



**NAM NGIEP 1
POWER COMPANY**

Nam Ngiep 1 Hydropower Project

Quarterly Environment Monitoring Report Second Quarter of 2023

April to June 2023

A1	4 September 2023				Final
A0	28 August 2023	Hendra WINASTU	Khamstone XAYSOMPHOU	Wanidaporn RODE	To ADB and LTA for Review
REV	DATE	AUTHOR	CHECKED	APPROVED	MODIFICATION DETAILS
Accessibility		Document No. NNP1-O-J0905-RP-010-A			
☒	Public				
☐	Internal				
☐	Confidential				

This document is NNP1 property and shall not be used, reproduced, transmitted and/or disclosed without prior permission.

Table of Contents

EXECUTIVE SUMMARY.....	9
1 INTRODUCTION	11
2 ENVIRONMENTAL MANAGEMENT AND MONITORING	11
2.1 Environmental Management System (EMS)	11
2.1.1 <i>Environmental Management Plan (EMP)</i>	13
2.2 Contractor SS-ESMMPs	13
2.3 Results of Compliance Inspections at Construction Sites	13
2.4 Site Decommissioning and Rehabilitation	14
2.5 Waste Management at the Operation Sites	16
2.5.1 <i>Waste Management at NNP1 Project Sites</i>	16
2.5.2 <i>Hazardous Waste Management</i>	16
2.5.3 <i>Animal Fodder (Pig Feed) Collection Programme</i>	17
2.5.4 <i>Community Solid Waste Management and Recycling Programme</i>	17
2.5.5 <i>Houay Soup Landfill</i>	17
2.6 Reservoir Operations.....	18
2.6.1 <i>Main Reservoir</i>	18
2.6.2 <i>Environmental Flow Requirements (EFRs) for the Operation Phase</i>	19
2.7 Water Quality Monitoring	26
2.7.1 <i>Surface Water (River) and Depth Profile Water Quality</i>	26
2.7.2 <i>Compliance Monitoring of Effluents from Camps</i>	37
2.7.3 <i>Groundwater Quality Monitoring</i>	42
2.7.4 <i>Gravity Fed Water Supply (GFWS) Monitoring</i>	45
2.7.5 <i>Landfill Leachate Monitoring</i>	46
2.7.6 <i>Water Quality Compliance Monitoring</i>	47
3 WATERSHED AND BIODIVERSITY MANAGEMENT	49
3.1 Watershed Management	49
3.1.1 <i>Implementation of Watershed Management Plan</i>	49
3.1.2 <i>Preparation of Annual Implementation Plan (AIP) 2022</i>	54
3.1.3 <i>Preparation of Annual Implementation Plan (AIP) 2023</i>	54
3.2 Biodiversity Offset Management	54
3.2.1 <i>Implementation of Biodiversity Offset Management Plan</i>	54
3.2.2 <i>Preparation of Annual Implementation Plan (AIP) 2023</i>	59
4 FISHERY MONITORING.....	60

5	HEALTH AND SAFETY	64
5.1	Related to NNP1PC Health and Safety	64
5.1.1	<i>Health and Safety Training and Emergency Drills</i>	<i>66</i>
5.2	Related to COVID-19	67
5.2.1	<i>NNP1PC COVID-19 Measures</i>	<i>67</i>
5.2.2	<i>General situation of COVID-19 in NNP1PC</i>	<i>68</i>
6	EXTERNAL MISSIONS AND VISITS	68
	APPENDICES	69
	Appendix 1: Environmental Monitoring Corrective Actions Q2 2023	70
	Appendix 2: Site Codes, Locations, Monitoring Parameters and Its map of the Surface Water Quality Monitoring.....	77
	Appendix 3: Key Trends of Water Quality Monitoring From January 2020 to End of June 2023 (only parameters that exceeded the standards)	79
	APPENDIX 4: WATER QUALITY MONITORING DATA.....	84
	APPENDIX 4-1: SURFACE WATER QUALITY MONITORING – Q2 2023	84
	APPENDIX 4-2: EFFLUENT CAMP MONITORING RESULTS – Q2 2023.....	99
	APPENDIX 4-3: COMMUNITY GROUNDWATER QUALITY MONITORING RESULTS – Q2 2023	101
	APPENDIX 4-4: GRAVITY FED WATER SUPPLY QUALITY MONITORING RESULTS – Q2 2023	103
	APPENDIX 4-5: LANDFILL LEACHATE MONITORING RESULTS – Q2 2023	104

Table of Tables

Table 2-1: The Details of EMPs 2023 Implementation	12
Table 2-2: Summary of Document Review in Q2 2023	13
Table 2-3: Site Inspection Results During Q2 2023	13
Table 2-4: Site Inspection of the rehabilitated areas in Q2 2023.....	15
Table 2-5: Amounts of Recyclable Waste during Q2 2023	16
Table 2-6: Hazardous material and hazardous waste recorded during Q2 2023	16
Table 2-7: Summary of EFRs Compliance Monitoring in Q2 2023.....	19
Table 2-8: River depth measurements in Nam Ngiep downstream the re-regulation dam	22
Table 2-9: 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 Q2 2023	33
Table 2-10: Ammonia Nitrogen (mg/L) results for the surface water in Nam Ngiep and its main tributaries monitored in Q1 2023.....	35
Table 2-11: BOD₅ (mg/L) results for the surface water in Nam Ngiep and its main tributaries monitored in Q2 2023.....	35
Table 2-12: COD (mg/L) results for the surface water in Nam Ngiep and its main tributaries in Q2 2023	36
Table 2-13: Faecal coliforms (MPN/100 mL) results in Nam Ngiep and its main tributaries in Q2 2023	36
Table 2-14: Total coliform (MPN/100 mL) results in Nam Ngiep and its main tributaries in Q2 2023.....	37
Table 2-15: Results of the Effluent Water Quality Monitoring of the Camps in Q2 2023 (Non-compliance Parameters Only).....	38
Table 2-16: Compliance Status of Effluent Discharge from the Camps in Q2-2023	40
Table 2-17: The GFWS Monitoring Result in Q2 2023	45
Table 2-18: Non-compliances relating to water quality monitoring in Q2 2023	47
Table 3-1: The Action Taken under NNP1 watershed and biodiversity program.....	52
Table 4-1: Fish Species dominating the Fish Catch in Q2 2023	60
Table 4-2: Threatened Species of Q2 2023 Fish Catch.....	60
Table 4-3: Occurrence of Threatened Species in the Fish Catch.....	61
Table 4-4: Main Biodiversity Indicators for Q2 2023	62
Table 4-5: Mean Daily Fish Catch per Household for Q2 from 2016 to 2023	63
Table 4-6: Proportion of the catch reported by main habitats (%) in Q2 2023.....	63
TABLE 5-1: SAFETY INCIDENTS REPORTED DURING THE OPERATION PHASE (SEPTEMBER 2019 TO JUNE 2023).	64

Table of Figures

Figure 2-1: Inflow to the Main Reservoir.....	18
Figure 2-2: Water Level of the Main Reservoir.....	18
Figure 2-3: Discharge from the Re-regulation Dam during Q2 2023	20
Figure 2-4: Location map of river depth monitoring points	23
Figure 2-5: Hourly Stage Height Fluctuations During Q2 2023.....	24
Figure 2-6: 24-Hour Stage Height Difference (M) during Q2 2023.....	25
Figure 2-7: 7-day Stage Height Difference (M) during Q2 2023	25
Figure 2-8: Dissolved Oxygen immediately upstream and downstream of the Main Dam.....	26
Figure 2-9: Dissolved Oxygen Long Profile Measurement from Immediately Upper Main Dam to Lower Nam Ngiep (Q1 2023 vs Q2 2023)	26
Figure 2-10: Main reservoir Dissolved Oxygen at the End of Q2 2023.....	29
Figure 2-11: Water Temperature and Dissolved Oxygen – depth profiles in the Main Reservoir immediately upstream of the main dam (R05)	30
Figure 2-12: Water Temperature and DO Depth Profiles in the Main Reservoir (R04 - R05), with Position of Intake at the Actual Water Level During September 2018 – June 2023.....	31
Figure 2-13: The STRAIGHT-LINE graph of Monthly Averaged DO and Water Temperature at R04 and R05	32
Figure 2-14: Location of effluent monitoring points	38
Figure 2-15: Groundwater Sampling Locations	43
Figure 2-16: Overview of Gravity fed water supply	45
Figure 2-17: Landfill Leachate Monitoring Location	47
Figure 3-1: REPRESENTATIVE PHOTOS FROM PLUP UPDATED ACTIVITY IN VIENGTHONG DISTRICT	55
Figure 3-2: Map of patrolling track in March 2023.....	57
Figure 3-3: Map of threats in March 2023	57
Figure 3-4: REPRESENTATIVE PHOTOS FOR MONTHLY PATROLLING IN MARCH 2023	58
Figure 3-5: REPRESENTATIVE PHOTOS OF OUTREACH IMPLEMENTATION IN XAYCHAMPHONE DISTRICT FROM 2-7 APRIL 2023	58
FIGURE 4-1: FISH DIVERSITY INDEX (SHANNON) BY FISHING ZONE FROM JULY 2015 TO JUNE 2023	62
Figure 4-2: Mean Daily Fish Catch per Household from July 2015 to June 2023.....	63
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 Q2 from 2016 to 2023	64
Figure 5-1: Number, Type and Frequency of Safety Incidents since September 2019 to 30 June 2023.....	65
Figure 5-2 Representative Photographs of Fire Prevention and Basic Fire Fighting Training and Drills	66

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
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
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
NC-NX	Nam Chouane-Nam Xang
NCR	Non-Compliance Report
NNP1PC	Nam Ngiep 1 Power Company Limited
OAA	Other aquatic animals
OC	Obayashi Corporation
ONC	Observation of Non-Compliance
OSOV	Owners' Site Office and Village
PAFO	Provincial Department of Agriculture and Forestry
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
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 Q2 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.

During Q2 2023, EMO received two DWP & SS-ESMMPs from the contractor (PKCC) for review and approval. One DWP & SS-ESMMP is for monitoring work and the other document is on repair and maintenance work.

Two joint 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 carried out including maintenance of wetland ponds at OSOV1 by weeding, replacing dead reeds and fixing the fencing. The results of the effluent analyses of the WWTSS provide important feedback for guiding continuous adjustments and implementing necessary corrective actions.

During Q2 2023, all 31 rehabilitated areas 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. TD has confirmed that these holes will be filled once the new Maintenance Works Contract of 2023 is executed.

A total of 25.17 m³ solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, an increase of 0.03 m³ compared with Q1 2023. NNP1 EMO has coordinated with the Bolikhan District Environment Management Unit or EMU for 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 NNP1, village and district authorities after receiving the 2022 monitoring funds, which NNP1 transferred to MONRE on 11 May 2023 following the fund disbursement request by MONRE on 20 April 2023.

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 5.9 mg/L and 9.1 mg/L. The monthly mean DO concentration at the intake level decrease from 0.7 mg/L in April 2023, to 0.4 mg/L in May 2023 and 0.1 mg/L in June 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 1.9 and 4.0 mg/L.

