the meeting chairman as follows. NNP1 EMO is following up with the DEB-MEM for the official MOM.

1. It is recommended that the XSB PAFO, XSB PONRE, XSB PEMO and 3 relevant districts (Hom, Thathom, and Anouvong), as per the XSB Provincial Governor Agreement on the establishment of XSB WRPC and XSB WRPO, No.0286/XSB.PG, dated 29 Mar 2022, has further

internal discussion to develop an action plan that shall be discussed and implemented at provincial and district levels to solve the issues raised during the meeting.

2. It is recommended that DEB-MEM and NNP1PC review the fund disbursement to ensure a faster process from the central to the provincial level. In addition, it is also recommended that DEB-MEM and NNP1PC review the CA among GOL and NNP1PC to be in line with Decree No. 414 dated 10/12/2019 because this is a special decree for the development in XSB Province.
3. It is recommended that XSB WRPO review the role and responsibility for implementing the activities within the NNP1 watershed as per comments from the district governors in which that the activities shall be implemented by the district levels of WRPC and WRPO instead. The province XSB WRPC and WRPO shall act as secretary in coordinating and monitoring the implementation activities. In addition, it is also recommended that XSB WRPO (XSB PAFO) review and revise the structure and working arrangement to ensure that decision-making and implementation activities are carried out on time among XSB WRPO at provincial and district levels.
4. It is recommended that the XSB Provincial Military implement the Xaysomboun Provincial Agreement to monitor and remove the offenders or villagers at the Xam Lieam Area within the NNP1 watershed as per the Ministry of Defense recommendation.
5. It is recommended that the Xaysomboun PEMO regularly monitor and provide support for the mining exploration of Boulay Mangkone Thong Company as well as the development of Nam Phouan HPP that they shall follow the agreed work plan and in line with Decree No. 414. In addition, XSB PEMO should monitor the progress of the mining exploration of Boulay Mangkone Thong Company within the NNP1 watershed, and the area should be returned to NNP1PC if no mineral resources are found.
6. It is recommended that NNP1 update the figures of funds transferred to the Xaysomboun WRPO from 2015 to 2023 to have a distinction between the former XSB WRPO under POPNRE and the current XSB WRPO under PAFO, then submit the updated information to the provincial management for acknowledgment and reference.

NNP1 EMO distributed the hard copies of the approved NNP1 Financial Management Manual (FMM) to the relevant offices in the province and district levels in Xaysomboun and Bolikhamxay Province as of September 2023. NNP1 EMO is discussing the FPF DOF-MAF to organize the FMM training for the WRPOs and the Biodiversity Offset Management Unit (BOMU) especially to avoid delays in the fund disbursement process.

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 September 2023
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: Further discussion on the Law Enforcement Strategy (LES) could not be organized in June 2023 because the Head of Xaysomboun WRPO was occupied with other assignments within the forestry section of Xaysomboun PAFO. The strategic document is expected to be ready in the fourth quarter of 2023.
b	The operation of Xaysomboun WRPO sub-office at Hom District	Jan 2022 (original) Q2 2023 (new)	Delayed - A meeting among the NNP1 EMO, Xaysomboun WRPO, and BSP-WCS on the Law Enforcement Strategy (LES) was organized on 24 July 2023. BSP-WCS continues to draft the LES document. - The site visit to check the Xaysomboun WRPO sub-office at Hom District was conducted on 20 June 2023. The Head of Xaysomboun WRPO shared the budget plan to fix the Xaysomboun WRPO sub-office on 21 August 2022. NNP1 EMO reviewed the plan and communicated it with Xaysomboun WRPO for improvement on 22 August 2023. Despite a series of follow up, there was no action on the sub-office fixing plan and the issuance of official assignment for the staff to be based in the sub-office as of the end of September 2023.
c	Checkpoints in the NNP1 sub-catchment	Dec 2020 (original) Q2 2023 (new)	Delayed The Head of Xaysomboun WRPO met with the contractor to construct the two reservoir checkpoints in July 2023 but there was no official MOM for this. He informed NNP1 EMO on 21 September 2023 that the construction had not started and the contractor cannot be contacted. He consulted with the Head of Xaysomboun PAFO and they plan to call the contractor in October 2023.

d	TPZ demarcation in the NC-NX offset site	Jan 2022 (original) Q2 2023 (new)	Delayed • The Head of Xaysomboun WRPO informed that they received the AIP2022 fund on 26 July 2023 but the activity did not progress as of the end of September 2023 because Xaysomboun WRPO focussed on the patrolling work, FCMP meeting, and the Head of WRPO himself was also occupied with reporting for another assignment.
e	Reservoir fishery management	Jan 2022 (original) Q2 2023 (new)	Delayed • Xaysomboun WRPO did not share the detailed meeting agenda with NNP1 EMO and organized the meeting with Thathom and Hom District on 22 and 29 August 2023, respectively. Xaysomboun WRPO shared the MOM with the NNP1 EMO on 7 September 2023. After a series of follow-ups, including during a monthly meeting on 21 September 2023, NNP1 EMO did not receive the draft fishery regulation from Xaysomboun WRPO as of the end of September 2023.

3.1.2 Preparation of Annual Implementation Plan (AIP) 2022

3.1.2.1 Xaysomboun WRPO

The Xaysomboun WRPO re-submitted the revised official request for fund disbursement to FPF DOF-MAF in July 2023. NNP1 EMO noted from the follow-up with FPF DOF-MAF that all the coordination and communication work of the Project development within DOF-MAF are under the responsibility of the Department of Planning and Investment (DPI)-MAF and the FPF DOF-MAF is only responsible for fund management. Both DPI-MAF and FPF DOF-MAF are also responsible for all the projects within the country. Therefore, in the absence of an official assignment for the FPF DOF-MAF staff to specifically manage the NNP1PC Project the documentation process might be delayed as currently experienced. The Xaysomboun WRPO informed NNP1 EMO on 3 August 2023 that they had received the funds under the approved AIP2022 from FPF DOF-MAF on 26 July 2023.

3.1.2.2 Bolikhamxay WRPO

The Bolikhamxay AIP2022 was completed and DOF-MAF transferred their fund on 2 November 2022.

3.1.3 Preparation of Annual Implementation Plan (AIP) 2023

3.1.3.1 Xaysomboun WRPO

The Head of Xaysomboun WRPO agreed to discuss with the NNP1 EMO and BSP-WCS after the Xaysomboun PAFO received the response letter from FPF DOF-MAF on 21 July 2023 for them to follow up with the MOM of the FMM finalization workshop in January 2023 as well as the approved FMM in May 2023. He assigned his deputy for this because he has to attend the training for the other project that he was assigned at the other province at the end of July 2023. NNP1 EMO, the deputy head of Xaysomboun WRPO and BSP-WCS had further discussions on 25 July 2023.

The draft of AIP2023 was finalized after the 8th revision by NNP1 EMO, Xaysomboun WRPO, and BSP-WCS and it was submitted to ADB and IAP for review and approval on 16 August 2023. ADB and IAP approved the plan on 18 and 20 September 2023, respectively. Xaysomboun WRPO will obtain approval from the Head of Xaysomboun PAFO in the first week of October 2023 and submit it to FPF DOF-MAF afterward. NNP1 EMO expects to receive the official fund disbursement request from FPF DOF-MAF in the second week of October 2023 at the soonest.

3.1.3.2 Bolikhamxay WRPO

Bolikhamxay WRPO submitted the request for the second two-quarter funds of the approved AIP2023 to FPF DOF-MAF in early July 2023. NNP1PC did not receive the official fund disbursement request as of the end of July 2023. Please refer to **section 3.1.2.1** above on the reason for the long documentation process. NNP1PC received the official request from the FPF DOF-MAF on 28 July 2023. NNP1PC transferred the funds on 17 August 2023, totalling **583,688,000 LAK**, from which **163,490,000 LAK** is under NNP1 NNL and **420,198,000 LAK** is under GOL CA. Bolikhamxay did not receive the fund yet from FPF DOF-MAF until the end of September 2023.

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 drafted the Participatory Land Use Plan (PLUP) in Vangphieng Village from July to September 2023. The draft plan was discussed among BOMU, BSP-WCS, NNP1-EMO and relevant offices at BOMU's office in Viengthong from 12-14 September 2023. The plan required major revisions, so it is expected to be ready for presentation to the Bolikhamxay PAFO and Viengthong District management in October 2023.

b. Component 2 – Enforcement

The July 2023 patrolling was conducted from 7 to 26 July 2023 and focused on the TPZ highest and high priority area. Bolikhamxay BOMU planned to conduct patrolling during 5-24 August 2023. However, NNP1 EMO, BOMU, and BSP-WCS discussed and agreed to postpone the activity for safety reasons related to accessing the area, difficulties in the logistic arrangement, and challenges in case of emergency under the continued heavy rain in Viengthong. The September 2023 patrolling was conducted from 7 to 26 September 2023, focusing on the TPZ highest and high priority area.

The results of patrolling in July and September 2023 are as follows:

Team	Patrolling Area/Distance	Observations/Actions Taken
1	7 to 26 July 2023 TPZ highest priority area including Nam San, Houay Payang, Houay Pong (the tributary of Nam Sone) and Nam Sone downstream (15 days covering a distance of 94 Km on distance forest patrolling) 7 to 26 September 2023 TPZ highest area covering Houay Xay Noy and Houay Xay Gnai. (14 days covering a distance of 103 Km on distance forest patrolling).	7 to 26 July 2023 The team did not observe any threats during the patrolling. 7 to 26 September 2023 The team did not observe any threats during the patrolling.
2	7 to 26 July 2023 TPZ highest priority area including Nam Sone, Nam Chang, Nam Chouan and Houay Pong (15 days covering a distance of 62 Km on distance forest patrolling)	7 to 26 July 2023 The team did not observe any threats during the patrolling. 7 to 26 September 2023

Team	Patrolling Area/Distance	Observations/Actions Taken
	7 to 26 September 2023 TPZ highest priority area covering Nam San, some tributaries and mountain ridges at Nam San downstream. (15 days covering a distance of 43.5 Km on distance forest patrolling).	The team did not observe any threats during the patrolling.
3	7 to 26 July 2023 TPZ high priority area including Nam Ma, Nam Pang, Nam Mong and some mountain ridges (15 days covering a distance of 76 Km on distance forest patrolling) 7 to 26 September 2023 TPZ high priority area covering Nam Ma, Nam Sa Nga and mountain ridge of Nam Sa Nga. (15 days covering a distance of 110 Km on distance forest patrolling).	7 to 26 July 2023 The team observed and destroyed an old hunting camp at Nam Mong and an old fire place for fishing at Nam Pang. 7 to 26 September 2023 The team observed and destroyed three old fishing camps, a small bamboo cage for wildlife detaining and a spent cartridge at Nam Ma, a fresh fishing camp, two old and a fresh hunting camps at Nam Sa Nga, and signs of cutting for walking tracks close to Nam Sa Nga and Nam Ma.
4	7 to 26 July 2023 TPZ highest priority area including Nam San, some tributaries and some mountain ridges (15 days covering a distance of 63 Km on distance forest patrolling) 7 to 26 September 2023 TPZ high priority area covering Nam Houng, Nam Chamhang, Nam Lak and Houay Kasae. (15 days covering a distance of 153 Km on distance forest patrolling).	7 to 26 July 2023 The team observed and destroyed an old fishing camp at Nam San. The team suspected local villagers/hunters made it during the period when forest patrolling had not been carried out in the area. 7 to 26 September 2023 The team observed and destroyed an old fishing camp at Nam Lak, a hunting camp and a snare fence (with 5 individual small-wire snares) at Houay Kasae, a recent hunting camp at Nam Houng and also heard gunshots close to Nam Chamhang.