The DO levels in Nam Ngiep downstream the Re-regulation Dam (NNG05) during the gate discharge in April 2023 were generally around 8 mg/L for the first few kilometres, gradually decreasing to approximately 7 mg/L over the following 25 km sometimes. However, in May and June 2023, during turbine discharge and combination of turbine and gate discharges, DO levels in all the Nam Ngiep Downstream stations were less than 6 mg/L.

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

NNP1PC transferred the funds for the first two quarters under the approved Bolikhamxay Annual Implementation Plan (AIP) 2023 to the Forest Protection Fund (FPF) office of Department of Forestry (DOF) – Ministry of Agriculture and Forestry (MAF) on 10 April 2023. FPF DOF-MAF requested the Bolikhamxay Watershed and Reservoir Protection Office (WRPO) to submit an official request for fund transfer from DOF-MAF to the Bolikhamxay WRPO account on 19 April 2023. Bolikhamxay WRPO only received the fund from FPF DOF-MAF on 7 June 2023 due to long internal document processes. Bolikhamxay WRPO continued with the forest and reservoir patrol in May and June 2023.

The Xaysomboun WRPO could not implement the long overdue activities under the previous AIPs during Q2 2023. These activities include the meeting on the roles and responsibilities for the reservoir fishery co-management, boat registration, and the construction of patrolling substations and reservoir checkpoints. A meeting was held on 26 April 2023, between the Head of Xaysomboun Province Agriculture and Forestry Office (PAFO) and the NNP1 to discuss the outstanding delays of Xaysomboun WRPO. The meeting agreed on the next steps and a timeline for the related actions. However, there were still no further progresses as of the end of June 2023 because the Head of Xaysomboun WRPO was occupied with other assignments within the forestry section of Xaysomboun PAFO.

The Bolikhamxay Biodiversity Offset Management Unit (BOMU) informed the NNP1 EMO on 10 April 2023 that Bolikhamxay PAFO management has advised to progress with the approval of the Nam Chouane-Nam Xang (NC-NX) and its Totally Protected Zone (TPZ) boundary after completing updating the village land use plans. BOMU conducted the outreach campaign in Xaychamphone and Viengthong District from 2 to 7 April 2023 and from 24 to 29 April 2023 respectively. The Head of Bolikhamxay PAFO approved the BOMU AIP2023 on 19 April 2023 and BOMU submitted it to DOF-MAF on 8 May 2023. The FPF DOF-MAF submitted an official fund disbursement request for the first two quarters of the approved BOMU AIP2023 on 16 June 2023. NNP1PC transferred the funds to FPF DOF-MAF on 30 June 2023. BOMU could not continue with patrolling from April to June 2023 due to the delays in the AIP2023 finalization and fund disbursement processes from FPF DOF-MAF to BOMU. The only activities during Q2 2023 involved safeguarding the three patrol sub-stations using the remaining budget from the AIP2022.

The dominated fish catch by weight in Q2 2023 include *Oreochromis niloticus* and four species group of Hampala, *Poropuntius*, *Sikukia gudgeri* and *Amblyrhynchichthys truncatus*, and *Mastacembelus* that are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species except *Sikukia gudgeri* is classified as Data deficient (DD) and *Oreochromis niloticus* is an exotic species. The recorded catch of threatened species includes three Vulnerable species (VU): *Cirrhinus cirrhosus*, *Scaphognathops bandanensis*, and *Tor sinensis*.

1 INTRODUCTION

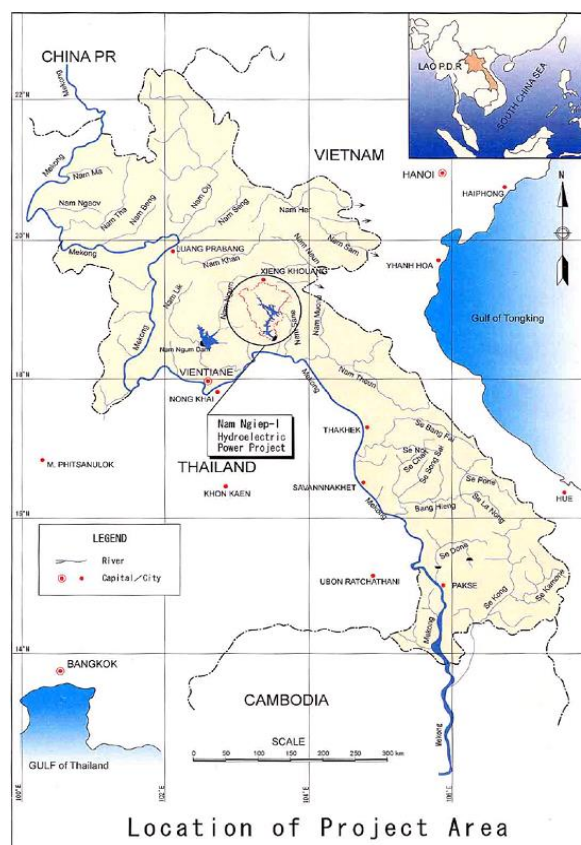
The Nam Ngiep originates in the mountains of Xiengkhouang Province, flowing through Khoun District into Thathom District of Xaysomboun Province, through Hom District and into Bolikhamxay District of Bolikhamxay Province. The Nam Ngiep meets the Mekong River just upstream from Pakxan in Bolikhamxay Province.

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 Q2 2023.

2.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

During Q2 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	Key Performance Indicator (KPI)	The EMP Evaluation Schedule	Implementation Progress
01/2023*	Providing HSE awareness training to NNP1PC staff and contractors	80% of NNP1PC staff and the Contractors are trained on Health, Safety and Environmental awareness during April 2023 to March 2024	Oct 2023 – Feb 2024	Ongoing preparation of the training which is scheduled to be carried out in Q4 2023. The training is conducted every year to provide updated knowledge and skills to all individuals involved.
02/2023*	Reducing the paper consumption in NNP1 offices	Total use of A4 paper for printing in the NNP1PC's offices (VTE, OSOV1, OSOV2) is reduced by 10% during April 2023 to March 2024 compared with the previous 12 months	Oct 2023 – Dec 2024	Ongoing monitoring and gathering data on monthly basis
03/2023*	Minimising waste generation and maximising waste separation at sources to reduce the quantity of waste disposal at NNP1 project landfill	Total waste disposal at the NNP1 landfill is reduced by 10% during April 2023 to March 2024 compared with the previous 12 months	Sept 2023 – Mar 2024	Ongoing monitoring and gathering data on monthly basis
04/2023 [#]	Planting trees	Percentage of plant survival. Planting trees aims at contributing to NNP1PC's environmental sustainability objectives (refer to Tree Planting Plan)	Feb 2024	The tree planting event will take place in July 2023 (see section 2.1.1 below)

*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)

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

Preparations of the tree planting event is scheduled to take place in mid-July 2023 as part of the Environmental Management Plan (EMP04-2023). This includes identifying suitable planting spots within OSOV1, OSOV2 and along the edge of the football field, and preparing around 60 local seedlings at the PHX- agricultural center and 40 fruit tree seedlings will be sourced through a campaign where staff members are encouraged to bring the propagated seedling.

2.2 CONTRACTOR SS-ESMMPs

EMO received two DWP & SS-ESMMPs from the contractor (PKCC) for review and approval. The status of the review is summarised in **Table 2-2**.

TABLE 2-2: SUMMARY OF DOCUMENT REVIEW IN Q2 2023

Document Title	Date Received	Reviewing Status
DWP & SS-ESMMP for monitoring work	07 June 2023	No objection and no comments
DWP & SS-ESMMP for maintenance and repair work	09 June 2023	No objection with Comments

2.3 RESULTS OF COMPLIANCE INSPECTIONS AT CONSTRUCTION SITES

During Q2 2023, two joint 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 carried out including maintenance of wetland ponds at OSOV1 by weeding, replacing dead reeds and fixing the fencing.

The site inspection results are summarized in **Table 2-3**.

TABLE 2-3: SITE INSPECTION RESULTS DURING Q2 2023

	
All 17 tanks and air blowers at OSOV1 were randomly checked by the ADM staff and they are functioning properly	Maintenance for OSOV1 wetland ponds including weeding, replacing dead reeds and fixing the fence have been completed.



The waste compaction at NNP1 landfill is currently on hold, waiting for ADM to finalize an arrangement for waste compaction.



The outlet pipe of the storage facility needs to be permanently closed or equipped with a control valve to prevent accidental oil releases.



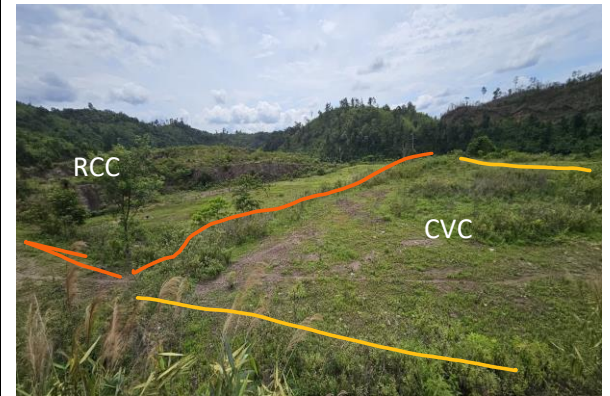
- The chlorine dosing system at the Main Powerhouse's WWTS fails to activate automatically when the wastewater pump is running.
- It was fixed accordingly.

2.4 SITE DECOMMISSIONING AND REHABILITATION

All 31 rehabilitated areas were inspected. No evidence of erosion or instability were observed at any of the inspected sites, except for the remaining deep holes at the RCC plant, identified by the LTA during the mission in May 2023. TD has confirmed that these holes will be filled once the new Maintenance Works Contract of 2023 is executed.

After a meeting on 10 February 2023, between GOL and NNP1PC regarding the transfer of land with non-exclusive land use rights, it was noted that the process of issuing a certificate for the handover of sites with non-exclusive land use rights to NNP1PC, in accordance with CA requirements, is currently underway.

TABLE 2-4: SITE INSPECTION OF THE REHABILITATED AREAS IN Q2 2023

	
Inspection of site stability and vegetation cover at the former Main quarry site	Inspection of site stability and vegetation cover at the former RCC and CVC plants

2.5 WASTE MANAGEMENT AT THE OPERATION SITES

2.5.1 Waste Management at NNP1 Project Sites

A total of 25.17 m³ solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, an increase of 0.03 m³ compared with Q1 2023.

During this reporting period, the Contractor continued the regular waste collection from the NNP1PC's operation sites and operated the project landfill for three days per week. The work included waste segregation and disposal, grass cutting and repairing of perimeter fences.

During the Q2 2023, The amount of recyclable waste managed on site during the reporting period is shown in **Table 2-5**.

TABLE 2-5: AMOUNTS OF RECYCLABLE WASTE DURING Q2 2023

Source and Type of Recyclables		Unit	Total in Q2 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	71	0	71
3	Aluminium Can	kg	0	0	0
4	Paper/Cardboard	kg	80	0	80
5	Glass	kg	105	0	105
7	Scrap metal	Kg	0	0	0
Sub-Total 2		kg	256.0	0	0
Grand Total (Sub-Total 1+2)		kg	256.0	0	256.0

2.5.2 Hazardous Waste Management

The amounts of hazardous waste and hazardous materials that were collected, stored and disposed of during Q2 2023 are shown in **Table 2-6**.