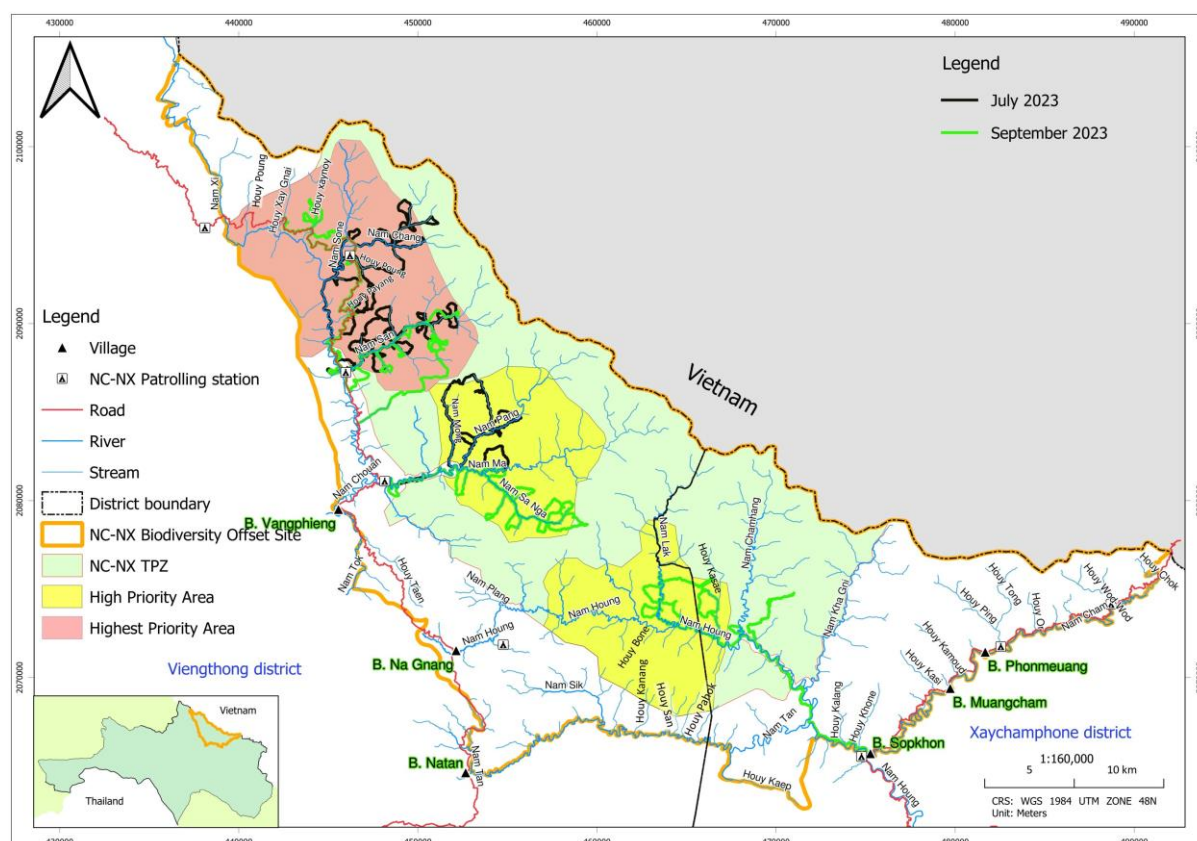


FIGURE 3-1: MAP OF PATROLLING TRACK IN JULY AND SEPTEMBER 2023

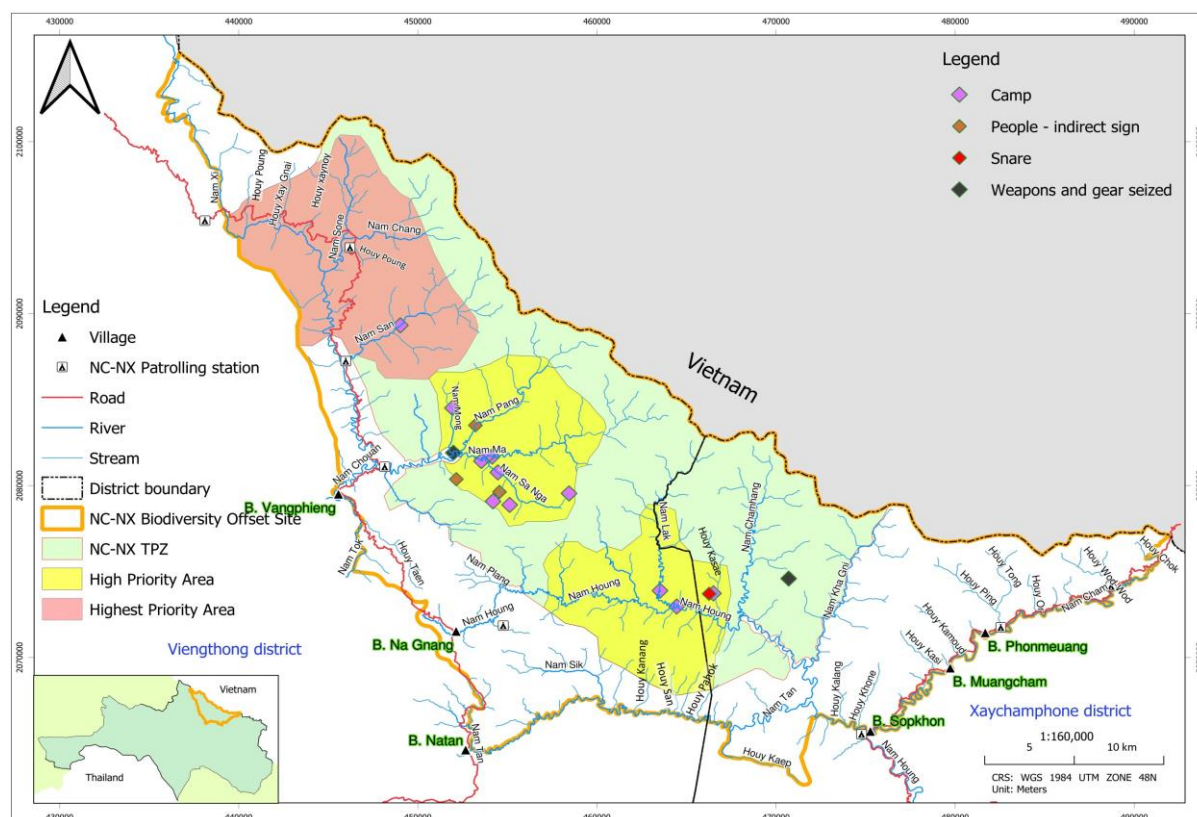


FIGURE 3-2: MAP OF THREATS IN JULY AND SEPTEMBER 2023

Figure 3-3: REPRESENTATIVE PHOTOS FOR MONTHLY PATROLLING IN JULY AND SEPTEMBER 2023

	
A hunting camp observed and destroyed by patrol team at Nam Sa Nga in September 2023	A bamboo cage for wildlife detaining found and destroyed by patrol team at Nam Ma in September 2023
	
A snare fence found and destroyed by patrol team at Houy Kasae in September 2023	Shell of impressed tortoise observed by patrol team at Nam Houg in September 2023

c. Component 3 – Conservation Outreach

BSP-WCS is preparing the report for the outreach activity conducted in April 2023.

The outreach activities under the approved AIP2023 are scheduled from October to December 2023. BSP-WCS is now preparing the contents and methods of the school outreach program and will present them during the monthly meeting in October 2023 for comment and further revision. The materials will be discussed with the Viengthong and Xaychamphone District Education and Sports Offices before the implementation.

d. Component 4 – Conservation linked livelihood

Bolikhamxay BOMU with the participation of the relevant district office, the NNP1 EMO, and BSP-WCS engaged in the establishment of livestock farmer groups at Viengthong and Xaychamphone District in accordance with the Community Development Plan (CDP) and the approved AIP2023. Bolikhamxay BOMU with the participation of the Livestock and Fishery

Section of Bolikhamxay PAFO, relevant district offices, the NNP1 EMO, and BSP-WCS established the livestock farmer groups at Viengthong and Xaychamphone District from 26 July to 3 August 2023. BSP-WCS shared the report with NNP1 EMO and BOMU on 15 August 2023. BOMU, with support from the Bolikhamxay PAFO livestock and fishery section, submitted the report and proposal to the District Agriculture and Forestry Office (DAFO) of Viengthong and Xaychamphone for the official farmer groups approval. After reviewing the documents, DAFO advised the team to provide supporting documents such as the farmer's regulations and the proposal from the farmer group. In this regard, BOMU and DAFO planned to conduct another field trip to all the villages from the third week of October 2023 and will submit the supporting document to DAFO for approval afterward.

The snare removal was conducted from 9-21 July 2023 and 9-23 September 2023, respectively at the TPZ highest priority area covering Nam San, downstream of Nam Sone, Nam Chouan, Houay Pong and Houay Payang. The team did not observe any snares or other threats during the two monthly patrolling.

3.2.2 Preparation of Annual Implementation Plan (AIP) 2023

Bolikhamxay BOMU submitted the request for the second two-quarter fund disbursement under their approved AIP2023 to FPF DOF-MAF on 18 August 2023. NNP1PC received the fund disbursement request from DOF-MAF on 5 September 2023 for the second six months of the BOMU AIP2023. NNP1PC transferred the fund on 18 September 2023, totalling **3,136,113,000 LAK**, from which **1,830,995,000 LAK** is under the GOL CA fund and **1,305,118,000 LAK** is under the NNP1 No Net Loss (NNL) fund.

4 FISHERY MONITORING

Three species groups and two species dominated the fish catch by weight in Q3 2023 as listed in **Table 4-1**. All species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species² and *Oreochromis niloticus* is an exotic species.

TABLE 4-1: FISH SPECIES DOMINATING THE FISH CATCH IN Q3 2023

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Oreochromis niloticus</i>	ປານິນ	939.8	LC
<i>Mastacembelus armatus</i> , <i>Mastacembelus favus</i>	ປາຫຼາດ	645.2	LC
<i>Hampala dispar</i> , <i>Hampala macrolepidota</i>	ປາສຸດ	300.6	LC

² The IUCN Red List of Threatened Species is the world's most comprehensive inventory and classification of threatened species. The Red List classifies species into nine groups: Extinct (EX), Extinct in the wild (EW), Critically endangered (CR), Endangered (EN), Vulnerable (VU), Near threatened (NT), Least concern (LC), Data deficient (DD), and Not Evaluated (NE). The term "Threatened" includes Critically Endangered, Endangered, and Vulnerable.

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Poropuntius normani</i> , <i>Poropuntius laoensis</i> , <i>Poropuntius carinatus</i>	ປາຈາດ	296.6	LC
<i>Channa striata</i>	ປາຄໍ້	241.1	LC

The recorded catch of Threatened species (IUCN Red List classification) in Q3 2023 are presented in **Table 4-2**. The list includes one species that is classified as Endangered species (EN) and two species that are classified as Vulnerable species (VU).

Table 4-2: Threatened Species of Q3 2023 Fish Catch

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Probarbus labeamajor</i>	ປາເອີນ	0.5	EN
<i>Scaphognathops bandanensis</i>	ປາປຽນ/ປາວຽນໄຟ	90.8	VU
<i>Tor sinensis</i>	ປາແດງ	54	VU

The occurrence of Threatened species in the fish catch by quarter since the start of species identification in Q3 2015 is displayed in **Table 4-3**. Based on the 7-day reported catch from the Daily Catch Logbook (DCL) survey.

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
<i>Bangana behri</i> (VU)	+	+	+	+	+	+	+	+	+			+	+	+		+																	
<i>Cirrhinus cirrhosus</i> (VU)	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+		+	+	+		+		+	+	+	+	+	+	+	+	
<i>Datnioides undecimradiatus</i> *																+																	
<i>Epalzeorhynchus 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)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

**Datnioides undecimradiatus* was caught in Mekong by DS households

Species abundance and occurrence is based on the 7-day reported catch from the DCL survey in Q3 2023. The catch is divided in 3 areas including above the main dam (the areas refer to combination of reservoir and stream upstream of the reservoir).

, below the main dam and Mekong area. Main biodiversity indicators in Q3 2023 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 Q3 2023

Biodiversity Indicators	Mekong	Below dam	Above dam
Total species and groups	35	41	44
Single species	29	29	30
Species groups	6	12	14
Top 15 species (% total catch weight)	90.83%	83.17%	89.94%
Proportion for species groups	13.52%	57.94%	43.67%
Diversity index (Shannon)	2.4536	2.9050	2.4556

FIGURE 4-1 shows fish diversity index (Shannon) for above dam, below dam and Mekong area from July 2015 to September 2023.

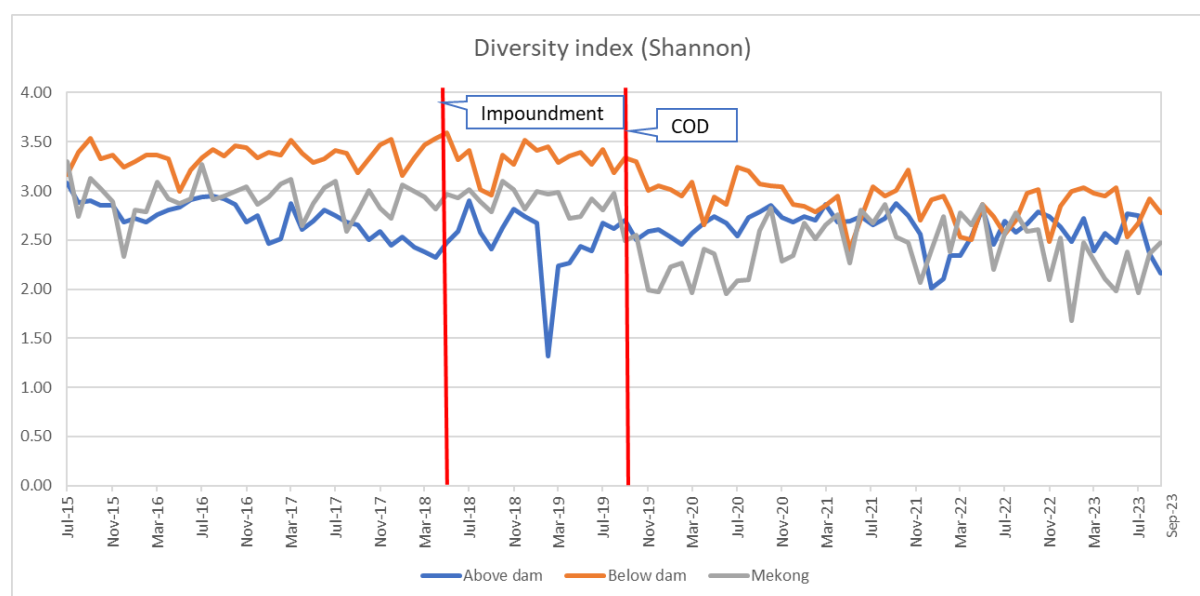


FIGURE 4-1: FISH DIVERSITY INDEX (SHANNON) BY FISHING ZONE FROM JULY 2015 TO SEPTEMBER 2023

The mean daily fish catch per household from July 2015 to September 2023 is displayed in **Figure 4-2** and the mean fish catch per household per fishing day for Q3 from 2015 to 2023 are shown in **Table 4-5**.