TABLE 2-6: HAZARDOUS MATERIAL AND HAZARDOUS WASTE RECORDED DURING Q2 2023

No.	Type of Hazardous Material	Unit	Total in Q2 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	91	6	85
4	Colour paint	Litre	39	0	39
5	Thinner	Litre	1	0	1
6	Grease oil	Litre	785	0	785
7	Gear Oil	Litre	17.25	0.75	16.5
8	Chlorine Liquid	Litre	168	78	90
9	HA Cut AF	Litre	3,925	0	3,925
10	HA Cut Cat AF	Litre	373	0	373

No.	Type of Hazardous Material	Unit	Total in Q2 2023	Used/ Disposed	Remaining
	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	7	0	7
17	Contaminated soil, sawdust and textile material	M3	0.8	0	0.8
18	Used tyre	Piece	5	0	5
19	Empty used chemical drum/container (drum 20L)	Unit	19	0	19
20	Lead acid batteries	Unit	6	0	6
21	Empty paint and spray cans	Can	43	0	43
22	Halogen/fluorescent bulbs	Unit	370	0	370
23	Empty cartridge (Ink)	Piece	91	0	91
24	Clinic Waste	Kg	8,6	1,2	7,4
25	Expired Chlorine Powder	Kg	65	0	65

2.5.3 Animal Fodder (Pig Feed) Collection Programme

During Q1 2023, local villagers collected 1,302.2 kg food waste from the Owner's Site Office and Village (OSO) for feeding their animals. During the previous 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 vegetable as much as possible) and perform proper waste segregation. Ongoing monitoring to ensure that instructions are adequately implemented.

2.5.4 Community Solid Waste Management and Recycling Programme

In Q2 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 NNP1, village and district authorities after receiving the 2022 monitoring funds, which NNP1 transferred to MONRE on 11 May 2023 following the fund disbursement request by MONRE on 20 April 2023.

2.5.5 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 Q2 2023, the mean daily inflow to the main reservoir was 67 m³/s. The minimum daily inflow was 29 m³/s, maximum daily inflow was recorded at 268 m³/s, and 25th percentile of 51 m³/s and 75th percentile of 72 m³/s. As indicated in **Figure 2-1**, the inflow during Q2 2023 was lower compared to the same period in 2022.

The water level in the main reservoir decreased with 14.18 m from El. 310.76 m asl. (01 April 2023) to El. 296.58 m asl. (22 June 2023) and then increased with 1.15 m (up to El. 297.73 m) by the end of Q2 2023.

FIGURE 2-1: INFLOW TO THE MAIN RESERVOIR

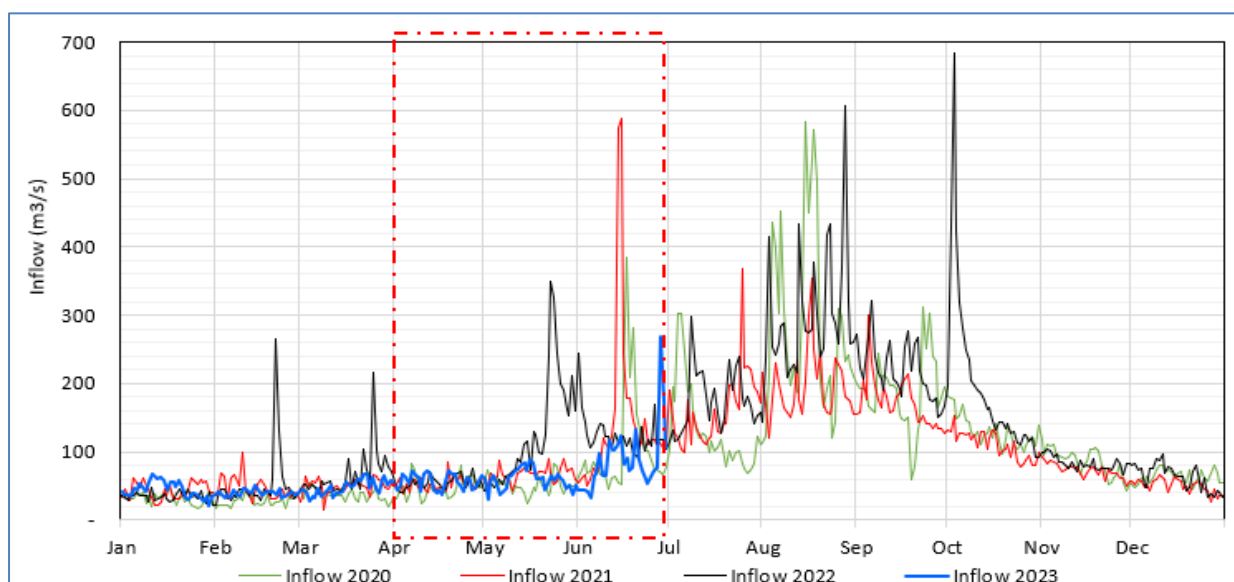
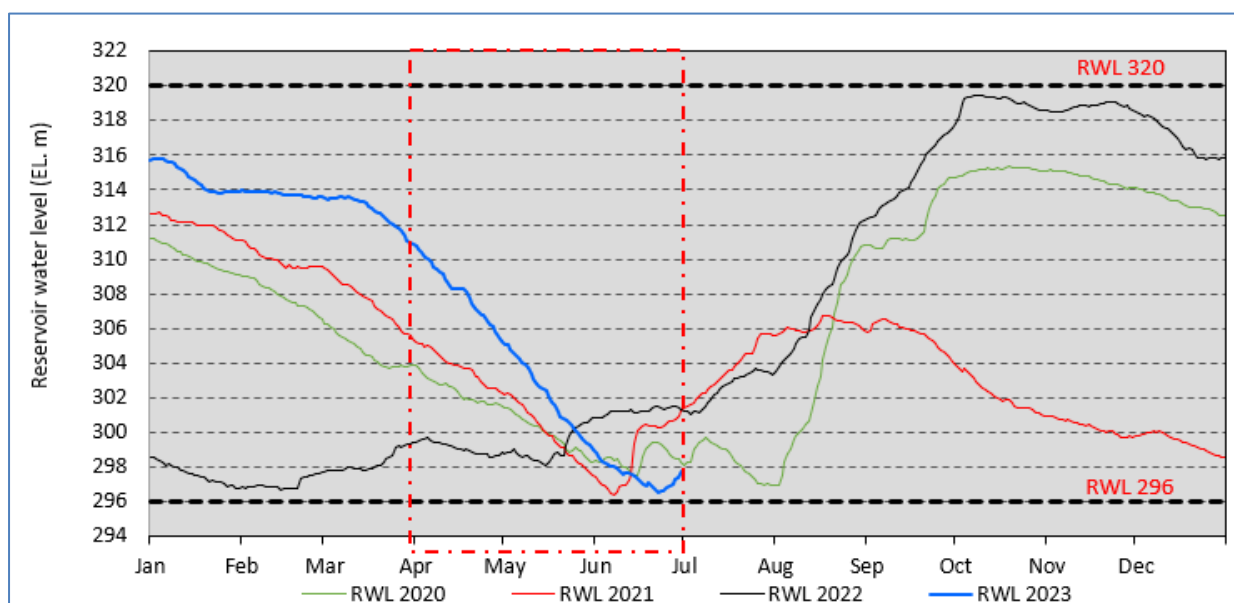


FIGURE 2-2: WATER LEVEL OF THE MAIN RESERVOIR



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 Q2 2023 are summarized in **Table 2-7**.

TABLE 2-7: SUMMARY OF EFRs COMPLIANCE MONITORING IN Q2 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 one monthly missions (April 2023) for thalweg water depth monitoring were carried out during the Re-regulation Dam discharged of 27 m³/s. Three measurements at 3 measuring points located within 5.7 km from the re-regulation dam did not comply. 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: 1) Identify any problems (navigation, villagers' complaints, etc.). 2) During our recent field monitoring and measurement, no boat navigation difficulties were observed. However, in October 2023, at the beginning of the dry season, NNP1PC will conduct interviews with inhabitants, who use boats, to gather and assess complaints and feedback related boat navigation difficulties. 3) Confirm the effectiveness of the measures. 4) 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	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	100% of 24-hour fluctuations comply

No	EFRs in the Downstream of the Re-regulation dam	EFRs compliance
	determines the maximum difference in stage height over 24-hour periods)	
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

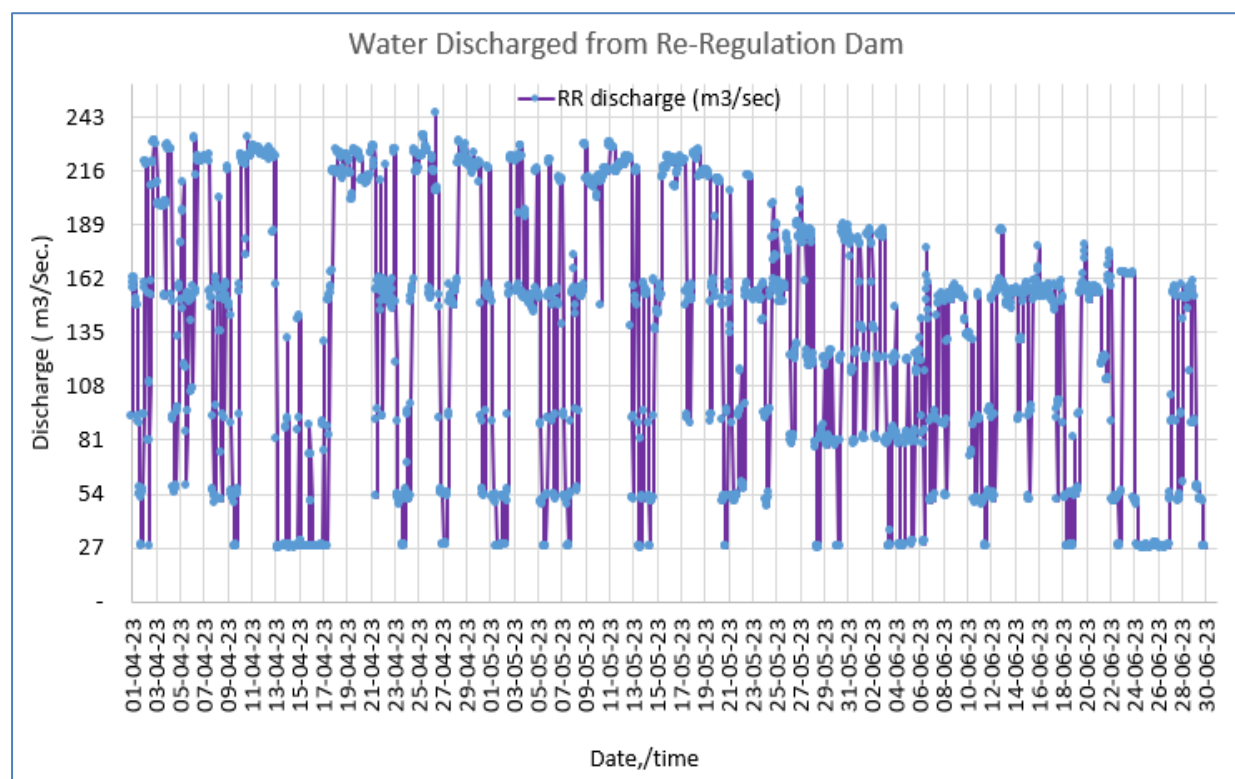
2.6.2.1 Minimum Flow Requirements

The discharge monitoring data for the re-regulation dam during Q2 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 Q2 2023, the mean discharge from the re-regulation dam was about 149 m³/s in April 2023 and about 147 m³/s and 104 m³/s in May and June 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 Q2 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.

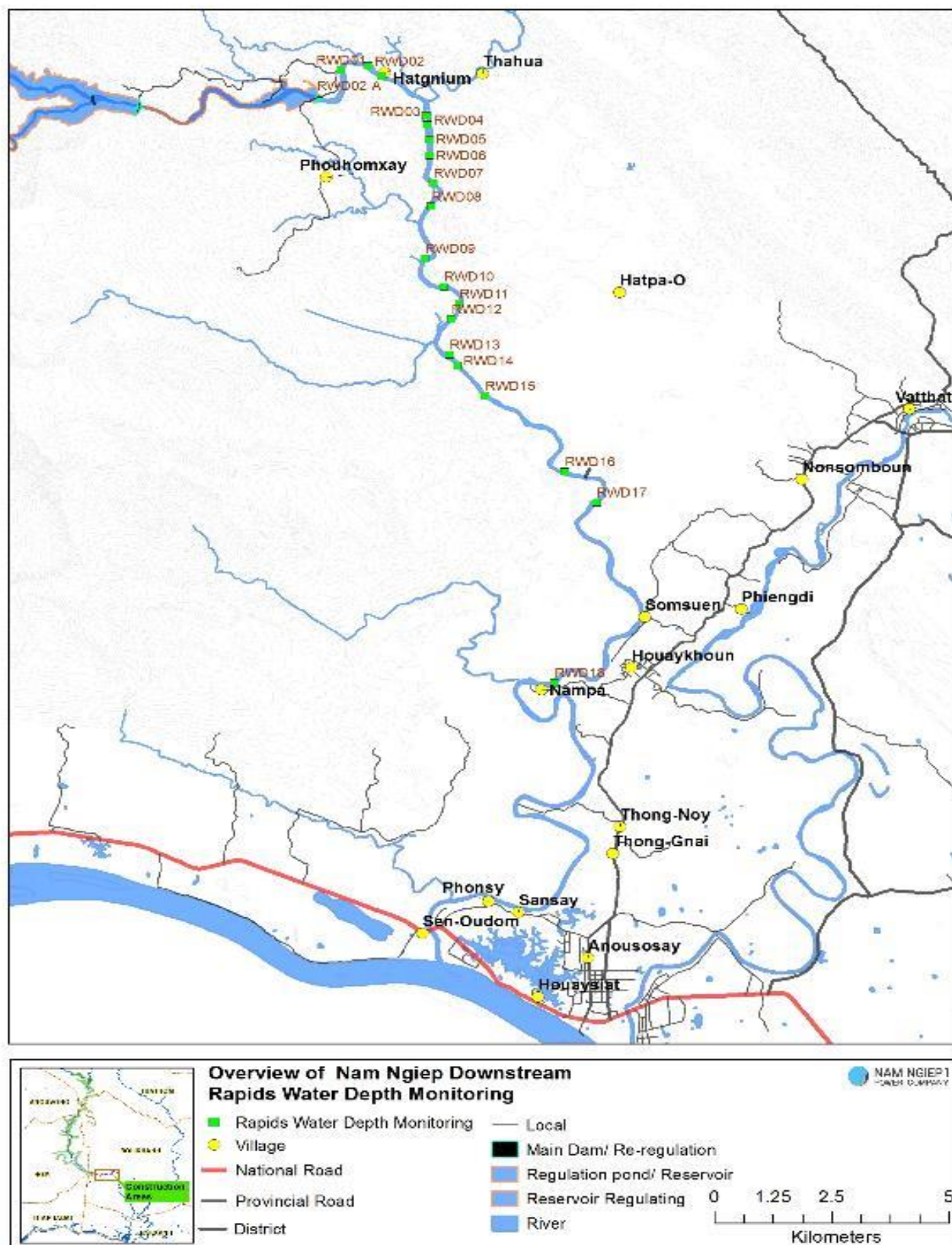
According to the recommendation by Lenders' Technical Advisor (LTA) during the virtual site visit on 21 to 26 November 2021, NNP1PC has continued to monitor the situation at the critical sites under conditions with discharge of less than 30 m³/s for detecting the navigation problems and also monitor whether any complaint is raised to consider the methodologies for solving where necessary.

The results of the monitoring during Q2 2023 are presented in **Table 2-8**. NNP1PC undertook monthly monitoring missions, and among these, one measurement was conducted during a period with discharge <30 m³/s. No boat navigation difficulties were observed during this recent measurement. However, we plan to conduct interviews with the downstream residents, who use boat, in October 2023, before finalizing and drawing conclusions from these findings,

TABLE 2-8: 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)
27-Apr-23	28	0.49	0.42	0.5	0.55	0.6	0.35	0.65	0.66	0.76	0.67	0.73	0.85	0.81	0.95	1.07	1.15	1.13	1.26	0.88
19-May-23	207	- 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 - NP1 (EMO and TD) closely monitors the Nam Ngiep River downstream the re-regulation dam to check boat navigation difficulties due to thalweg water depths below 0.5 m																		
9-Jun-23	154																			

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.

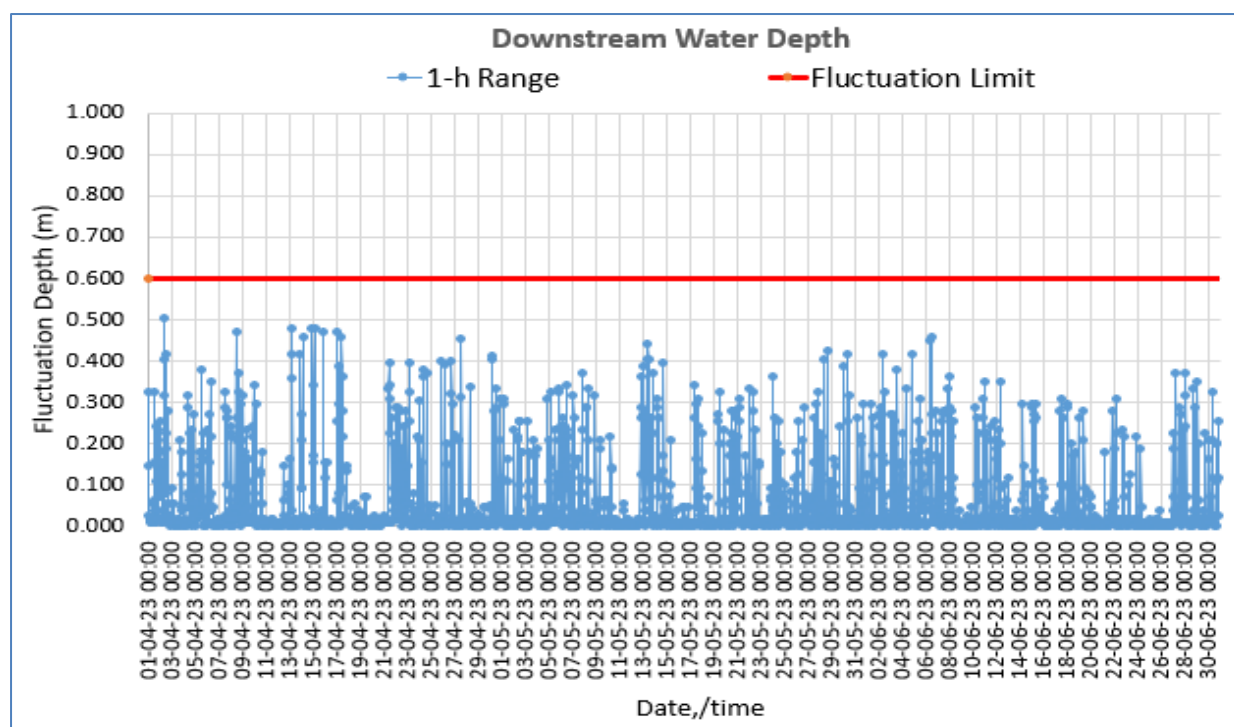
For the 0.6 m in 1-hour maximum fluctuation EFR, the cumulative rises and falls are calculated from the hourly water level recordings.

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 Q2 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**.

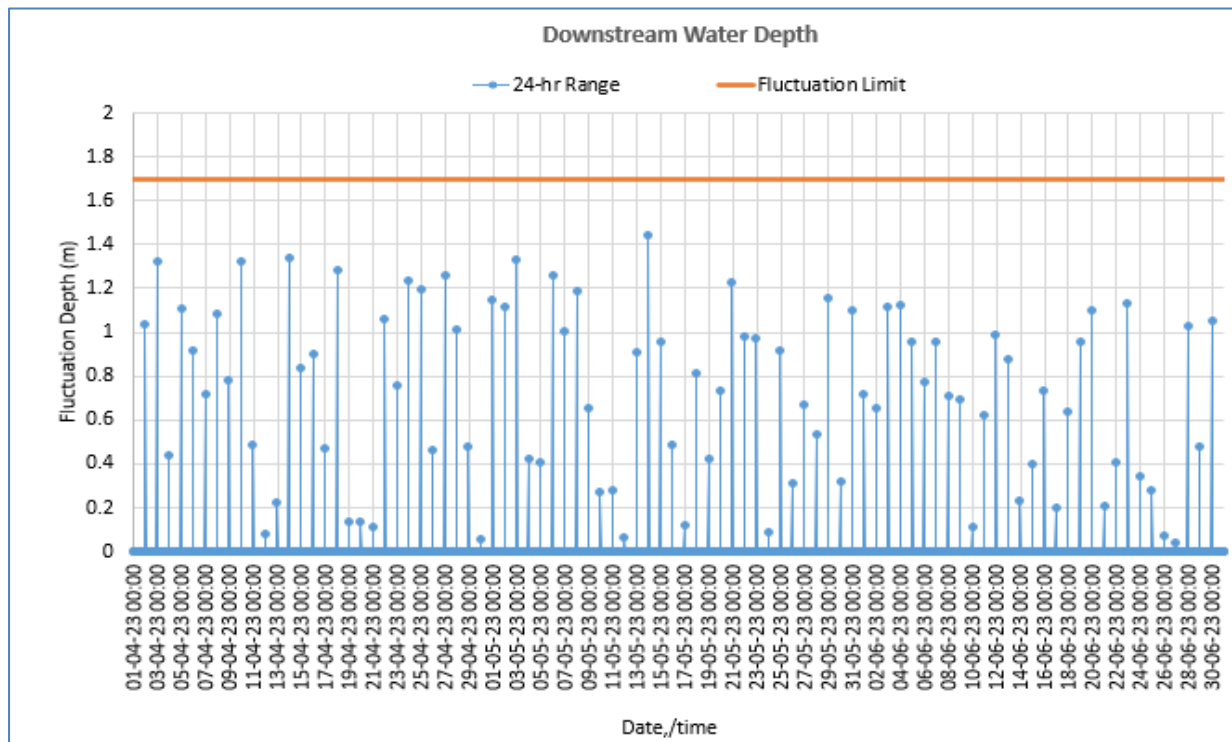
FIGURE 2-5: HOURLY STAGE HEIGHT FLUCTUATIONS DURING Q2 2023



During Q2 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).