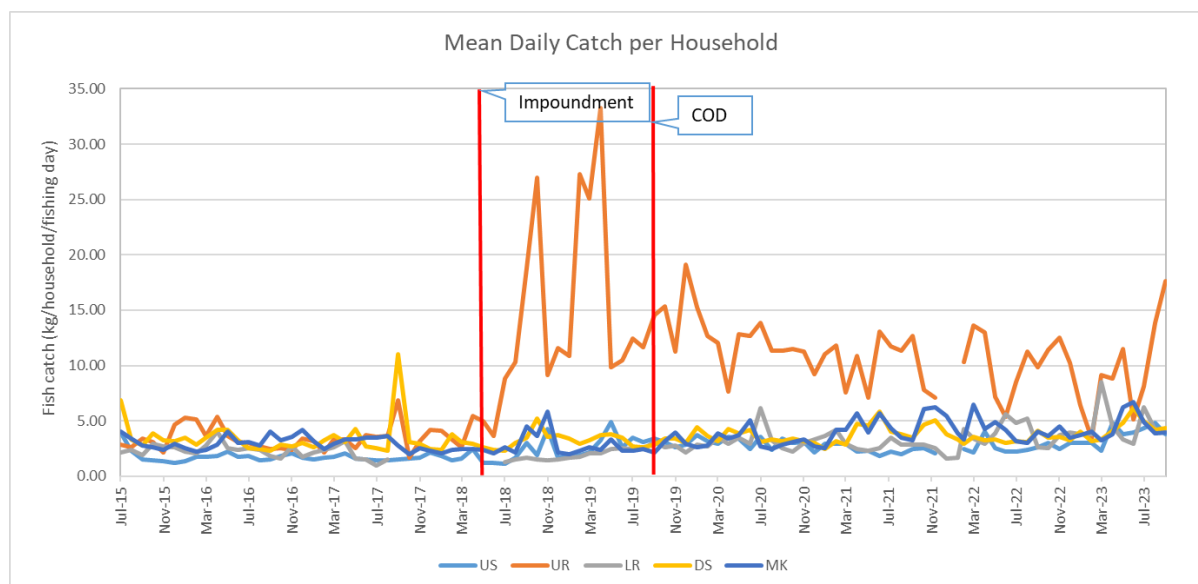


FIGURE 4-2: MEAN DAILY FISH CATCH PER HOUSEHOLD FROM JULY 2015 TO SEPTEMBER 2023

TABLE 4-5: MEAN DAILY FISH CATCH PER HOUSEHOLD FOR Q3 FROM 2015 TO 2023

Fishing Zone	Q3 2015 (kg)	Q3 2016 (kg)	Q3 2017 (kg)	Q3 2018 (kg)	Q3 2019 (kg)	Q3 2020 (kg)	Q3 2021 (kg)	Q3 2022 (kg)	Q3 2023 (kg)
Upstream	2.56	1.59	1.49	1.94	3.31	3.12	2.21	2.40	4.31
Upper reservoir	2.94	2.71	4.71	12.64	12.90	12.20	11.92	9.87	13.18
Lower reservoir	2.16	2.24	1.24	1.49	2.67	3.97	3.05	4.21	4.89
Downstream	4.32	2.42	5.31	2.93	2.73	3.20	3.79	3.46	4.51
Mekong	3.38	3.30	3.32	3.08	2.30	2.67	3.70	3.40	4.24

The survey results in Q3 2023 indicate that Nam Ngiep is the main fishing habitat for the upstream and downstream zones, while the main fishing habitat for the lower reservoir are the reservoir and tributaries and streams, and the upper reservoir and Mekong zones are the reservoir, and Mekong respectively. The proportion of fishing habitats in Q3 2023 are displayed in **Table 4-6**.

TABLE 4-6: PROPORTION OF THE CATCH REPORTED BY MAIN HABITATS (%) IN Q3 2023

Habitats	US	UR	LR	DS	MK
Mekong	0.0%	0.0%	0.0%	3.0%	84.8%
Nam Ngiep	43.2%	9.6%	0.0%	64.0%	3.1%
Nam Xan	0.0%	0.0%	0.0%	0.0%	0.0%
Reservoir	26.6%	88.3%	49.7%	0.0%	0.0%
Tributary and stream	27.1%	1.5%	48.8%	32.6%	2.0%
Wetland	3.1%	0.6%	1.5%	0.0%	10.1%
Others	0.0%	0.0%	0.0%	0.4%	0.0%

Total reported fish and other aquatic animal (OAA) catch (proportion of OAA) for the same 7-day period in Q3 from 2015 to 2023 are shown in **Figure 4-3**.

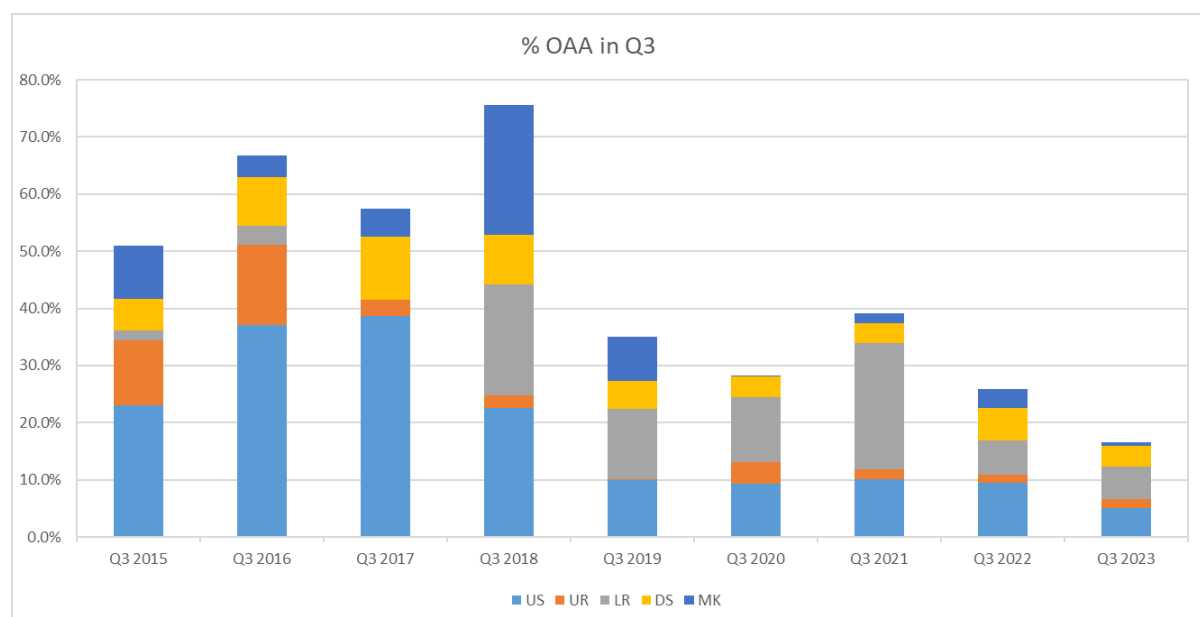


FIGURE 4-3: PROPORTION OF OAA TO THE TOTAL REPORTED KILOGRAM (KG) OF FISH AND OAA FOR A 7-DAY PERIOD BY FISHING ZONE IN Q3 FROM 2015 TO 2023

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 September 2023) are provided in **TABLE 5-1**.

TABLE 5-1: SAFETY INCIDENTS REPORTED DURING THE OPERATION PHASE (SEPTEMBER 2019 TO SEPTEMBER 2023)

Type of Incidents	LTI	RI	NM	PD	FI	MVI	Total
No. of Incidents in Q3, 2023	0	0	0	0	0	0	0
Cumulative Total Incidents to 30 September 2023	0	3	0	0	0	1	4

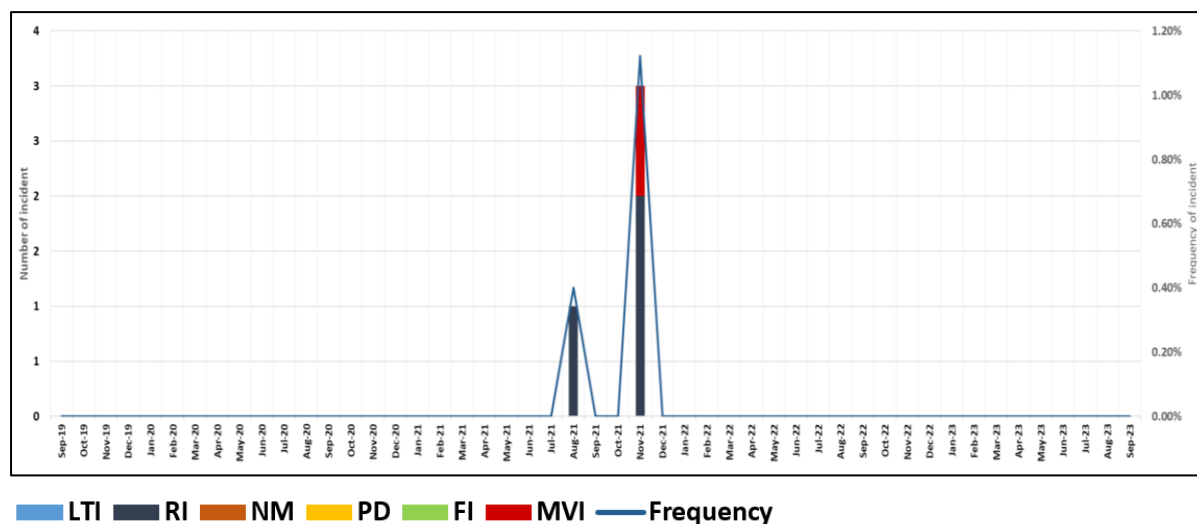
LTI: Lost Time Incident; RI: Recordable Injury; NM: Near Miss; PD: Property Damage; FI: Fire Incident; MVI: Motor Vehicle Incident

There were no incidents or accident reported in Q3 2023.

The histogram below in **Figure 5-1** shows the number of reported incidents occurring in each month since 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 SINCE SEPTEMBER 2019 TO 30 SEPTEMBER 2023

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 Q3 2023.

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

There were no training events and drills during the Q3 2023.

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 work place 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 third quarter 2023.

6 External missions and visits

There was no external missions during the Q3 2023.

The action priorities recommended by ADB, IAP, and LTA during the mission in May 2023 are listed for further follow-up as shown in the **appendix 1**.

APPENDICES

APPENDIX 1: ENVIRONMENTAL MONITORING CORRECTIVE ACTIONS Q3 2023

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 29 September 2023)
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).	Q3 2023	<u>In progress:</u> - NNP1PC and the village authorities have identified a new muster point at Hat Gnuin Village but will check again with the BLK District Disaster Management Committee (DDMC) about safe surroundings, safe distance, the appropriate size of space and it was confirmed that drill was organised before the end of September 2023 - Prepare the drill under the realistic conditions for Hat Gnuin, Thaheua, and Phouhomxay Villages to be conducted by August 2023.
		Thaheua: suitable muster point identified, but not accessible due to dense vegetation.	Make accessible (clear overgrown path, keep open by regular cutting).	30 June 2023	<u>In progress:</u> - The paths will be cleared to make it was Confirmed that paths were cleared by end of September and before the drill took place 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.
			Both villages: carry out drill under realistic conditions (i.e.,	Q3 2023	<u>In progress:</u> As mentioned above, NNP1PC conducted the drill at end of September 2023

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 29 September 2023)
			people actually reaching identified muster point.		-
		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 the fields would be at risk.	Confirm statements about spillway and exposure of village; check with Technical LTA. Include warning system and evacuation plan for farm and fields in EAP.	Q3 2023	<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. - This matter will be discussed with the Technical LTA on their next visit In January 2024.
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.	Q3 2023	<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: - Identify any problems (navigation, villagers' complaints, etc.). - Take measures if practicable. During the recent field monitoring and measurement, no boat navigation difficulties were observed. However, in Q42023, at the beginning of the dry

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 29 September 2023)
					season, NNP1PC will conduct interviews with inhabitants who use boats to gather and assess complaints and feedback about boat navigation difficulties - Confirm the effectiveness of the measures. - Based on an evaluation of the monitoring results and the effectiveness of any mitigation measures, in Q2 2024, NNP1PC will consider officially proposing revisions to the monitoring programme
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.	Q3 2023	Follow-up: 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 massive sheet erosion.	Reinforce activities for protecting the watershed area (land use, fishing) according to contractual requirements.	Q3 2023	Follow-up: See section 3.1.1.3 on the progress of meeting to address the risks and challenges for achieving the No Net Loss with relevant GOL offices from central, provincial, and district level.

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 29 September 2023)
5	Irrigation system	Section with Category A damage.	Make reinforcement as soon as possible, before collapse of the section.	-	<u>In progress:</u> - NNP1PC discussed and plans to repair it in 2023.
		Pump for providing irrigation water; installation work started.	Confirm operation of pump	30 June 2023	<u>In progress:</u> Installation of pump was completed and functional well, the pump was operated by one SMO staff together with one member of the water user group.
6	Site rehabilitation	Site of former batching plant: two access holes to underground structure remain, not secured sufficiently.	Eliminate risk, best be removing the entire structure, but at least by filling cavity and securely close access holes. Clearly mention in handover document.	30 June 2023	<u>In progress:</u> - TD and EMO jointly inspected soil filling of the holes at the former RRC Plant. Soil filling and securely closing these identified holes was completed in early August 2023. The handover materials will also be mentioned as suggested.
7	Groundwater supply	Two boreholes "broken".	Clearly state whether replacement is required or not (alternative solution?), if required replace them.	Q3 2023	<u>Completed:</u> - The two broken boreholes were repaired and put back into operation in April 2023. - NNP1PC resumed its monthly water quality monitoring as scheduled.
		E. coli contamination of drinking water due to cattle around intake sites.	Clarify whether measures (fencing) can be taken to reduce risk, and if yes do it.	Q3 2023	<u>Completed:</u> - According to the 2019 site condition survey, fencing off the upstream water course is not feasible due to cattle having access from all directions along the stream.

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 29 September 2023)
					- The villagers were informed about the monitoring results and advised to boil water before drinking. - This clarification will be identified in the Monthly and Quarterly Monitoring Reports.
8	Financial Management Manual (FMM)	Inform ADB and IAP of Mr. Vansy's decision on the financial manual by June 15, 2023		-	<u>Completed</u> The Head of Xaysomboun WRPO agreed to finalize their AIP2023 with the NNP1 EMO and BSP-WCS after the Xaysomboun PAFO received the response letter from FPF DOF-MAF on 21 July 2023 for them to follow up with the MOM of the FMM finalization workshop in January 2023 as well as the approved FMM in May 2023.
9	IAP Contracts	NN1PC to extend the IAP contracts.		-	<u>In progress:</u> - The 2 IAP contracts for Biodiversity Management Offset Expert (Dr Will Duckworth) and Involuntary Resettlement Expert (Dr Tony Zola) are in the process of extension until 31 August 2024. One onsite mission is included.
10	NNL Audit	NN1PC to share NNL audit technical proposals with ADB and agree on the selection process		-	<u>In progress:</u> - NNP1PC conducted the bidding committee meeting on 11 Jul 2023. NNP1 EMO completed the technical review on 12 Jul

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 29 September 2023)
					2023 and shared the proposals to ADB, IAP, LTA, and BSP-WCS on 18 Jul 2023. - The review by IAP, LTA, and BSP-WCS was discussed during the 5th MOU of NNP1-ADB-WCS on 27 Jul 2023. RINA Consulting was recommended by IAP and BSP-WCS over LCG because they have better technical qualification. - NNP1PC bidding committee meeting was organized on 18 Aug 2023 with the conclusion that RINA has better qualification but recommended for financial price negotiation. After further inquiry, EMO noted that the only way to negotiate the price down is by reducing the scope of work which is impractical. - NNP1 EMO requested further view from ADB, IAP, LTA, and BSP-WCS for further selection process on 30 Aug 2023. - After the meeting with Xaysomboun Provincial Management and relevant GOL offices related to the NNL on 22 Sep 2022, IAP recommended cancelling the NNL audit assignment and using the budget for reviewing the Biodiversity Impact Mitigation and Offset Framework (BIMOF). NNP1PC agreed with the recommendation from IAP.