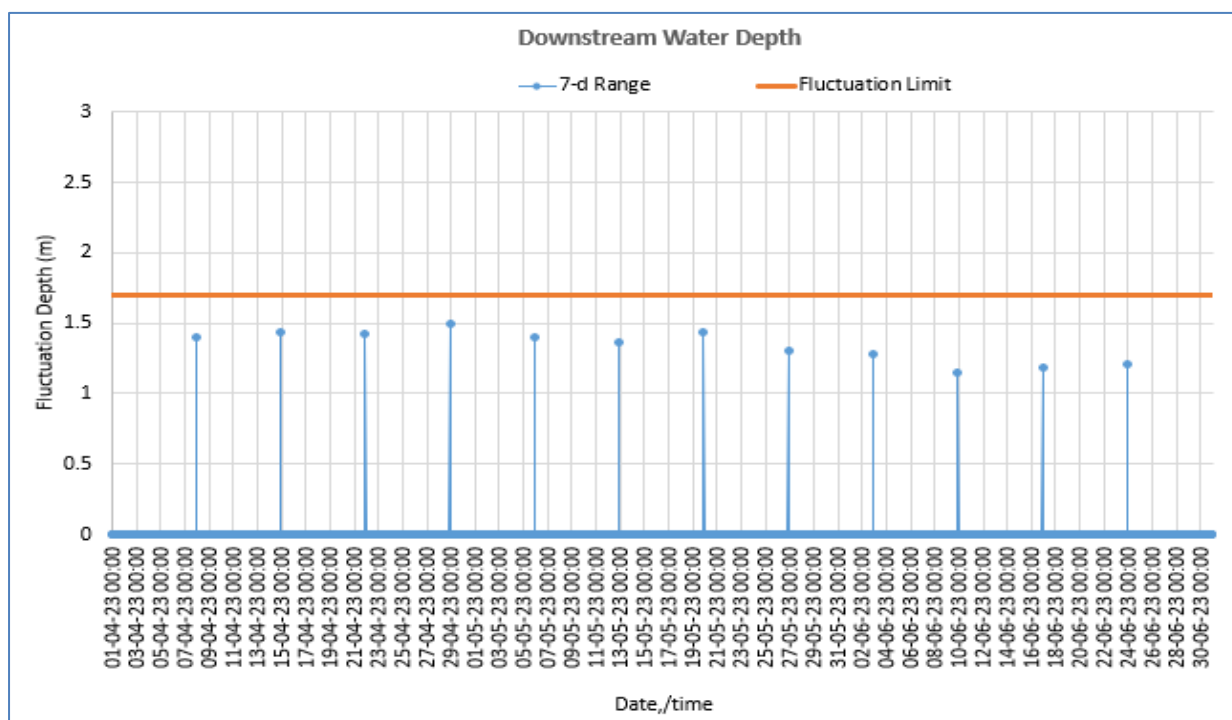
The results of the monitoring are presented in **Figure 2-6**.

FIGURE 2-6: 24-HOUR STAGE HEIGHT DIFFERENCE (M) DURING Q2 2023



During Q2 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 Q2 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 Q2 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 – surface and intake at 276 m asl.) and station R07 in the re-regulation dam (surface) 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 2-9**.

The water temperature and DO depth profiles in the main reservoir at R05 during Q2 2022, Q1 2023 and Q2 2023 are presented in **Figure 2-10** to **Figure 2-12**.

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

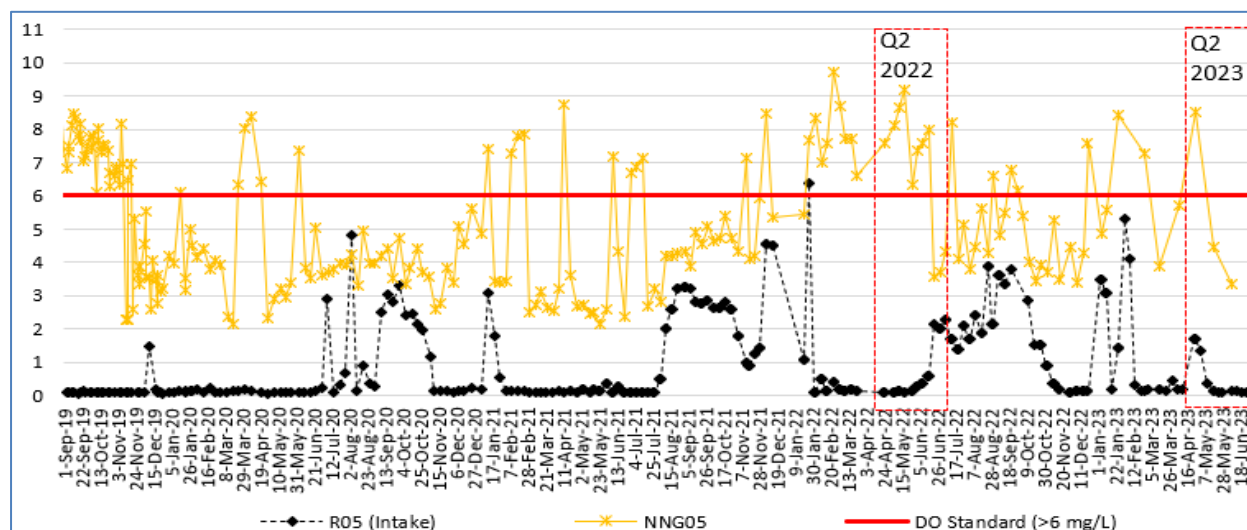
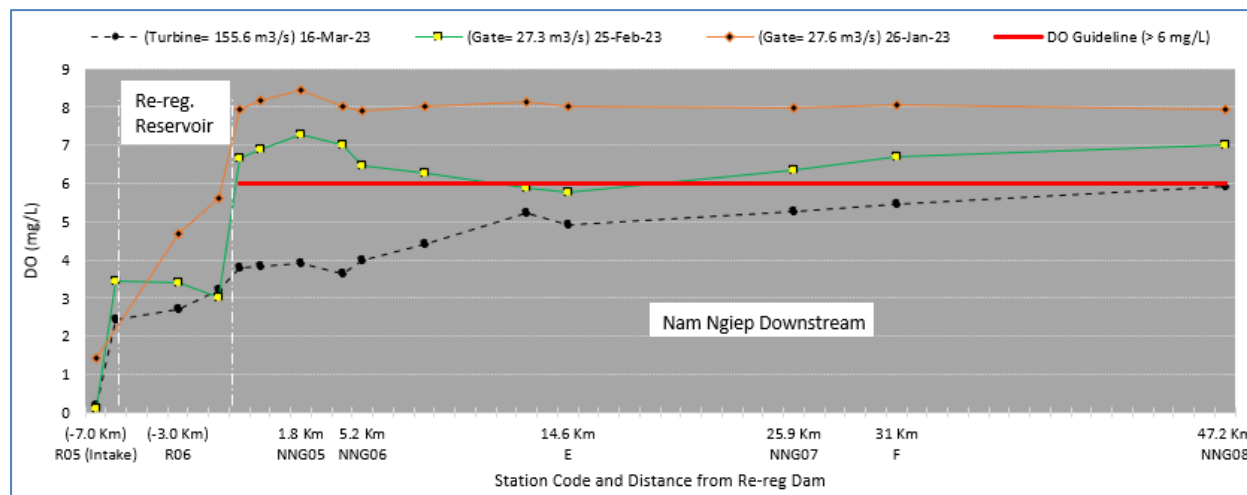
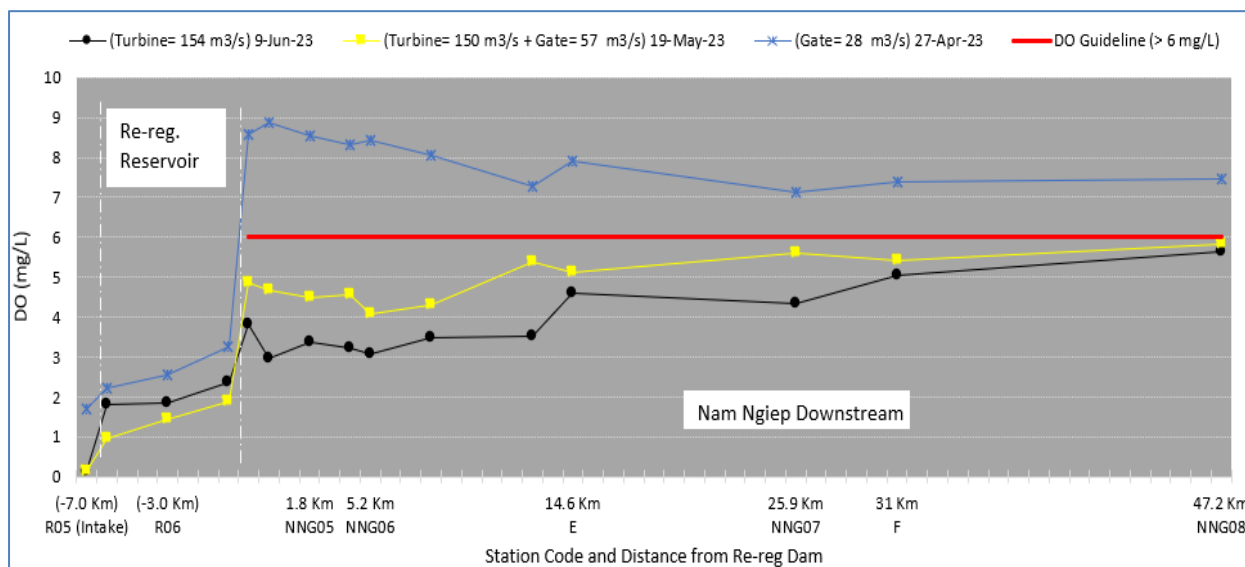


FIGURE 2-9: DISSOLVED OXYGEN LONG PROFILE MEASUREMENT FROM IMMEDIATELY UPPER MAIN DAM TO LOWER NAM NGIEP (Q1 2023 VS Q2 2023)





Main Reservoir

Figure 2-12 presents the DO and water temperature depth profile timeseries in the Main Reservoir (R04 and R05) from September 2018 to June 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 Q2 2023 indicates formation of oxyclines in the main reservoir at the monitored stations at different depths.

At R05, when comparing Q2 2023 with Q2 2022, overall, the thermocline and oxycline show a similar pattern.

Figure 2-13 shows the average DO concentrations observed during the Q2 2023. It reveals a minor improvement in the DO level near the water surface and no-significant improvement at the intake level when compared to the same period in Q2 2022.