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 29 September 2023)
11	MoU Meeting	Set a date for the next MoU meeting (ADB-NN1-WCS)		-	<u>In progress:</u> The 5 th MOU meeting between NNP1PC, ADB, and BSP-WCS was organized on 27 Jul 2023.
12	Next joint ADB-LTA-IAP mission	Agree on the dates for the next mission.		-	<u>In progress:</u> ADB, IAP, and LTA confirmed for the ENV joint mission in Jan 2024.

APPENDIX 2: SITE CODES, LOCATIONS, MONITORING PARAMETERS AND ITS MAP OF THE SURFACE WATER QUALITY MONITORING

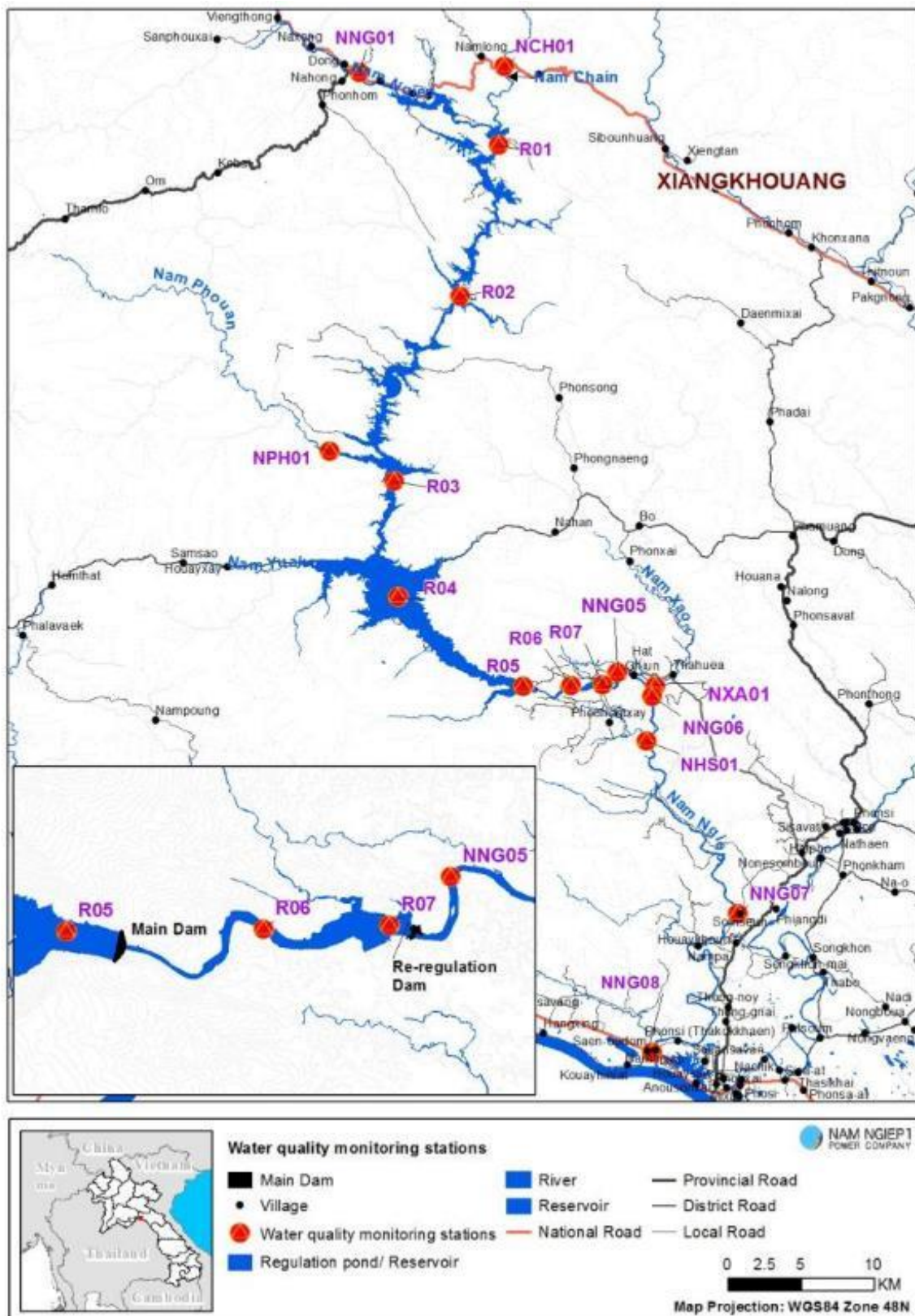
SITE CODES AND LOCATION STATION FOR SURFACE WATER QUALITY MONITORING

Site Code	Location station	Zone
NNG01	Nam Ngiep Upstream of Phientga 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

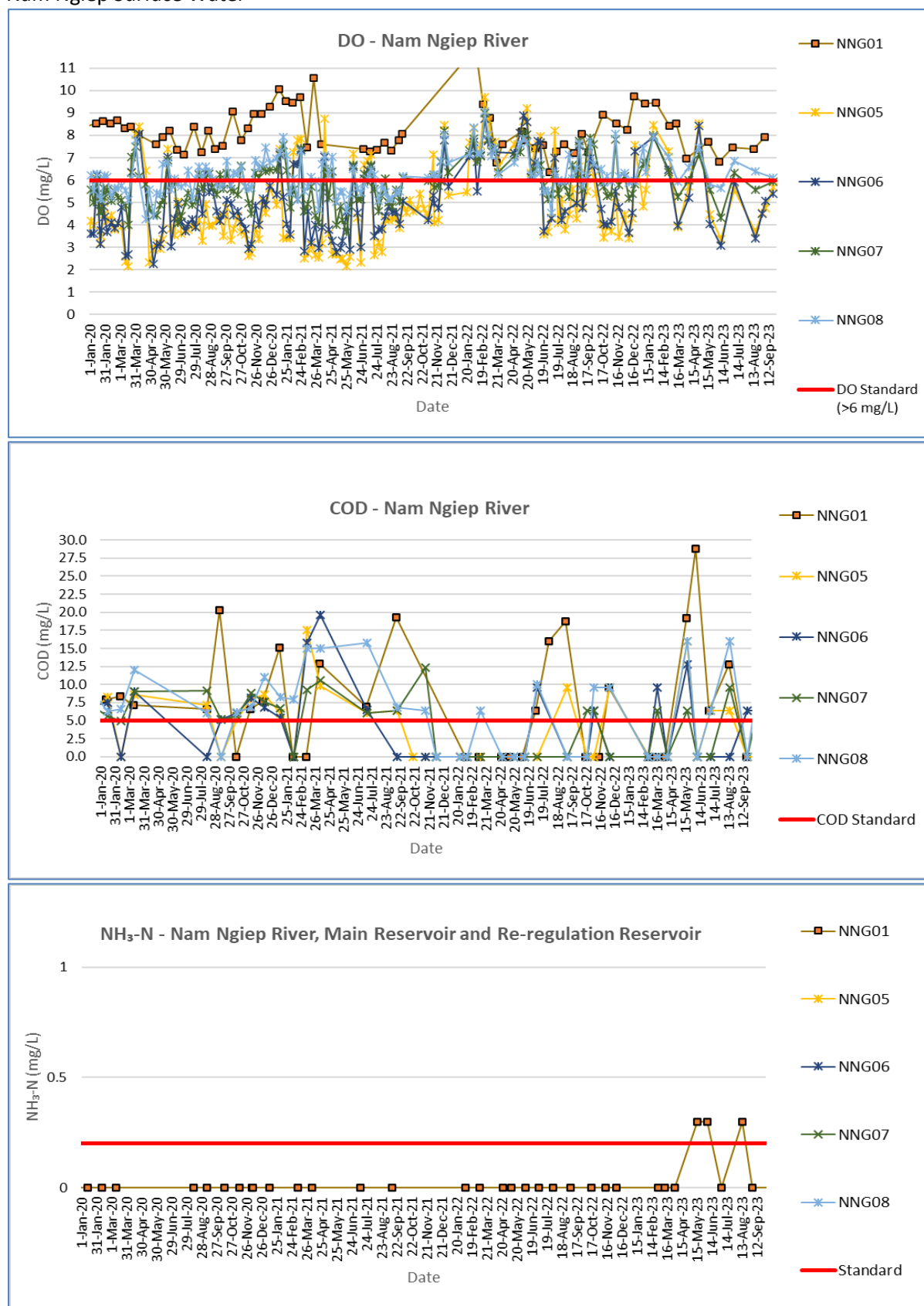
Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/L), Conductivity (µs/cm), Temperature (°C), Turbidity (NTU).	- Main Reservoir: R01, R02, R03, R04, R05; - Re-regulation Reservoir: R06 and R07.
Monthly	pH, DO (%), DO (mg/L), Conductivity (µs/cm), Temperature (°C), Turbidity (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

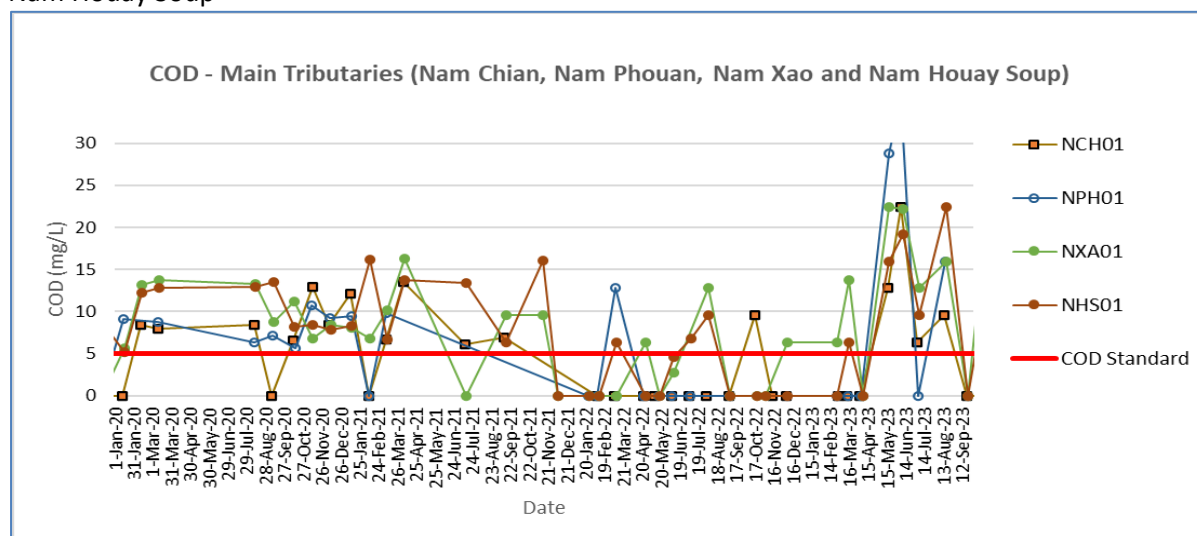


APPENDIX 3: KEY TRENDS OF WATER QUALITY MONITORING FROM JANUARY 2020 TO END OF SEPTEMBER 2023 (ONLY PARAMETERS THAT EXCEEDED THE STANDARDS)

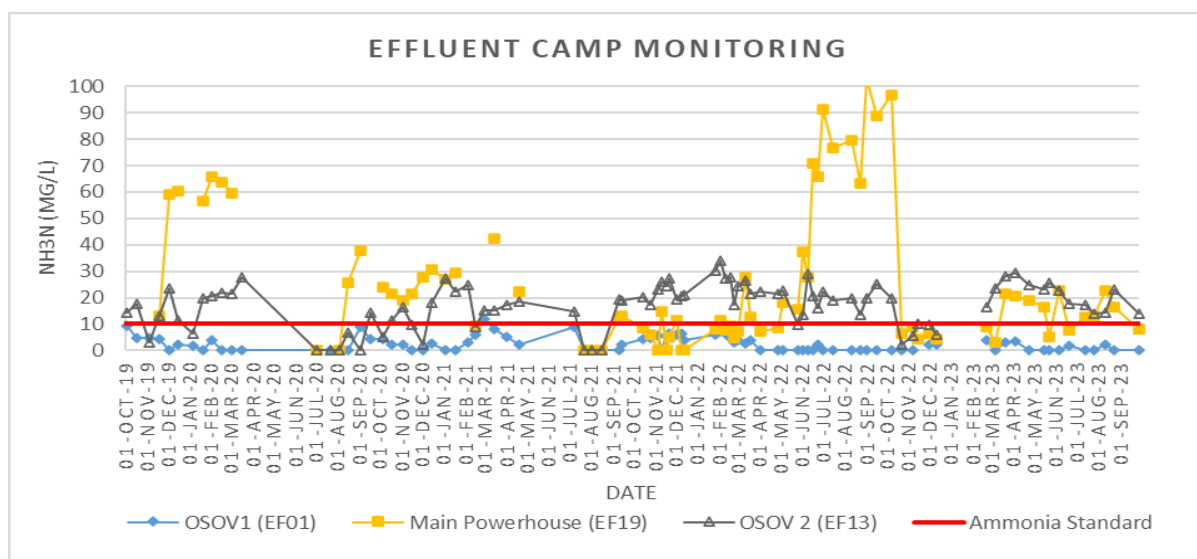
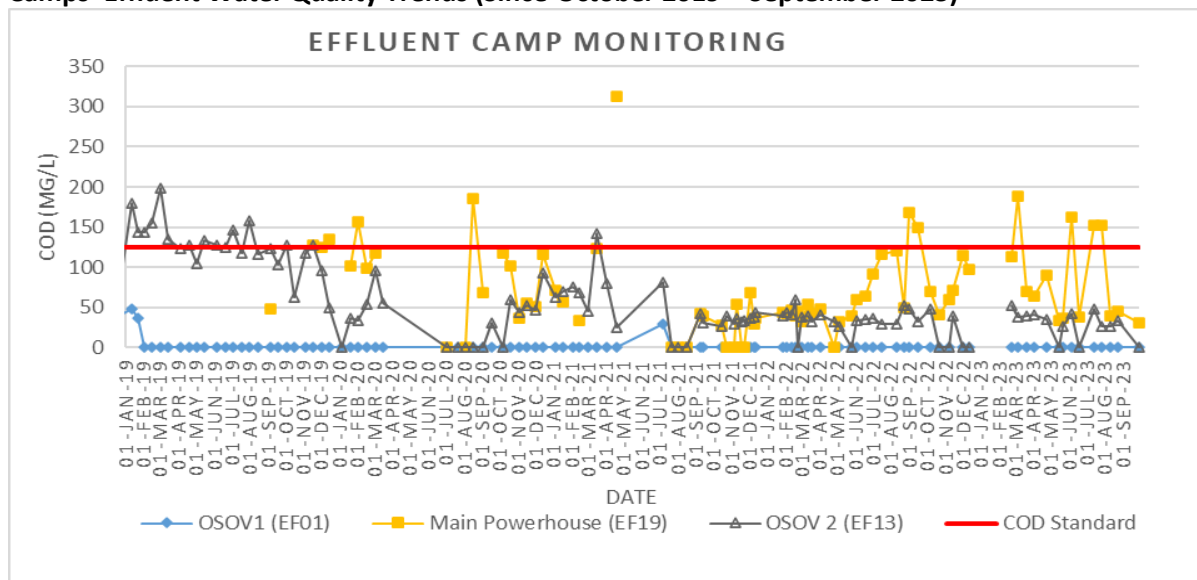
Nam Ngiep Surface Water