At R05 (the station closest to the main dam), during the period with warmer weather in April, May and June 2023, the thermocline deepened to about 13 m below surface. During April and May 2023, the DO concentrations in upper 9.5 m varied from 5.0 mg/L to 9.3 mg/L with a mean of 8.0 mg/L. In June 2023, in the upper 7.0 m, DO concentrations varied from 4.3 mg/L to 7.6 mg/L with a mean of 6.1 mg/L. The monthly mean DO concentration at the intake level decreased from 0.7 mg/L in April 2023, to 0.4 mg/L in May 2023 and 0.1 mg/L in June 2023. Anoxic levels were found at depths of about 34 m to bottom in April 2023, about 12 m in May 2023 and 32 m in March 2023 corresponding to 4.0 m below to 12.0 m above the intake.

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

At R02, in the upper 4.0 m, DO concentrations varied between 6.1 mg/L and 9.0 mg/L with a mean DO concentration of 8.1 mg/L in April 2023. During this period, the DO concentrations varied from 0.6 mg/L to 5.1 mg/L in the depth below 4.5 m to the bottom. During the first two weeks of May 2023, in the upper 4.0 m, the DO concentrations varied from 5.0 mg/L to 8.7 mg/L and below 4.0 m, DO concentrations were between 0.1 mg/L and 4.7 mg/L. During the mid-May 2023 and end of June 2023, DO concentrations varied from 1.4 mg/L to 9.8 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 6.89 mg/L over the entire water column with no measurements below 6.1 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 2.60 mg/L in April, 1.36 mg/L in May to 2.60 mg/L in June 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 Q2 2023.

Downstream Stations

During Q2 2023, a total of three monitoring missions were conducted, out of these, one monitoring was undertaken during the minimum discharge of 27 m³/s, through the turbine (27 April 2023) and other two monitoring at a higher discharge through both the turbine and the gate.

As indicated in Figure 2-9, periods with only turbine discharge result in DO concentrations in the range of 3 mg/L to 4 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. During periods with only gate discharge, the water is aerated bringing the DO concentrations above 6 mg/L over the entire reach from the re-regulation dam to the confluence with the Mekong River. Figure 2-9 also indicates that during periods with both gate and turbine discharge, the DO concentrations are increased with about 2 mg/L compared with only turbine discharge, however, still below 6 mg/L. 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 Q2 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 2-10: MAIN RESERVOIR DISSOLVED OXYGEN AT THE END OF Q2 2023

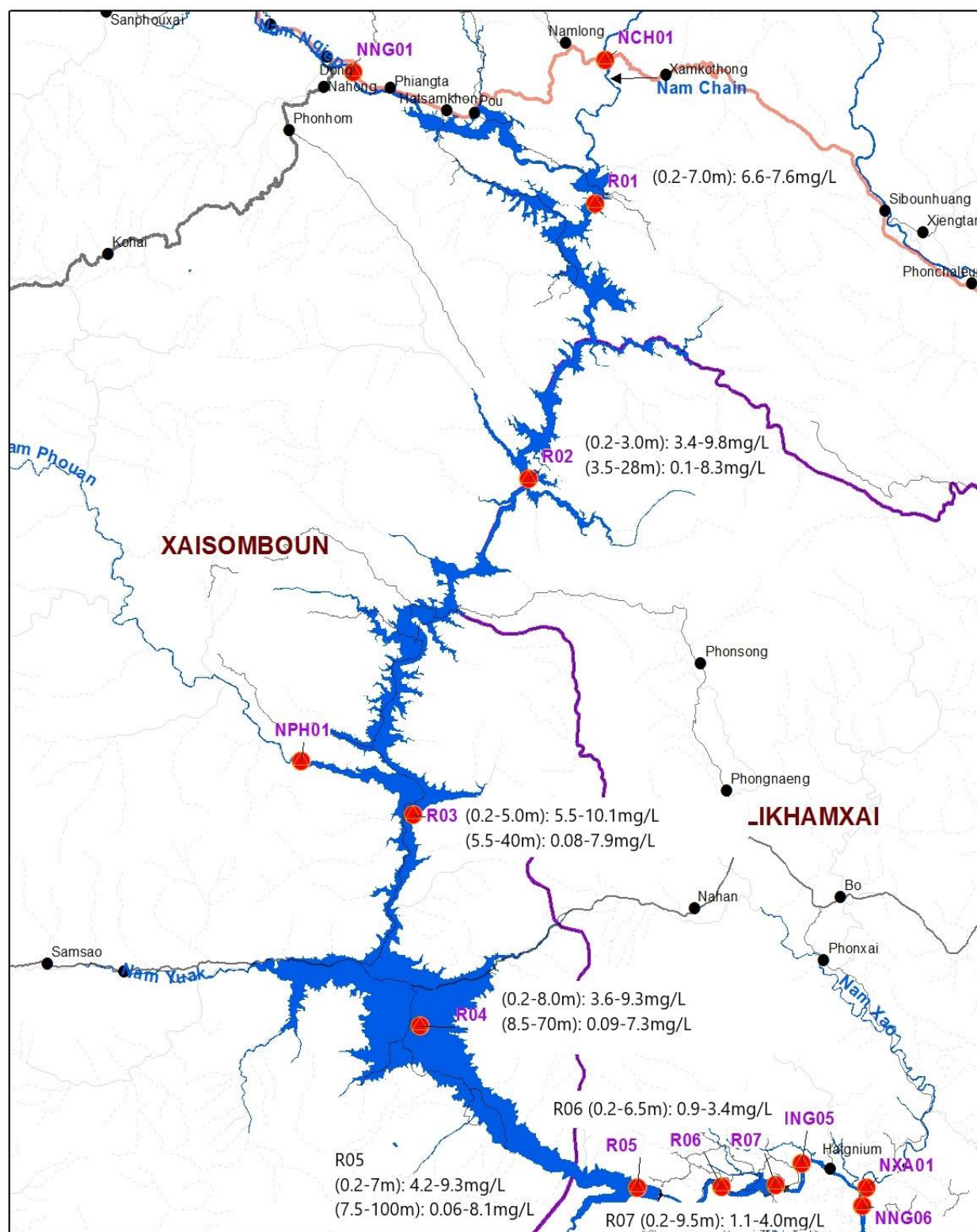


FIGURE 2-11: WATER TEMPERATURE AND DISSOLVED OXYGEN – DEPTH PROFILES IN THE MAIN RESERVOIR IMMEDIATELY UPSTREAM OF THE MAIN DAM (R05)

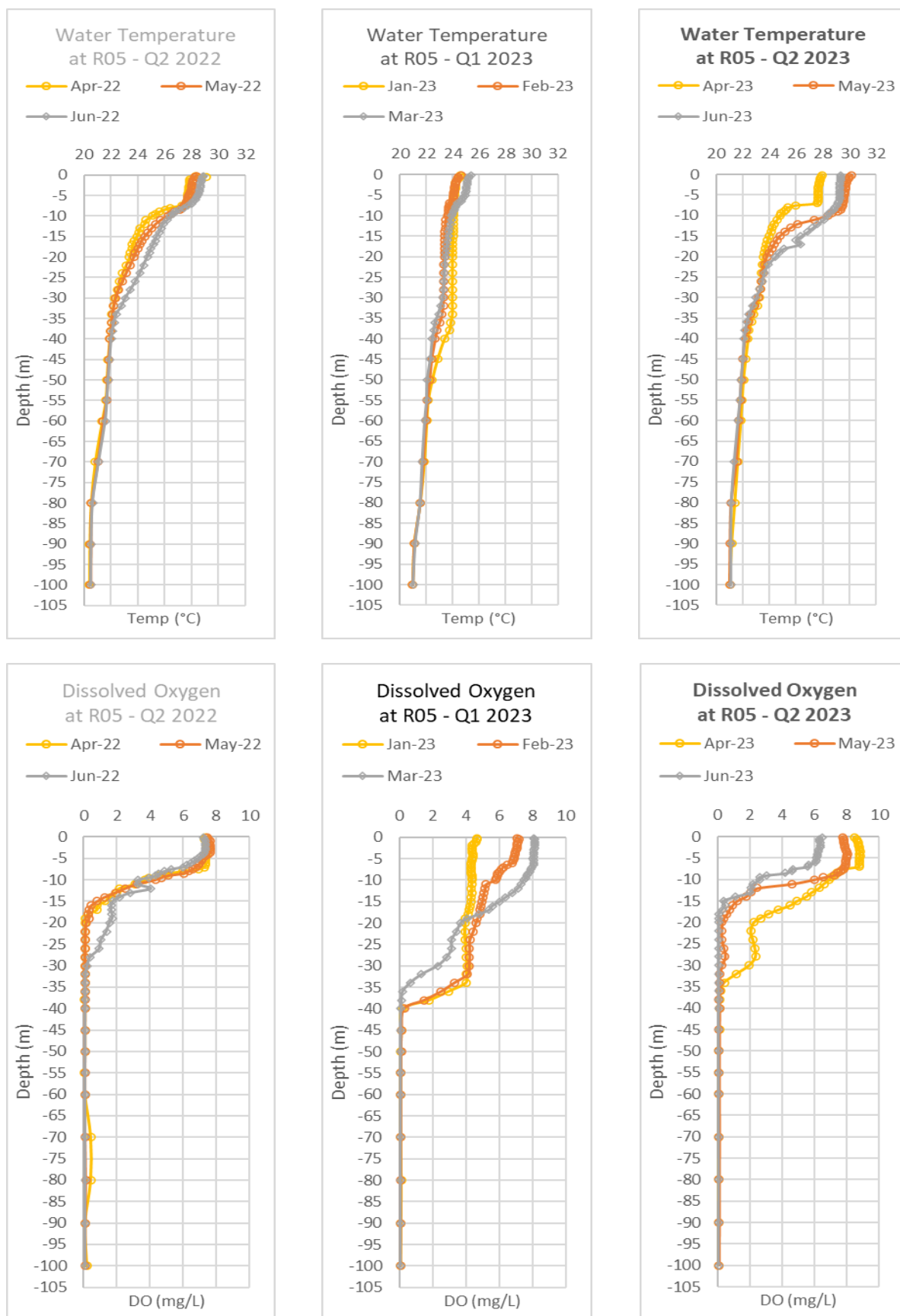


FIGURE 2-12: WATER TEMPERATURE AND DO DEPTH PROFILES IN THE MAIN RESERVOIR (R04 - R05), WITH POSITION OF INTAKE AT THE ACTUAL WATER LEVEL DURING SEPTEMBER 2018 – JUNE 2023