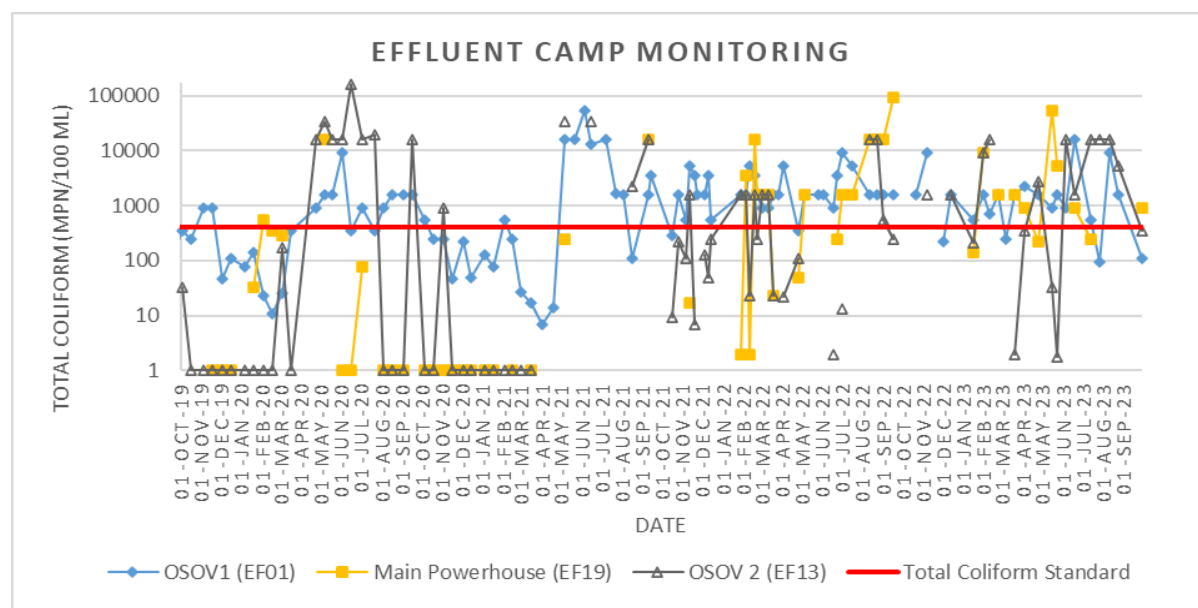
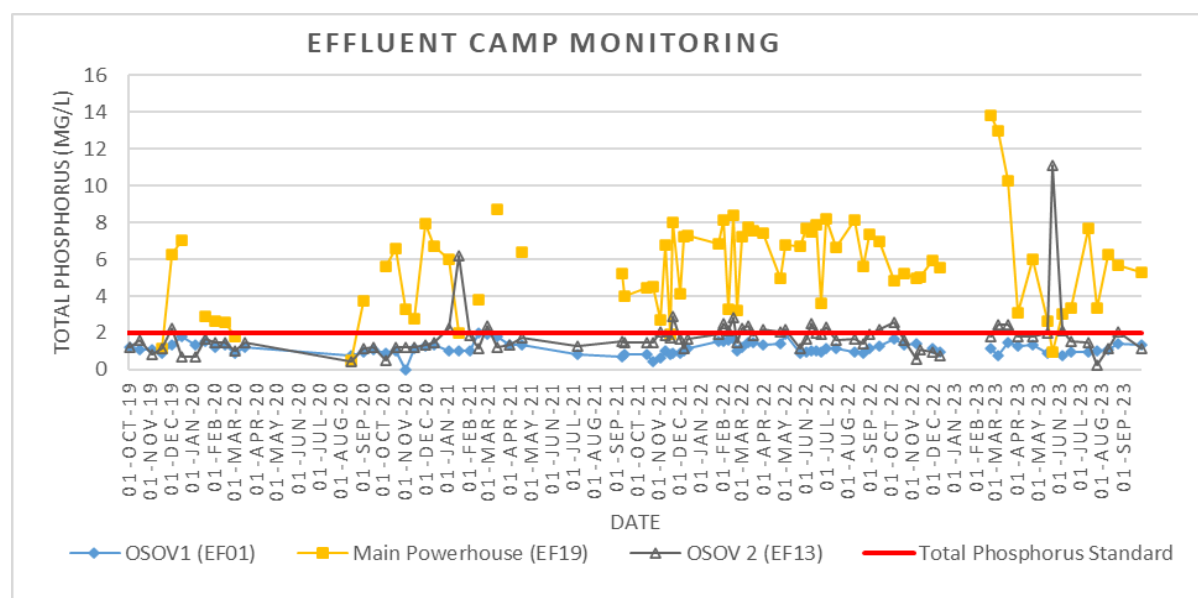
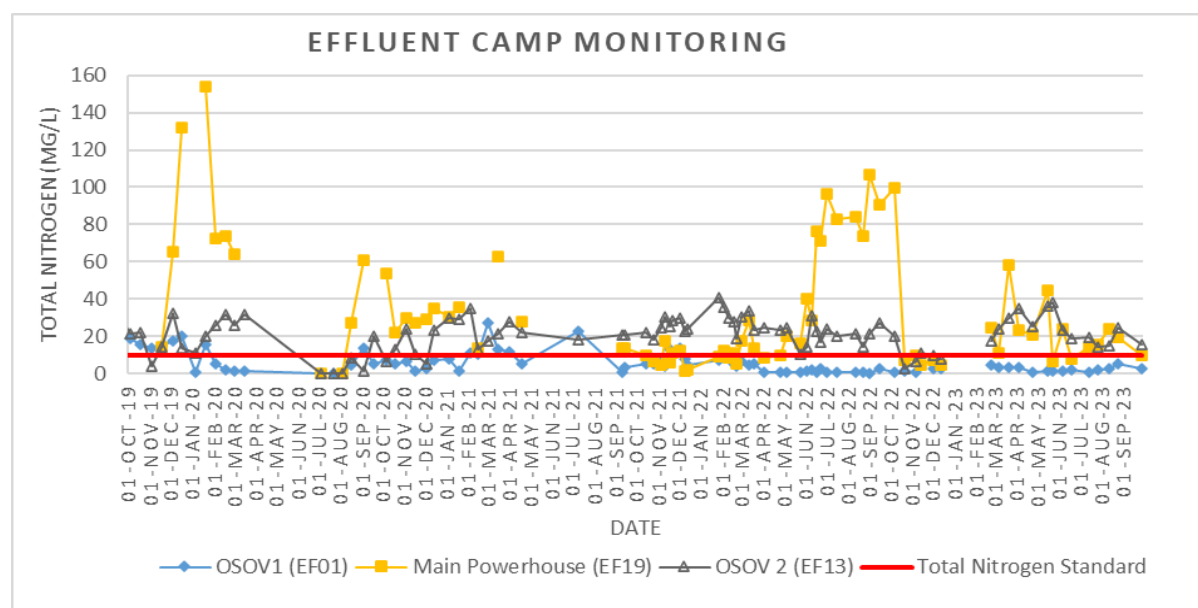


Key Water Quality Parameters for the Nam Ngiep Tributaries: Nam Chian, Nam Phouan, Nam Xao, Nam Houay Soup



Camps' Effluent Water Quality Trends (Since October 2019 – September 2023)





APPENDIX 4: WATER QUALITY MONITORING DATA**APPENDIX 4-1: SURFACE WATER QUALITY MONITORING – Q3 2023**

Date	Parameters (Unit)	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
		Guideline																
3-Jul-23	pH	5.0 - 9.0	6.7												6.85			
4-Jul-23	pH	5.0 - 9.0		6.92	6.85	6.77										7.1		
5-Jul-23	pH	5.0 - 9.0					6.64	6.5	6.66	6.74								
6-Jul-23	pH	5.0 - 9.0									6.63	6.91	6.97	7.18			7.08	7.01
11-Jul-23	pH	5.0 - 9.0		6.88	6.78	6.7												
12-Jul-23	pH	5.0 - 9.0					6.55	6.61	6.78	6.85								
17-Jul-23	pH	5.0 - 9.0					6.81	6.84	6.53	6.58								
18-Jul-23	pH	5.0 - 9.0		6.95	6.82	6.7												
27-Jul-23	pH	5.0 - 9.0		6.95	6.81	6.78												
28-Jul-23	pH	5.0 - 9.0					6.75	6.74	6.64	6.6								
3-Aug-23	pH	5.0 - 9.0				6.68	6.62	6.51	6.75	6.9								
8-Aug-23	pH	5.0 - 9.0		6.96	6.85	6.6												
9-Aug-23	pH	5.0 - 9.0					6.52	6.59	6.74	6.83								
14-Aug-23	pH	5.0 - 9.0	6.88												6.7			
15-Aug-23	pH	5.0 - 9.0					6.6	6.69	6.65	6.82								
16-Aug-23	pH	5.0 - 9.0		6.92	6.82	6.77										7.02		
17-Aug-23	pH	5.0 - 9.0									6.65	6.74	6.9	7.05			7.11	7.06
22-Aug-23	pH	5.0 - 9.0		6.89	6.79	6.7												
23-Aug-23	pH	5.0 - 9.0					6.5	6.55	6.56	6.72								
29-Aug-23	pH	5.0 - 9.0		6.98	6.81	6.58												
30-Aug-23	pH	5.0 - 9.0					6.62	6.77	6.6	6.82	6.89	6.91					7.15	7.03
4-Sep-23	pH	5.0 - 9.0	6.52												7.05			7.02
5-Sep-23	pH	5.0 - 9.0		6.75	6.58	6.55												
6-Sep-23	pH	5.0 - 9.0					6.58	6.64	6.59	6.7	6.85	6.91					7.1	7.02
14-Sep-23	pH	5.0 - 9.0		6.91	6.73	6.66												
15-Sep-23	pH	5.0 - 9.0					6.5	6.59	6.45	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																
20-Sep-23	pH	5.0 - 9.0		6.88	6.7	6.64												
21-Sep-23	pH	5.0 - 9.0					6.59	6.71	6.56	6.8								
22-Sep-23	pH	5.0 - 9.0									6.74	6.86	6.92	7.06			7.1	6.98
26-Sep-23	pH	5.0 - 9.0		6.84	6.72	6.6												
27-Sep-23	pH	5.0 - 9.0					6.55	6.66	6.75	6.83								
3-Jul-23	Sat. DO (%)		91.3												100.2			
4-Jul-23	Sat. DO (%)			89	97.8	98.3										95.4		
5-Jul-23	Sat. DO (%)						92.5	81.2	73.4	72.7								
6-Jul-23	Sat. DO (%)										69.6	73.8	79.7	85.8			90.7	84.3
11-Jul-23	Sat. DO (%)			107.7	122.1	129.3												
12-Jul-23	Sat. DO (%)						112.1	114.4	32.6	67.1								
17-Jul-23	Sat. DO (%)						105.4	107.8	26.2	43.8								
18-Jul-23	Sat. DO (%)			87.5	101.4	102.4												
27-Jul-23	Sat. DO (%)			84.6	91.1	97.3												
28-Jul-23	Sat. DO (%)						102.9	101.8	24.2	31								
3-Aug-23	Sat. DO (%)					95.1	85.8	77.9	43.2	48.7								
8-Aug-23	Sat. DO (%)			112.6	102.9	79.4												
9-Aug-23	Sat. DO (%)						87.2	75.8	42.4	48.8								
14-Aug-23	Sat. DO (%)		87.5												100.2			
15-Aug-23	Sat. DO (%)						103.2	67.2	17.2	10.8								
16-Aug-23	Sat. DO (%)			100.1	115.9	110.2										103.3		
17-Aug-23	Sat. DO (%)										44.4	40.8	67.7	78.5			98.8	92.9
22-Aug-23	Sat. DO (%)			89.3	110.9	110.3												
23-Aug-23	Sat. DO (%)						102.3	91.3	28.6	16.9								
29-Aug-23	Sat. DO (%)			104.8	117.2	129.8												
30-Aug-23	Sat. DO (%)						111.7	102.6	27.4	48.9	49.6	55.3					97	96.2
4-Sep-23	Sat. DO (%)		96.7												103.1			
5-Sep-23	Sat. DO (%)			88.2	91.2	100.4												
6-Sep-23	Sat. DO (%)						96.9	105.8	28.1	40.2	57.7	61.4					81.2	82.8