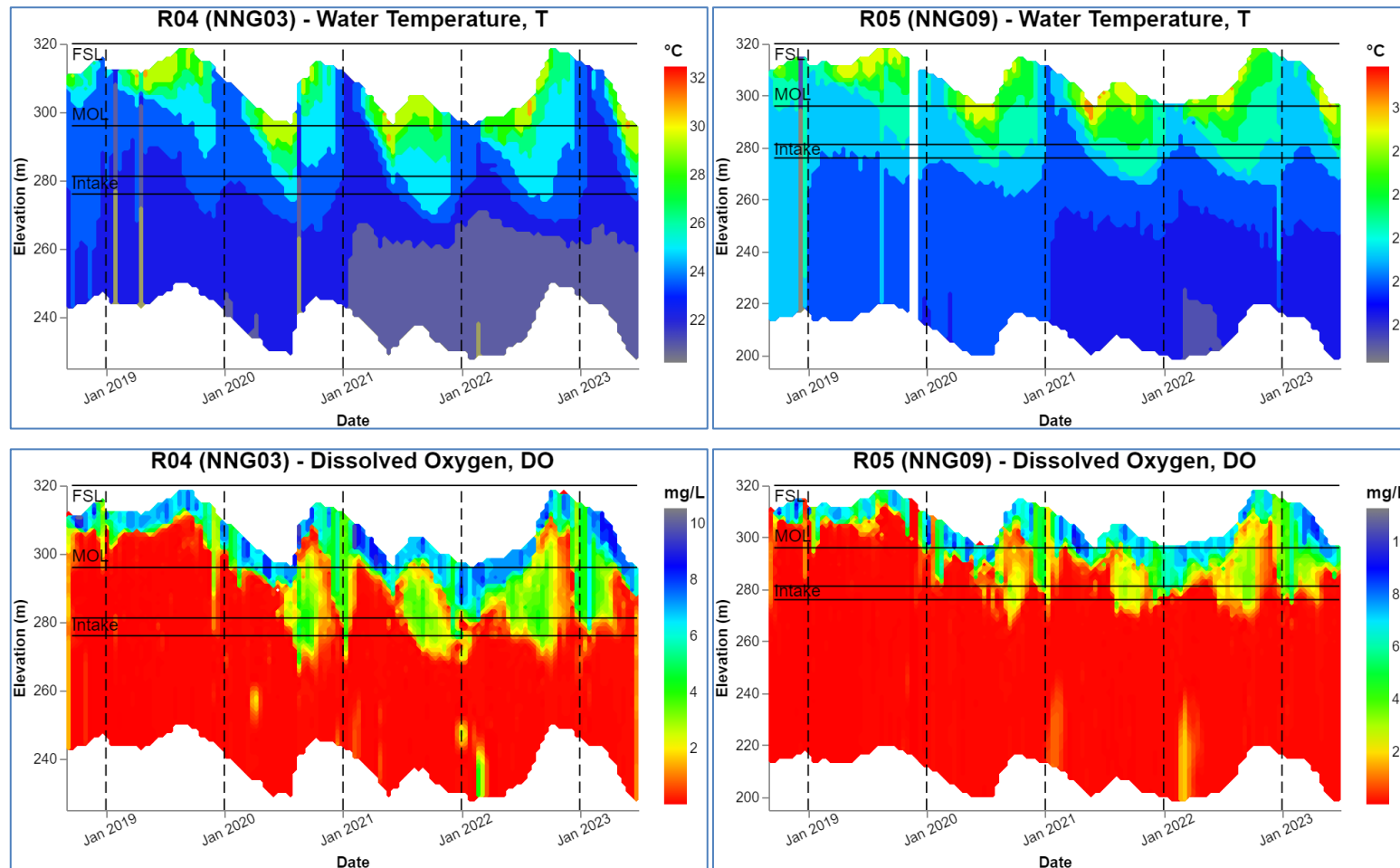


FIGURE 2-13: THE STRAIGHT-LINE GRAPH OF MONTHLY AVERAGED DO AND WATER TEMPERATURE AT R04 AND R05

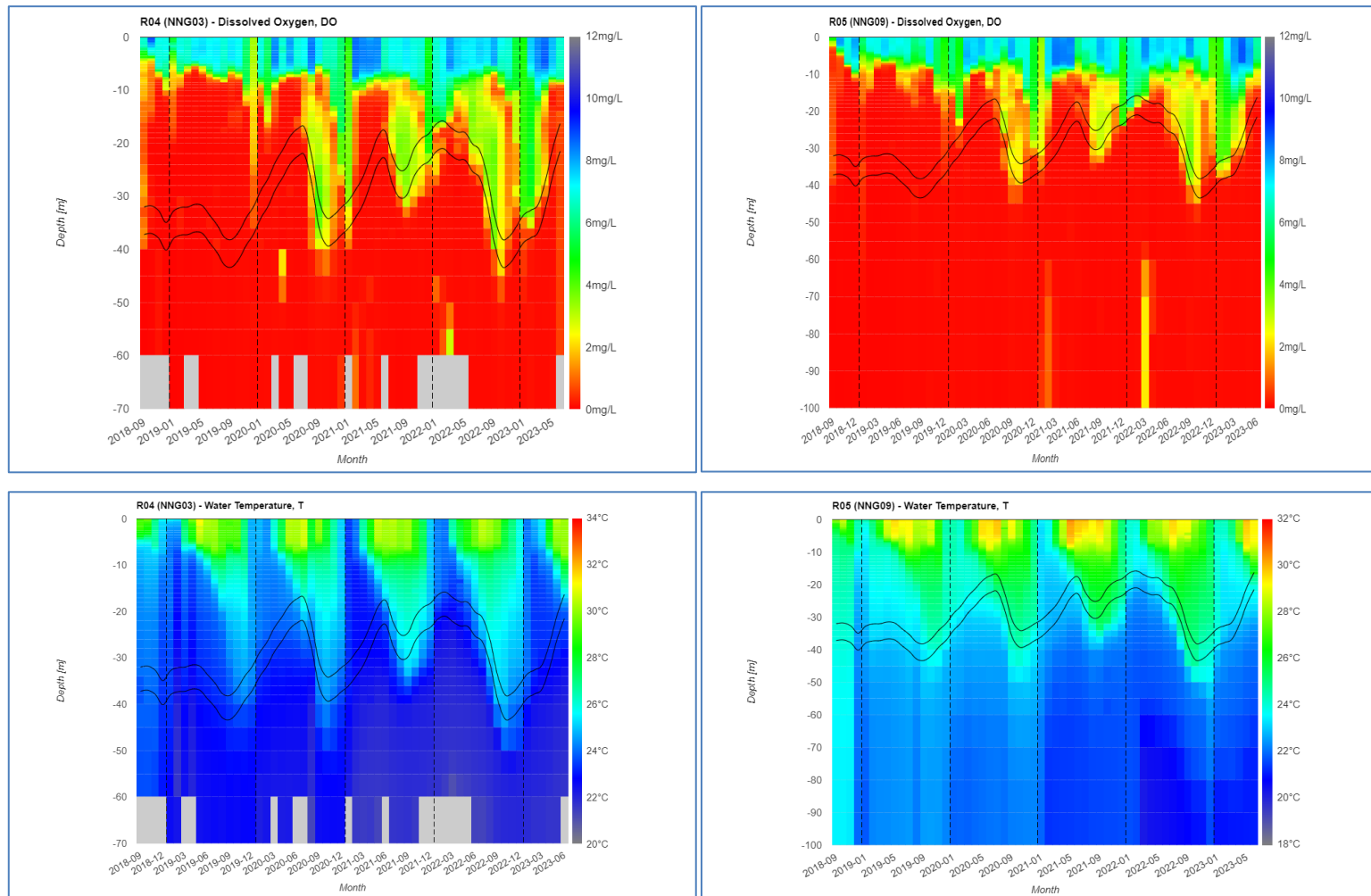


TABLE 2-9: DO (MG/L) RESULTS OF SURFACE WATER IN MAIN RESERVOIR, DO (MG/L) RESULTS OF R05 AT INTAKE DEPTH, RE-REGULATION RESERVOIR, NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q2 2023**(NATIONAL SURFACE WATER QUALITY STANDARD FOR DISSOLVED OXYGEN: ≥ 6 MG/L)**

Station Code	NNG01	R01	R02	R03	R04	R05 Intake	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
2-Apr-23	6.97													9.22			
4-Apr-23		7.14	8	7.59											7.47		
5-Apr-23					8.32	0.16	8.22	3.2	3.27								
10-Apr-23		7.46	8.88	8.76													
11-Apr-23					9.1	0.18	9.14	2.9	3.13								
26-Apr-23					7.94	1.7	8.11	2.57	3.26								
27-Apr-23										8.53	8.42	7.14	7.47			6.1	6.05
2-May-23		6.43	8.24	8.08													
3-May-23					7.38	1.32	6.87	1.98	2.76								
9-May-23		7.27	8.32	8.35													
10-May-23					8.88	0.34	8.26	2.14	2.26								
16-May-23	7.72													6.42			
17-May-23		7.14	8.37	8.08											7.99		
18-May-23					8.02	0.12	8.39	1.43	1.9								
19-May-23										4.47	4.06	5.59	5.82			6.73	5.04
24-May-23					7.15	0.11	7.45	1.18	2.28								
25-May-23		6.64	7.01	7.28													
29-May-23					8.02	0.09	7.94	1.53	2.91								

Station Code	NNG01	R01	R02	R03	R04	R05 Intake	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
30-May-23		7.08	9.1	9.36													
6-Jun-23	6.82													6.83			
7-Jun-23		6.24	6.99	7.55											7.51		
8-Jun-23					6.54		6.47	1.85	2.37								
9-Jun-23						0.12	6.47	1.85	2.37	3.36	3.07	4.34	5.64			5.45	6.48
13-Jun-23		6.16	6.06	6.79													
14-Jun-23					7.5	0.12	7.18	3.38	3.21								
20-Jun-23		6.89	6.14	6.58													
21-Jun-23					6.7	0.09	6.3	3.35	4.02								
27-Jun-23					6.52	0.09	5.92	2.45	2.35								
28-Jun-23		6.45	5.02	6.87													

Ammonia Nitrogen

In Q2 2023, Ammonia Nitrogen complied with the National Surface Water Quality Standard (<0.2 mg/L) in all monitored stations, except NNG01 and NCH01, however, these results are unrelated to the project.

TABLE 2-10: AMMONIA NITROGEN (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 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	NPH0 1	NXA 01	NHS 01
2-Apr-23	<0.2												<0.2			
4-Apr-23		0.2		<0.2										0.2		
5-Apr-23					<0.2	<0.2										
16-May-23	0.3												0.4			
17-May-23		<0.2		<0.2										<0.2		
18-May-23					<0.2	<0.2										
6-Jun-23	0.3												0.2			
7-Jun-23		0.4		0.6										0.2		
8-Jun-23					0.3	<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 Q2 2023 indicate that the BOD₅ levels are in compliance with the standard at all stations, except NNG01 and NCH01, however, these results are unrelated to the project.

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 2-11: BOD₅ (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q2 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
2-Apr-23	<1												<1			
4-Apr-23		<1		<1										<1		
5-Apr-23					<1	<1	<1	<1								
7-Apr-23									<1	<1	<1	<1			<1	<1
16-May-23	2.71												2.63			
17-May-23		1.17		<1										1.03		
18-May-23					<1	<1	<1	<1								
19-May-23									<1	<1	<1	<1			<1	<1
6-Jun-23	<1												<1			
7-Jun-23		1.11		<1										<1		
8-Jun-23					1.16	<1	<1	<1								
9-Jun-23									<1	<1	<1	<1			<1	<1

Chemical Oxygen Demand (COD)

The COD measurements in Q2 2023 are presented in **Table 2-12**.