		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-Sep-23	Sat. DO (%)			80.7	123.5	109.7												
15-Sep-23	Sat. DO (%)						107.6	87.3	40.4	64.3								
20-Sep-23	Sat. DO (%)			87.5	99.2	96.9												
21-Sep-23	Sat. DO (%)						98.8	98.2	41.6	59.4								
22-Sep-23	Sat. DO (%)										69	65.4	74.5	76.6			98.9	97.9
26-Sep-23	Sat. DO (%)			105.6	112.3	105.7												
27-Sep-23	Sat. DO (%)						94.4	97.3	40.3	61.9								
3-Jul-23	DO (mg/L)	>6.0	7.45												8.41			
4-Jul-23	DO (mg/L)	>6.0		7.34	7.49	7.41										7.95		
5-Jul-23	DO (mg/L)	>6.0					7.02	6.27	5.51	5.47								
6-Jul-23	DO (mg/L)	>6.0						6.27	5.51	5.47	5.58	5.92	6.33	6.84			7.1	6.81
11-Jul-23	DO (mg/L)	>6.0		8.7	9.14	9.57												
12-Jul-23	DO (mg/L)	>6.0					8.32	8.61	2.66	5.42								
17-Jul-23	DO (mg/L)	>6.0					7.76	7.97	2.11	3.52								
18-Jul-23	DO (mg/L)	>6.0		7.08	7.54	7.58												
27-Jul-23	DO (mg/L)	>6.0		6.64	6.67	7.06												
28-Jul-23	DO (mg/L)	>6.0					7.52	7.42	1.95	2.47								
3-Aug-23	DO (mg/L)	>6.0				7.18	6.54	6.05	3.48	3.92								
8-Aug-23	DO (mg/L)	>6.0		9.73	8.82	6.22												
9-Aug-23	DO (mg/L)	>6.0					6.84	6.17	3.5	3.93								
14-Aug-23	DO (mg/L)	>6.0	7.38												8.39			
15-Aug-23	DO (mg/L)	>6.0					8.02	5.33	1.45	0.9								
16-Aug-23	DO (mg/L)	>6.0		8.5	9.27	8.53										8.77		
17-Aug-23	DO (mg/L)	>6.0									3.69	3.4	5.57	6.4			7.9	7.56
22-Aug-23	DO (mg/L)	>6.0		7.53	8.42	8.39												
23-Aug-23	DO (mg/L)	>6.0					7.82	7.09	2.41	1.39								
29-Aug-23	DO (mg/L)	>6.0		8.77	8.97	9.82												
30-Aug-23	DO (mg/L)	>6.0					8.56	8.01	2.27	3.91							7.62	7.59
4-Sep-23	DO (mg/L)	>6.0	7.94												8.62			

		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
Date	Parameters (Unit)	Guideline															
5-Sep-23	DO (mg/L)	>6.0		7.18	6.82	7.44											
6-Sep-23	DO (mg/L)	>6.0					7.35	8.04	2.31	3.31						6.25	6.42
14-Sep-23	DO (mg/L)	>6.0		6.58	9.14	8.31											
15-Sep-23	DO (mg/L)	>6.0					8.26	6.83	3.34	5.03							
20-Sep-23	DO (mg/L)	>6.0		6.96	7.41	7.25											
21-Sep-23	DO (mg/L)	>6.0					7.42	7.45	3.4	4.74							
22-Sep-23	DO (mg/L)	>6.0						7.45	3.4	4.74	5.68	5.38	5.92	6.1		7.73	7.77
26-Sep-23	DO (mg/L)	>6.0		8.09	8.44	7.94											
27-Sep-23	DO (mg/L)	>6.0					7.19	7.47	3.3	5.1							
3-Jul-23	Conductivity (µs/cm)		121											31			
4-Jul-23	Conductivity (µs/cm)			71	98	83									74		
5-Jul-23	Conductivity (µs/cm)						81	83	72	73							
6-Jul-23	Conductivity (µs/cm)										69	76	67	66		136	23
11-Jul-23	Conductivity (µs/cm)			79	92	85											
12-Jul-23	Conductivity (µs/cm)						81	81	84	83							
17-Jul-23	Conductivity (µs/cm)						81	81	90	89							
18-Jul-23	Conductivity (µs/cm)			99	91	86											
27-Jul-23	Conductivity (µs/cm)			88	92	88											
28-Jul-23	Conductivity (µs/cm)						81	79	90	88							
3-Aug-23	Conductivity (µs/cm)					89	79	79	74	74							
8-Aug-23	Conductivity (µs/cm)			69	64	91											
9-Aug-23	Conductivity (µs/cm)						82	83	71	71							
14-Aug-23	Conductivity (µs/cm)		76											32			
15-Aug-23	Conductivity (µs/cm)						81	82	87	84							
16-Aug-23	Conductivity (µs/cm)			75	78	81									86		
17-Aug-23	Conductivity (µs/cm)										81	82	79	65		120	20
22-Aug-23	Conductivity (µs/cm)			71	86	80											
23-Aug-23	Conductivity (µs/cm)						79	80	82	82							
29-Aug-23	Conductivity (µs/cm)			91	84	80											

		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																
30-Aug-23	Conductivity (µs/cm)					79	80	79	75	78	80					108	21	
4-Sep-23	Conductivity (µs/cm)		103											34				
5-Sep-23	Conductivity (µs/cm)			98	81	78												
6-Sep-23	Conductivity (µs/cm)					79	78	80	78	78	79					97	24	
14-Sep-23	Conductivity (µs/cm)			77	82	76												
15-Sep-23	Conductivity (µs/cm)					76	74	77	56									
20-Sep-23	Conductivity (µs/cm)			57	78	75												
21-Sep-23	Conductivity (µs/cm)					74	73	74	62									
22-Sep-23	Conductivity (µs/cm)									72	75	72	61			96	19	
26-Sep-23	Conductivity (µs/cm)			82	78	74												
27-Sep-23	Conductivity (µs/cm)					73	72	74	56									
3-Jul-23	Temperature (°C)		25.7											24.03				
4-Jul-23	Temperature (°C)			25.21	29.53	30.16									24.59			
5-Jul-23	Temperature (°C)					29.76	28.78	30.29	30.36									
6-Jul-23	Temperature (°C)									26.51	26.57	27.28	27.09			28.02	26.2	
11-Jul-23	Temperature (°C)			26.27	30.47	31.15												
12-Jul-23	Temperature (°C)					31.02	29.94	26.26	26.55									
17-Jul-23	Temperature (°C)					31.35	31.28	26.39	26.64									
18-Jul-23	Temperature (°C)			26.23	30.58	31.11												
27-Jul-23	Temperature (°C)			28	31.74	32.3												
28-Jul-23	Temperature (°C)					31.86	31.76	26.5	27.12									
3-Aug-23	Temperature (°C)				29.8	29.55	28.61	26.46	26.56									
8-Aug-23	Temperature (°C)			22.75	23.06	27.49												
9-Aug-23	Temperature (°C)					27.73	27.99	25.15	26.28									
14-Aug-23	Temperature (°C)		23.91											24.36				
15-Aug-23	Temperature (°C)					28.42	27.38	24.35	24.86									
16-Aug-23	Temperature (°C)			23.58	26.76	28.64									23.42			
17-Aug-23	Temperature (°C)									24.74	24.71	25.27	26.03			26.82	25.79	
22-Aug-23	Temperature (°C)			23.9	29.52	29.69												

		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																
23-Aug-23	Temperature (°C)						29.38	28.43	24.49	24.84								
29-Aug-23	Temperature (°C)			24.52	28.69	29.7												
30-Aug-23	Temperature (°C)						29.23	28.17	24.61	27.11	25.3	25.56					27.78	27.58
4-Sep-23	Temperature (°C)		25.44												24.64			
5-Sep-23	Temperature (°C)			25.67	30.61	31.53												
6-Sep-23	Temperature (°C)						29.86	29.74	25.19	24.98	24.96	25.43					28.72	28.69
14-Sep-23	Temperature (°C)			35.3	2.37	2.15												
15-Sep-23	Temperature (°C)						29.12	28.01	25.08	27.51								
20-Sep-23	Temperature (°C)			27.33	30.64	30.52												
21-Sep-23	Temperature (°C)						30.22	29.81	25.7	27.15								
22-Sep-23	Temperature (°C)										25.13	25.44	26.71	26.53			28.06	27.09
26-Sep-23	Temperature (°C)			29.24	30.56	30.33												
27-Sep-23	Temperature (°C)						29.45	29.03	24.88	25.81								
3-Jul-23	Turbidity (NTU)		54.9												56.5			
4-Jul-23	Turbidity (NTU)			69.1	4.8	2.18										21.6		
5-Jul-23	Turbidity (NTU)						3.04	2.36	16.6	8.38								
6-Jul-23	Turbidity (NTU)										14.1	40.8	51.7	54.3			136	15
11-Jul-23	Turbidity (NTU)			58.8	9.35	2.45												
12-Jul-23	Turbidity (NTU)						2.8	2.29	3.87	7.36								
17-Jul-23	Turbidity (NTU)						1.96	1.7	3.65	5.4								
18-Jul-23	Turbidity (NTU)			421	5.63	2.05												
27-Jul-23	Turbidity (NTU)			45.1	4.23	1.65												
28-Jul-23	Turbidity (NTU)						2.26	1.54	3.87	3.74								
3-Aug-23	Turbidity (NTU)					1.58	1.69	1.44	3.38	3.28								
8-Aug-23	Turbidity (NTU)			679	442	4.95												
9-Aug-23	Turbidity (NTU)						4.91	3.02	5.52	7.58								
14-Aug-23	Turbidity (NTU)		5790												84.5			
15-Aug-23	Turbidity (NTU)						1.67	1.98	26.1	27.4								
16-Aug-23	Turbidity (NTU)			1600	9.74	1.6										1540		

Date	Parameters (Unit)	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
		Guideline																
17-Aug-23	Turbidity (NTU)										25.3	26.3	22.5	19.6			20	5.85
22-Aug-23	Turbidity (NTU)			316	4.8	1.39												
23-Aug-23	Turbidity (NTU)						1.55	1.06	27.4	23.2								
29-Aug-23	Turbidity (NTU)			55.9	3.15	1.78												
30-Aug-23	Turbidity (NTU)						1.27	0.85	19.9	18.5	18.5	22.5					46	5.21
4-Sep-23	Turbidity (NTU)		310												15.7			
5-Sep-23	Turbidity (NTU)			42.9	2.65	1.33												
6-Sep-23	Turbidity (NTU)						1.45	1.03	17.8	16.1	21	26.8					99.1	5.76
14-Sep-23	Turbidity (NTU)			35.3	2.37	2.15												
15-Sep-23	Turbidity (NTU)						1.69	1.96	18.8	12.3								
20-Sep-23	Turbidity (NTU)			28.3	2.58	1.12												
21-Sep-23	Turbidity (NTU)						1.3	1.22	20.5	14.5								
22-Sep-23	Turbidity (NTU)										19.9	22.7	22.3	17.6			30.3	5.7
26-Sep-23	Turbidity (NTU)			4.41	3.78	1.44												
27-Sep-23	Turbidity (NTU)						1.36	1.69	19.8	18.6								
3-Jul-23	TSS (mg/L)		44.16												42.82			
4-Jul-23	TSS (mg/L)			86.22		<5										20.48		
5-Jul-23	TSS (mg/L)						<5	<5	8.57	<5								
6-Jul-23	TSS (mg/L)										6.6	18.24	42.68	50.21			88	8.64
14-Aug-23	TSS (mg/L)		4330												52.4			
15-Aug-23	TSS (mg/L)						<5	<5	13.77	8.6								
16-Aug-23	TSS (mg/L)			773.3		<5										1319		
17-Aug-23	TSS (mg/L)										11.53	12.37	15.4	10			17.77	6.94
4-Sep-23	TSS (mg/L)		178.7												10.63			
20-Sep-23	TSS (mg/L)			14.6		<5												
21-Sep-23	TSS (mg/L)						<5	<5	7.09	5.07								
22-Sep-23	TSS (mg/L)										8.8	10.14	14.05	9.16			27.4	5.61
3-Jul-23	BOD ₅ (mg/L)	<1.5	<1												<1			
4-Jul-23	BOD ₅ (mg/L)	<1.5		<1		<1										<1		

Date	Parameters (Unit)	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
		Guideline																
5-Jul-23	BOD ₅ (mg/L)	<1.5					<1	<1	<1	<1								
6-Jul-23	BOD ₅ (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
14-Aug-23	BOD ₅ (mg/L)	<1.5	<1												1.26			
15-Aug-23	BOD ₅ (mg/L)	<1.5					<1	1	<1	<1								
16-Aug-23	BOD ₅ (mg/L)	<1.5		<1		<1										<1		
17-Aug-23	BOD ₅ (mg/L)	<1.5									<1	<1	<1				<1	<1
4-Sep-23	BOD ₅ (mg/L)	<1.5	<1												<1			
20-Sep-23	BOD ₅ (mg/L)	<1.5		<1		<1												
21-Sep-23	BOD ₅ (mg/L)	<1.5					<1	<1	<1	<1								
22-Sep-23	BOD ₅ (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
3-Jul-23	COD (mg/L)	<5.0	6.4												6.4			
4-Jul-23	COD (mg/L)	<5.0														<5		
5-Jul-23	COD (mg/L)	<5.0							9.6	19.2								
6-Jul-23	COD (mg/L)	<5.0									6.4	<5	<5	6.4			12.8	9.6
14-Aug-23	COD (mg/L)	<5.0	12.8												9.6			
15-Aug-23	COD (mg/L)	<5.0							9.6	16								
16-Aug-23	COD (mg/L)	<5.0														16		
17-Aug-23	COD (mg/L)	<5.0									6.4	<5	9.6	16			16	22.4
20-Sep-23	COD (mg/L)	<5.0	<5												<5			
21-Sep-23	COD (mg/L)	<5.0							<5	<5								
22-Sep-23	COD (mg/L)	<5.0															<5	<5
3-Jul-23	NH ₃ -N (mg/L)	<0.2	<0.2												<0.2			
4-Jul-23	NH ₃ -N (mg/L)	<0.2		<0.2		<0.2										<0.2		
5-Jul-23	NH ₃ -N (mg/L)	<0.2					<0.2	<0.2										
14-Aug-23	NH ₃ -N (mg/L)	<0.2	0.3												<0.2			
15-Aug-23	NH ₃ -N (mg/L)	<0.2					<0.2	<0.2										
16-Aug-23	NH ₃ -N (mg/L)	<0.2		<0.2		<0.2										<0.2		
20-Sep-23	NH ₃ -N (mg/L)	<0.2		<0.2											<0.2			
3-Jul-23	NO ₃ -N (mg/L)	<5.0	0.24												0.08			

		River Name	Nam Ngiep											Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites											Location Refer to Construction Sites			
			Upstream/Main Reservoir						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
Date	Parameters (Unit)	Guideline															
4-Jul-23	NO ₃ -N (mg/L)	<5.0		0.09		0.06									0.08		
5-Jul-23	NO ₃ -N (mg/L)	<5.0					0.06	0.08									
14-Aug-23	NO ₃ -N (mg/L)	<5.0	0.18											<0.02			
15-Aug-23	NO ₃ -N (mg/L)	<5.0					<0.02	0.11									
16-Aug-23	NO ₃ -N (mg/L)	<5.0		0.38		<0.02									0.08		
20-Sep-23	NO ₃ -N (mg/L)	<5.0	0.13											0.11			
3-Jul-23	Faecal coliform (MPN/100 mL)	<1,000	280											350			
4-Jul-23	Faecal coliform (MPN/100 mL)	<1,000													1,600		
6-Jul-23	Faecal coliform (MPN/100 mL)	<1,000								130	350	540	920			920	110
14-Aug-23	Faecal coliform (MPN/100 mL)	<1,000	1,600											540			
16-Aug-23	Faecal coliform (MPN/100 mL)	<1,000													1,600		
17-Aug-23	Faecal coliform (MPN/100 mL)	<1,000								2	7	5	7			23	130
4-Sep-23	Faecal coliform (MPN/100 mL)	<1,000	920											920			
22-Sep-23	Faecal coliform (MPN/100 mL)	<1,000								7	11	79	110			920	110
3-Jul-23	Total Coliform (MPN/100 mL)	<5,000	350											1,600			
4-Jul-23	Total Coliform (MPN/100 mL)	<5,000													1,600		
6-Jul-23	Total Coliform (MPN/100 mL)	<5,000								920	1,600	1,600	1,600			1,600	920
14-Aug-23	Total Coliform (MPN/100 mL)	<5,000	1,600											540			
16-Aug-23	Total Coliform (MPN/100 mL)	<5,000													1,600		
17-Aug-23	Total Coliform (MPN/100 mL)	<5,000								140	540	1,600	540			1,600	1,600
4-Sep-23	Total Coliform (MPN/100 mL)	<5,000	1,600											1,600			
22-Sep-23	Total Coliform (MPN/100 mL)	<5,000								1,600	920	1,600	1,600			1,600	1,600
3-Jul-23	TKN		<1.5											<1.5			
4-Jul-23	TKN			<1.5		<1.5									<1.5		
5-Jul-23	TKN						<1.5	<1.5									
14-Aug-23	TKN		<1.5											<1.5			
15-Aug-23	TKN						<1.5	<1.5									
16-Aug-23	TKN			6.9		<1.5									<1.5		
20-Sep-23	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																
4-Jul-23	Secchi Disk (m)				2	2.5												
5-Jul-23	Secchi Disk (m)						2.3	3	0.7	1								
11-Jul-23	Secchi Disk (m)				2.8	3												
12-Jul-23	Secchi Disk (m)						3.5	3.7	1.8	1.6								
18-Jul-23	Secchi Disk (m)				1.7	2.6												
19-Jul-23	Secchi Disk (m)						2.8	2.6	2.5	2.2								
27-Jul-23	Secchi Disk (m)				1	2.8												
28-Jul-23	Secchi Disk (m)						2.5	2.8	2.3	2.4								
3-Aug-23	Secchi Disk (m)					2.8	2.5	3	2	2.2								
8-Aug-23	Secchi Disk (m)					1.3												
9-Aug-23	Secchi Disk (m)						2	2.4	1	1								
16-Aug-23	Secchi Disk (m)				0.8	2.6												
17-Aug-23	Secchi Disk (m)						2.8	2.7	0.5	0.48								
22-Aug-23	Secchi Disk (m)				1.75	2.5												
23-Aug-23	Secchi Disk (m)						3.2	3.75	0.5	0.6								
29-Aug-23	Secchi Disk (m)			0.2	1.75	3.25												
30-Aug-23	Secchi Disk (m)						3.5	4.2	0.6	0.7								
5-Sep-23	Secchi Disk (m)			0.2	2.1	3												
6-Sep-23	Secchi Disk (m)						2.8	3.7	0.7	0.75								
14-Sep-23	Secchi Disk (m)			0.2	2	2.2												
15-Sep-23	Secchi Disk (m)						2.2	2	0.5									
20-Sep-23	Secchi Disk (m)			0.4	2.25	3.5												
21-Sep-23	Secchi Disk (m)						3.6	3.2	1									
26-Sep-23	Secchi Disk (m)			1.5	2	3.3												
27-Sep-23	Secchi Disk (m)						3.3	3	0.7									
3-Jul-23	TOC (mg/L)		5.67												7.62			
5-Jul-23	TOC (mg/L)								5.19	4.57						5.12		
6-Jul-23	TOC (mg/L)										6.04	5.72	8.05	8.39			10.2	9.32
15-Aug-23	TOC (mg/L)								1.8	1.58								

Date	Parameters (Unit)	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
		Guideline																
16-Aug-23	TOC (mg/L)															6.92		
17-Aug-23	TOC (mg/L)										1.63	1.51	1.63	1.64			1.65	3.1
20-Sep-23	TOC (mg/L)		1.3												1.3			
21-Sep-23	TOC (mg/L)								1.13	1.19								
22-Sep-23	TOC (mg/L)										1.22	1.26	1.66	1.44			1.66	2.29
3-Jul-23	Total Phosphorus (mg/L)		0.03												0.05			
4-Jul-23	Total Phosphorus (mg/L)			0.03		0.03										0.03		
5-Jul-23	Total Phosphorus (mg/L)						0.02	0.03										
14-Aug-23	Total Phosphorus (mg/L)		0.57												0.04			
15-Aug-23	Total Phosphorus (mg/L)						0.01	<0.01										
16-Aug-23	Total Phosphorus (mg/L)			0.05		0.03										0.1		
20-Sep-23	Total Phosphorus (mg/L)		0.03												<0.01			
3-Jul-23	Total Dissolved Phosphorus (mg/L)		0.01												0.02			
4-Jul-23	Total Dissolved Phosphorus (mg/L)			0.01		0.01										<0.01		
5-Jul-23	Total Dissolved Phosphorus (mg/L)						<0.01	0.02										
14-Aug-23	Total Dissolved Phosphorus (mg/L)		0.43												0.03			
15-Aug-23	Total Dissolved Phosphorus (mg/L)						<0.01	<0.01										
16-Aug-23	Total Dissolved Phosphorus (mg/L)			0.03		0.01										0.05		
20-Sep-23	Total Dissolved Phosphorus (mg/L)		0.02												<0.01			
15-Aug-23	Turbidity (NTU)-bottom						1.67	1.98										
16-Aug-23	Turbidity (NTU)-bottom					1.6												
20-Sep-23	Turbidity (NTU)-bottom					48.6												
21-Sep-23	Turbidity (NTU)-bottom						4.46	1.97										
4-Jul-23	TSS (mg/L)-bottom					16.87												

		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-Jul-23	TSS (mg/L)-bottom					54.66	7.08											
15-Aug-23	TSS (mg/L)-bottom					26	12.94											
16-Aug-23	TSS (mg/L)-bottom				92.8													
20-Sep-23	TSS (mg/L)-bottom				21.71													
21-Sep-23	TSS (mg/L)-bottom					20.8	11.38											
4-Jul-23	BOD ₅ (mg/L)-bottom				8.66													
5-Jul-23	BOD ₅ (mg/L)-bottom					<1	9.98											
15-Aug-23	BOD ₅ (mg/L)-bottom					<1	5.92											
16-Aug-23	BOD ₅ (mg/L)-bottom				<1													
20-Sep-23	BOD ₅ (mg/L)-bottom				<1													
21-Sep-23	BOD ₅ (mg/L)-bottom					<1	5.78											
4-Jul-23	NH ₃ -N (mg/L)-bottom				0.6													
5-Jul-23	NH ₃ -N (mg/L)-bottom					<0.2	0.4											
15-Aug-23	NH ₃ -N (mg/L)-bottom					0.4	0.4											
16-Aug-23	NH ₃ -N (mg/L)-bottom				<0.2													
4-Jul-23	NO ₃ -N (mg/L)-bottom				0.06													
5-Jul-23	NO ₃ -N (mg/L)-bottom					0.08	0.08											
15-Aug-23	NO ₃ -N (mg/L)-bottom					0.08	<0.02											
16-Aug-23	NO ₃ -N (mg/L)-bottom				0.11													
4-Jul-23	TKN-bottom				<1.5													
5-Jul-23	TKN-bottom					<1.5	<1.5											
15-Aug-23	TKN-bottom					<1.5												
16-Aug-23	TKN-bottom																	
4-Jul-23	Total Dissolved Phosphorus (mg/L)-bottom				0.03													
5-Jul-23	Total Dissolved Phosphorus (mg/L)-bottom					0.05	0.06											
15-Aug-23	Total Dissolved Phosphorus (mg/L)-bottom					0.03	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																
16-Aug-23	Total Dissolved Phosphorus (mg/L)-bottom					0.02												
4-Jul-23	Total Phosphorus (mg/L)-bottom					0.04												
5-Jul-23	Total Phosphorus (mg/L)-bottom						0.09	0.08										
15-Aug-23	Total Phosphorus (mg/L)-bottom						0.05	0.07										
16-Aug-23	Total Phosphorus (mg/L)-bottom					0.04												
15-Aug-23	Hydrogen Sulfide (mg/L)-bottom						0.1	0.06										
16-Aug-23	Hydrogen Sulfide (mg/L)-bottom					0.08												
4-Jul-23	Chlorophyll-A-bottom					1.3												
5-Jul-23	Chlorophyll-A-bottom						0.41	0.88										
15-Aug-23	Chlorophyll-A-bottom						2.18	1.7										
16-Aug-23	Chlorophyll-A-bottom					2.59												
4-Jul-23	Chlorophyll-A			1.77		5.91												
5-Jul-23	Chlorophyll-A						3.06	2.24										

APPENDIX 4-2: EFFLUENT CAMP MONITORING RESULTS – Q3 2023

		Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
13-Jul-23	pH	6.0 - 9.0	6.88	6.8	6.65
26-Jul-23	pH	6.0 - 9.0	6.56	6.77	6.7
11-Aug-23	pH	6.0 - 9.0	6.55	6.99	7.11
24-Aug-23	pH	6.0 - 9.0	6.66	6.73	6.92
28-Sep-23	pH	6.0 - 9.0	6.6	6.79	6.8
13-Jul-23	Sat. DO (%)		56.5	90	63.8
26-Jul-23	Sat. DO (%)		64.2	93	85.1
11-Aug-23	Sat. DO (%)		56.2	37.1	66.9
24-Aug-23	Sat. DO (%)		28.1	64	40.8
28-Sep-23	Sat. DO (%)		28.5	49.5	47.4
13-Jul-23	DO (mg/L)		4.42	6.79	4.79
26-Jul-23	DO (mg/L)		4.96	6.95	6.24
11-Aug-23	DO (mg/L)		4.47	2.89	5.43
24-Aug-23	DO (mg/L)		2.22	4.96	3.14
28-Sep-23	DO (mg/L)		2.25	3.8	3.6
13-Jul-23	Conductivity (µs/cm)		340	552	1126
26-Jul-23	Conductivity (µs/cm)		374	481	1252
11-Aug-23	Conductivity (µs/cm)		343	522	1268
24-Aug-23	Conductivity (µs/cm)		380	561	1500
28-Sep-23	Conductivity (µs/cm)		271	425	873
13-Jul-23	Temperature (°C)		27.98	30.04	30.2
26-Jul-23	Temperature (°C)		28.62	30.54	31.04
11-Aug-23	Temperature (°C)		26.84	28.41	28.86
24-Aug-23	Temperature (°C)		27.41	28.55	28.89
28-Sep-23	Temperature (°C)		27.47	29.04	29.48
13-Jul-23	Turbidity (NTU)		1.67	26.8	104
26-Jul-23	Turbidity (NTU)		0.47	6.99	88.7
11-Aug-23	Turbidity (NTU)		2.18	6.93	25.1
24-Aug-23	Turbidity (NTU)		1.09	7.72	15.5
28-Sep-23	Turbidity (NTU)		1.32	4.67	6.82
13-Jul-23	TSS (mg/L)	<50	<5	30.51	71.21
26-Jul-23	TSS (mg/L)	<50	<5	6.8	117
11-Aug-23	TSS (mg/L)	<50	<5	10.36	19.79
24-Aug-23	TSS (mg/L)	<50	<5	7.8	27.14
28-Sep-23	TSS (mg/L)	<50	<5	5.94	10.93
13-Jul-23	BOD ₅ (mg/L)	<30	<6	21.54	<6
26-Jul-23	BOD ₅ (mg/L)	<30	<6	22.02	<6
11-Aug-23	BOD ₅ (mg/L)	<30	<6	7.11	<6
24-Aug-23	BOD ₅ (mg/L)	<30	<6	<6	<6
28-Sep-23	BOD ₅ (mg/L)	<30	<6	7.35	11.64
13-Jul-23	COD (mg/L)	<125	<25	48.2	152
26-Jul-23	COD (mg/L)	<125	<25	26.0	152
11-Aug-23	COD (mg/L)	<125	<25	26.5	39
24-Aug-23	COD (mg/L)	<125	<25	34.0	45

		Site Name	OSOV1	OSOV 2	Main Powerhouse
Date	Parameter (Unit)	Station Code	EF01	EF13	EF19
		Guideline in the CA			
28-Sep-23	COD (mg/L)	<125	<25	<25	32
13-Jul-23	NH ₃ -N (mg/L)	<10.0	<2	17.1	12.8
26-Jul-23	NH ₃ -N (mg/L)	<10.0	<2	13.8	13.1
11-Aug-23	NH ₃ -N (mg/L)	<10.0	2.1	14.2	22.7
24-Aug-23	NH ₃ -N (mg/L)	<10.0	<2	23.0	16.3
28-Sep-23	NH ₃ -N (mg/L)	<10.0	<2	13.9	8.2
13-Jul-23	Total Nitrogen (mg/L)	<10.0	1.0	19.2	14.4
26-Jul-23	Total Nitrogen (mg/L)	<10.0	1.8	14.3	15.8
11-Aug-23	Total Nitrogen (mg/L)	<10.0	2.5	15.1	23.7
24-Aug-23	Total Nitrogen (mg/L)	<10.0	4.9	24.7	19.4
28-Sep-23	Total Nitrogen (mg/L)	<10.0	2.5	15.6	9.6
13-Jul-23	Total Phosphorus (mg/L)	<2	0.97	1.5	7.7
26-Jul-23	Total Phosphorus (mg/L)	<2	1	0.3	3.4
11-Aug-23	Total Phosphorus (mg/L)	<2	1.07	1.2	6.2
24-Aug-23	Total Phosphorus (mg/L)	<2	1.4	2.1	5.7
28-Sep-23	Total Phosphorus (mg/L)	<2	1.36	1.1	5.3
13-Jul-23	Faecal Coliform (MPN/100 mL)	<400	350	3,500	130
26-Jul-23	Faecal Coliform (MPN/100 mL)	<400	70	16,000	0
11-Aug-23	Faecal Coliform (MPN/100 mL)	<400	1,100	16,000	0
24-Aug-23	Faecal Coliform (MPN/100 mL)	<400	94	2,400	0
28-Sep-23	Faecal Coliform (MPN/100 mL)	<400	79	280	220
13-Jul-23	Total coliform (MPN/100 mL)	<400	540	16,000	240
26-Jul-23	Total coliform (MPN/100 mL)	<400	94	16,000	0
11-Aug-23	Total coliform (MPN/100 mL)	<400	9,200	16,000	0
24-Aug-23	Total coliform (MPN/100 mL)	<400	1,600	5,400	0
28-Sep-23	Total coliform (MPN/100 mL)	<400	110	350	920
13-Jul-23	Oil & Grease (mg/L)	<10.0	<1	1.3	1.5
26-Jul-23	Oil & Grease (mg/L)	<10.0			
11-Aug-23	Oil & Grease (mg/L)	<10.0	<1	<1	<1
24-Aug-23	Oil & Grease (mg/L)	<10.0			
28-Sep-23	Oil & Grease (mg/L)	<10.0	<1	<1	<1
13-Jul-23	Residual Chlorine (mg/L)	<1.0	N/A	0.07	0.54
26-Jul-23	Residual Chlorine (mg/L)	<1.0	N/A	0.06	0.17
11-Aug-23	Residual Chlorine (mg/L)	<1.0	N/A	0.04	1.08
24-Aug-23	Residual Chlorine (mg/L)	<1.0	N/A	0.06	1.59
28-Sep-23	Residual Chlorine (mg/L)	<1.0	N/A	0.06	0.06

APPENDIX 4-3: COMMUNITY GROUNDWATER QUALITY MONITORING RESULTS – Q3 2023

Month Year	Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	NamPa Village	ThongNoy Village	Pou Village	
		Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01	GPOU02
		Guideline							
03-Jul-23	pH	6.5 - 9.2						6.62	6.5
20-Jul-23	pH	6.5 - 9.2	6.6	6.58	6.58	6.75	6.5		
14-Aug-23	pH	6.5 - 9.2						6.57	6.61
28-Aug-23	pH	6.5 - 9.2			6.46	6.62	6.5		
04-Sep-23	pH	6.5 - 9.2						6.74	6.85
18-Sep-23	pH	6.5 - 9.2			6.6	6.55	6.47		
19-Sep-23	pH	6.5 - 9.2							
27-Sep-23	pH	6.5 - 9.2	6.51	6.6					
03-Jul-23	Sat. DO (%)							82.6	87.5
20-Jul-23	Sat. DO (%)		34	28	87.5	80.3	60.1		
14-Aug-23	Sat. DO (%)							85	84.4
28-Aug-23	Sat. DO (%)				72.5	82.2	59.4		
04-Sep-23	Sat. DO (%)							89.3	100.1
18-Sep-23	Sat. DO (%)				86.1	98.5	69.6		
19-Sep-23	Sat. DO (%)								
27-Sep-23	Sat. DO (%)		63.1	62.1					
03-Jul-23	DO (mg/l)							6.68	7.12
20-Jul-23	DO (mg/l)		2.68	2.26	6.97	6.29	4.59		
14-Aug-23	DO (mg/l)							6.71	6.76
28-Aug-23	DO (mg/l)				5.64	6.46	4.76		
04-Sep-23	DO (mg/l)							7.13	8.03
18-Sep-23	DO (mg/l)				6.73	7.74	5.49		
19-Sep-23	DO (mg/l)								
27-Sep-23	DO (mg/l)		5.26	5.01					
13-Jul-23	Conductivity (µS/cm)							22	434
20-Jul-23	Conductivity (µS/cm)		462	513	419	449	367		
14-Aug-23	Conductivity (µS/cm)							368	367
28-Aug-23	Conductivity (µS/cm)				501	466	335		
04-Sep-23	Conductivity (µS/cm)							28	324
18-Sep-23	Conductivity (µS/cm)				499	458	332		
19-Sep-23	Conductivity (µS/cm)								
27-Sep-23	Conductivity (µS/cm)		200	519					
03-Jul-23	Temperature (°C)							26.19	25.64
20-Jul-23	Temperature (°C)		28.35	26.45	26.93	27.84	28.37		
14-Aug-23	Temperature (°C)							27	26.62
28-Aug-23	Temperature (°C)				28.19	27.69	27.16		
04-Sep-23	Temperature (°C)							26.93	26.6
18-Sep-23	Temperature (°C)				27.98	27.64	27.51		
19-Sep-23	Temperature (°C)								

Month Year	Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	NamPa Village	ThongNoy Village	Pou Village	
		Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01	GPOU02
27-Sep-23	Temperature (°C)		24.4	26.35					
03-Jul-23	Turbidity (NTU)	<20						4.56	0.84
20-Jul-23	Turbidity (NTU)	<20	20.8	6.05	0.61	0.84	2.28		
14-Aug-23	Turbidity (NTU)	<20						0.31	0.96
28-Aug-23	Turbidity (NTU)	<20			0.56	0.42	0.78		
04-Sep-23	Turbidity (NTU)	<20						1.69	0.71
18-Sep-23	Turbidity (NTU)	<20			0.41	0.27	1.12		
19-Sep-23	Turbidity (NTU)	<20							
27-Sep-23	Turbidity (NTU)	<20	99.2	1.56					
03-Jul-23	Fecal coliform (MPN/100ml)	0						0	0
20-Jul-23	Fecal coliform (MPN/100ml)	0	0	0	2	14	170		
14-Aug-23	Fecal coliform (MPN/100ml)	0						0	0
28-Aug-23	Fecal coliform (MPN/100ml)	0			0	0	79		
04-Sep-23	Fecal coliform (MPN/100ml)	0						0	0
18-Sep-23	Fecal coliform (MPN/100ml)	0			2	0	37		
19-Sep-23	Fecal coliform (MPN/100ml)	0							
27-Sep-23	Fecal coliform (MPN/100ml)	0	0	0					
03-Jul-23	E.coli Bacteria (MPN/100ml)	0						0	0
20-Jul-23	E.coli Bacteria (MPN/100ml)	0	0	0	0	4.5	110		
14-Aug-23	E.coli Bacteria (MPN/100ml)	0						0	0
28-Aug-23	E.coli Bacteria (MPN/100ml)	0			0	0	22		
04-Sep-23	E.coli Bacteria (MPN/100ml)	0						0	0
18-Sep-23	E.coli Bacteria (MPN/100ml)	0			2	0	27		
19-Sep-23	E.coli Bacteria (MPN/100ml)	0							
27-Sep-23	E.coli Bacteria (MPN/100ml)	0	0	0					
18-Sep-23	Arsenic (mg/l)	<0.05			0.0018	0.0011	0.0012		
27-Sep-23	Arsenic (mg/l)	<0.05	<0.0003	0.0007				<0.0003	0.0014
18-Sep-23	Cadmium (mg/l)	<0.01			<0.003	<0.003	<0.003		
27-Sep-23	Cadmium (mg/l)	<0.01	<0.003	<0.003				<0.003	<0.003
18-Sep-23	Total Iron (mg/l)	<1			<0.01	0.005	0.019		
27-Sep-23	Total Iron (mg/l)	<1	7.73	2.14				0.086	0.032

Month Year	Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	NamPa Village	ThongNoy Village	Pou Village	
		Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01	GPOU02
18-Sep-23	Total hardness (mg/l)	<500			219	181	139		
27-Sep-23	Total hardness (mg/l)	<500	83.7	228				<4	166
18-Sep-23	Mercury (mg/l)	<0.01			<0.0002	<0.0002	<0.0002		
27-Sep-23	Mercury (mg/l)	<0.01	<0.0002	<0.0002				<0.0002	<0.0002
18-Sep-23	Lead (mg/l)	<0.05			<0.003	<0.003	<0.003		
27-Sep-23	Lead (mg/l)	<0.05	<0.008	<0.008				<0.008	<0.008

APPENDIX 4-4: GRAVITY FED WATER SUPPLY QUALITY MONITORING RESULTS – Q3 2023

		Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline				
20-Jul-23	pH	6.5 - 8.5	6.8	6.78	7.1	7.08
28-Aug-23	pH	6.5 - 8.5	6.7	6.67	6	6.01
19-Sep-23	pH	6.5 - 8.5	6.88	6.95	6.86	6.92
20-Jul-23	Sat. DO (%)		91.4	91.3	88.9	85.6
28-Aug-23	Sat. DO (%)		79	78.1	78.4	72.2
19-Sep-23	Sat. DO (%)		84.6	86.9	88.8	87.9
20-Jul-23	DO (mg/L)		7.1	7.29	6.98	6.83
28-Aug-23	DO (mg/L)		6.2	6.19	6.31	5.79
19-Sep-23	DO (mg/L)		6.63	6.71	6.89	6.83
20-Jul-23	Conductivity (µS/cm)	<1,000	56	108	10	11
28-Aug-23	Conductivity (µS/cm)	<1,000	43	103	10	10
19-Sep-23	Conductivity (µS/cm)	<1,000	33	65	12	11
20-Jul-23	Temperature (°C)	<35	28.44	27.02	26.81	26.92
28-Aug-23	Temperature (°C)	<35	27.71	27.36	27.5	
19-Sep-23	Temperature (°C)	<35	27.88	28.8	28.56	30.22
20-Jul-23	Turbidity (NTU)	<10	13.6	4.82	1.77	1.34
28-Aug-23	Turbidity (NTU)	<10	6.51	1.64	1.52	1.06
19-Sep-23	Turbidity (NTU)	<10	13.8	3.84	3.69	2.51
20-Jul-23	Faecal Coliform (MPN/100 mL)	0	350	240	170	240
28-Aug-23	Faecal Coliform (MPN/100 mL)	0	11	22	6.8	14
19-Sep-23	Faecal Coliform (MPN/100 mL)	0	49	79	49	27
20-Jul-23	E.coli Bacteria (MPN/100 mL)	0	220	130	130	130
28-Aug-23	E.coli Bacteria (MPN/100 mL)	0	8	14	4	4.5
19-Sep-23	E.coli Bacteria (MPN/100 mL)	0	49	79	22	27
19-Sep-23	Arsenic (mg/L)	<0.05	<0.0003	<0.0003	<0.0003	<0.0003

		Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline				
19-Sep-23	Cadmium (mg/L)	<0.003	<0.002	<0.002	<0.002	<0.002
19-Sep-23	Iron (mg/L)		0.381	0.109	0.166	0.1
19-Sep-23	Lead (mg/L)	<0.10	<0.01	<0.01	<0.01	<0.01
19-Sep-23	Total hardness (mg/L)	<300	23.8	28.7	4.1	4.1

APPENDIX 4-5: LANDFILL LEACHATE MONITORING RESULTS – Q3 2023

		Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharged Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline							
13-Jul-23	pH	6.0-9.0				7.1		7.03	
11-Aug-23	pH	6.0-9.0				6.58		6.75	
28-Sep-23	pH	6.0-9.0				7.11		7.2	
13-Jul-23	Sat. DO (%)					105.2		78	
11-Aug-23	Sat. DO (%)					123.1		110.8	
28-Sep-23	Sat. DO (%)					95		95.5	
13-Jul-23	DO (mg/L)					7.8		5.84	
11-Aug-23	DO (mg/L)					9.19		8.37	
28-Sep-23	DO (mg/L)					7.29		7.37	
13-Jul-23	Conductivity (µS/cm)					88		139	
11-Aug-23	Conductivity (µS/cm)					71		202	
28-Sep-23	Conductivity (µS/cm)					72		133	
13-Jul-23	Temperature (°C)					31.03		30.34	
11-Aug-23	Temperature (°C)					30.65		29.91	
28-Sep-23	Temperature (°C)					28.98		28.74	
13-Jul-23	Turbidity (NTU)					10.2		3.21	
11-Aug-23	Turbidity (NTU)					15		8.45	
28-Sep-23	Turbidity (NTU)					12.6		16.8	
13-Jul-23	BOD5 (mg/L)	<30				<6		<6	
11-Aug-23	BOD5 (mg/L)	<30				<6		<6	
28-Sep-23	BOD5 (mg/L)	<30				7.2		<6	
13-Jul-23	COD (mg/L)	<125				30.2		<25	
11-Aug-23	COD (mg/L)	<125				32		<25	
25-Sep-23	COD (mg/L)	<125				<25		<25	
13-Jul-23	Faecal Coliform (MPN/100mL)	<400				240		540	
11-Aug-23	Faecal Coliform (MPN/100mL)	<400				220		1,600	
28-Sep-23	Faecal Coliform (MPN/100mL)	<400				33		8	

Date	Parameter (Unit)	Guideline	Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
			Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharged Point
			Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
13-Jul-23	Total Coliform (MPN/100mL)	<400					350		540	
11-Aug-23	Total Coliform (MPN/100mL)	<400					1,600		1,600	
28-Sep-23	Total Coliform (MPN/100mL)	<400					280		33	
13-Jul-23	Total Nitrogen (mg/L)	<10					0.46		0.49	
11-Aug-23	Total Nitrogen (mg/L)	<10					0.9		2.95	
25-Sep-23	Total Nitrogen (mg/L)	<10					1.25		1.76	
25-Sep-23	Lead (mg/L)	<0.2					<0.01		<0.01	
25-Sep-23	Copper (mg/L)						<0.005		<0.005	
25-Sep-23	Iron (mg/L)						0.216		0.932	
13-Jul-23	Ammonia nitrogen (mg/L)	<10					<2		<2	
11-Aug-23	Ammonia nitrogen (mg/L)	<10					<2		2.70	
25-Sep-23	Ammonia nitrogen (mg/L)	<10					<2		<2	
13-Jul-23	Oil & Grease (mg/L)	<10					<1		<1	
11-Aug-23	Oil & Grease (mg/L)	<10					2.5		1.3	
25-Sep-23	Oil & Grease (mg/L)	<10					<1		<1	