TABLE 2-12: COD (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q2 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
2-Apr-23	<5												<5			
4-Apr-23														<5		
5-Apr-23							<5	<5								
7-Apr-23									<5	<5	<5	<5			<5	<5
16-May-23																
17-May-23	19.2												12.8			
18-May-23							6.4	12.8						28.8		
19-May-23									16.0	12.8	6.4	16.0			22.4	16
6-Jun-23	28.8												22.4			
7-Jun-23														35.2		
8-Jun-23							<5	6.7								
9-Jun-23									<5	<5	<5	<5			22.2	19.2

Faecal Coliform Bacteria

The results of the faecal coliform analyses in Q2 2023 are presented in **Table 2-13**.

Faecal coliform complied with the standard in all stations, except NCH01 and NPH01 in June 2023.

TABLE 2-13: FAECAL COLIFORMS (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q2 2023

(NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: <1,000 MPN/100 ML)

Station Code	NNG 01	R01	R02	R03	R0 4	R0 5	R0 6	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH0 1	NPH0 1	NXA 01	NHS 01
2-Apr-23	33												22			
4-Apr-23														5		
7-Apr-23									11	8	79	130			110	33
16-May-23	540												130			
17-May-23														110		
19-May-23									27	22	49	240			540	920
6-Jun-23	430												1,600			
7-Jun-23														1,600		
9-Jun-23									9	11	350	79			350	220

Total Coliform Bacteria

The results of measurements for total coliform bacteria are presented in **Table 2-14**. 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 2-14: TOTAL COLIFORM (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q2 2023
(NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: <5,000 MPN/100 ML)

Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG0 7	NNG0 8	NCH0 1	NPH0 1	NXA0 1	NHS 01
2-Apr-23	170												79			
4-Apr-23														14		
7-Apr-23									27	14	170	220			170	39
16-May-23	920												540			
17-May-23														170		
19-May-23									110	79	79	350			920	1,600
6-Jun-23	1,600												1,600			
7-Jun-23														1,600		
9-Jun-23									220	110	1,600	1,600			1,600	1,600

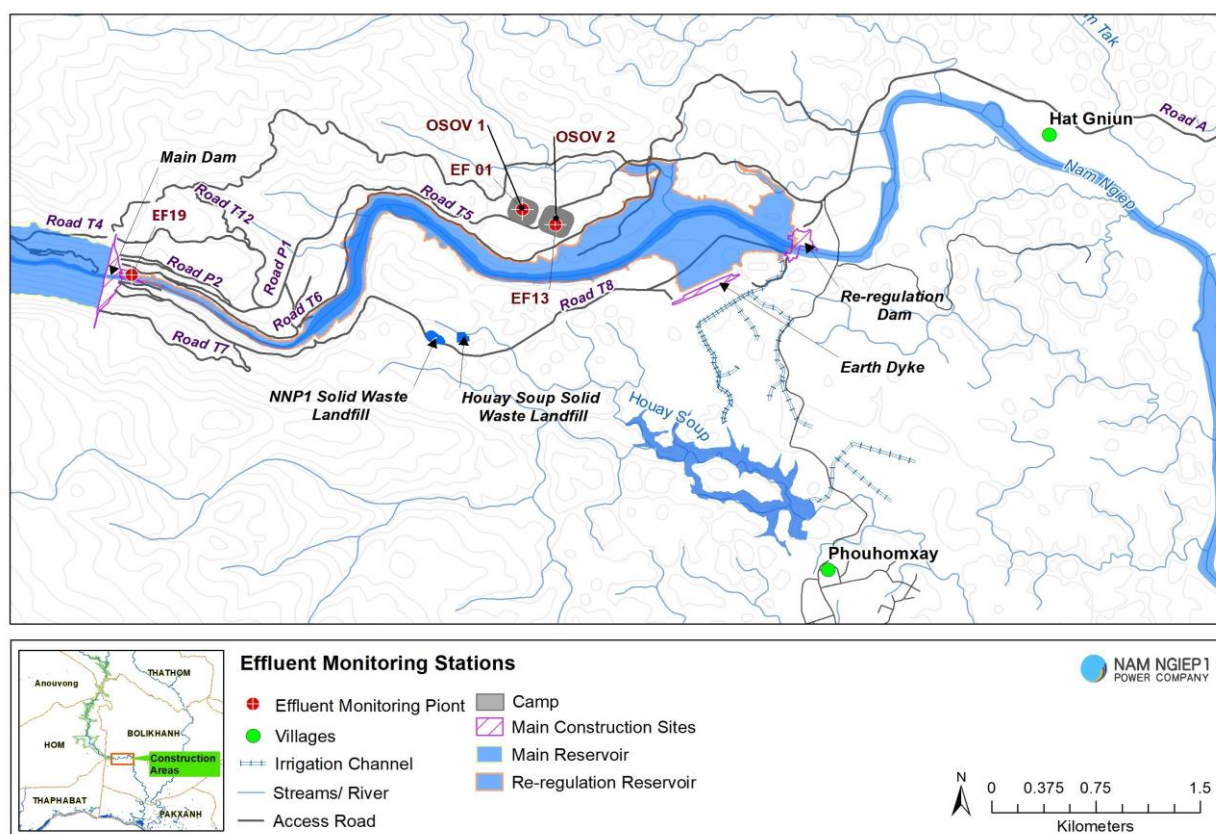
2.7.2 Compliance Monitoring of Effluents from Camps

A total of 03 sites discharged effluents in Q2 2023, including 02 camps (OSOV1 and OSOV2) and at the Wastewater Treatment System of the Main Powerhouse. The effluent monitoring location sites can be found in **Figure 2-14**.

The results are described in **Table 2-15** and the full data set is in **Appendix 4.2**.

The status of compliance as of 30 June 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 OSOV2 Camp (EF13);
- Non-compliance with Faecal Coliform and Total Coliform at Main Powerhouse (EF19), OSOV1 (EF01) and OSOV2 (EF13).

FIGURE 2-14: LOCATION OF EFFLUENT MONITORING POINTS**TABLE 2-15: RESULTS OF THE EFFLUENT WATER QUALITY MONITORING OF THE CAMPS IN Q2 2023 (NON-COMPLIANCE PARAMETERS ONLY)**

Date	Parameter (Unit)	Site Name	OSO V1	OSO V 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
		Guideline in the CA			
03-Apr-23	TSS (mg/L)	<50	6.2	10.86	25.9
24-Apr-23	TSS (mg/L)	<50	<5	6.8	45.6
15-May-23	TSS (mg/L)	<50	<5	5.2	11.4
22-May-23	TSS (mg/L)	<50	<5	<5	14.01
05-Jun-23	TSS (mg/L)	<50	<5	11.71	116
19-Jun-23	TSS (mg/L)	<50	<5	7.46	35.28
03-Apr-23	COD (mg/L)	<125	<25	40.5	65
24-Apr-23	COD (mg/L)	<125	<25	35.5	90
15-May-23	COD (mg/L)	<125	<25	<25	34
22-May-23	COD (mg/L)	<125	<25	26.0	36
05-Jun-23	COD (mg/L)	<125	<25	42.5	162
19-Jun-23	COD (mg/L)	<125	<25	<25	38
03-Apr-23	NH ₃ -N (mg/L)	<10.0	3.3	29.4	20.8
24-Apr-23	NH ₃ -N (mg/L)	<10.0	<2	24.7	19.1
15-May-23	NH ₃ -N (mg/L)	<10.0	<10	23.2	16.5
22-May-23	NH ₃ -N (mg/L)	<10.0	<10	25.8	5.2
05-Jun-23	NH ₃ -N (mg/L)	<10.0	<2	22.6	22.7

19-Jun-23	NH ₃ -N (mg/L)	<10.0	1.8	17.8	7.7
03-Apr-23	Total Nitrogen (mg/L)	<10.0	3.6	34.8	23.6
24-Apr-23	Total Nitrogen (mg/L)	<10.0	1.0	25.1	20.6
15-May-23	Total Nitrogen (mg/L)	<10.0	1.5	36.3	44.7
22-May-23	Total Nitrogen (mg/L)	<10.0	1.6	38.1	6.3
05-Jun-23	Total Nitrogen (mg/L)	<10.0	1.4	23.6	24.2
19-Jun-23	Total Nitrogen (mg/L)	<10.0	1.9	19.1	8.0
03-Apr-23	Total Phosphorus (mg/L)	<2	1.28	1.8	3.1
24-Apr-23	Total Phosphorus (mg/L)	<2	1.38	1.8	6.0
15-May-23	Total Phosphorus (mg/L)	<2	0.9	2.0	2.6
22-May-23	Total Phosphorus (mg/L)	<2	0.99	11.1	0.9
05-Jun-23	Total Phosphorus (mg/L)	<2	0.79	2.1	3.0
19-Jun-23	Total Phosphorus (mg/L)	<2	0.98	1.6	3.3
03-Apr-23	Faecal Coliform (MPN/100 mL)	<400	320	140	220
24-Apr-23	Faecal Coliform (MPN/100 mL)	<400	920	1,700	170
15-May-23	Faecal Coliform (MPN/100 mL)	<400	130	0	35,000
22-May-23	Faecal Coliform (MPN/100 mL)	<400	170	0	5,400
05-Jun-23	Faecal Coliform (MPN/100 mL)	<400	240	9,200	0
19-Jun-23	Faecal Coliform (MPN/100 mL)	<400	5,400	1,600	280
03-Apr-23	Total coliform (MPN/100 mL)	<400	2,200	350	920
24-Apr-23	Total coliform (MPN/100 mL)	<400	1,600	2,800	220
15-May-23	Total coliform (MPN/100 mL)	<400	920	33	54,000
22-May-23	Total coliform (MPN/100 mL)	<400	1,600	2	5,400
05-Jun-23	Total coliform (MPN/100 mL)	<400	920	16,000	0
19-Jun-23	Total coliform (MPN/100 mL)	<400	16,000	1,600	920

TABLE 2-16: COMPLIANCE STATUS OF EFFLUENT DISCHARGE FROM THE CAMPS IN Q2-2023

Site	ID	WWTS	Key Non-Compliance Issues ¹ in Q2-2023	Corrective Actions
OSOV 1 (Owner's Site Office and Village)	EF01	- Septic tanks (kitchen and black water) and wetland (grey water), discharge: 70 m³/day. - The effluent from this site was flowed into Re-regulation Reservoir.	- Faecal coliform (<400 MPN/100 mL): Non-compliance in 2 out of 6 samplings. Q2 mean 1,197 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in all 6 samplings. Q2 mean 3,873 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. - The effluent from this site was flowed into Re-regulation Reservoir.	- Ammonia-nitrogen (<10 mg/L): Non-compliance in all 6 samplings. Q2 mean 23.9 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in all 6 samplings. Q2 mean 29.5 mg/L. - Total Phosphorus (<2 mg/L): Non-compliance in 3 out of 6 samplings. Q2 mean 3.4 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 3 out of 6 samplings. Q2 mean 2,107 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 3 out of 6 samplings. Q2 mean 3,464 MPN/100 mL.	The installed WWTS does not eliminate nitrogen or phosphorus. However, given the less discharge effluent quantity which is completely absorbed/dried up within a distance of 260 m before reaching the re-regulation pond, there is no concern. Cleaning all 17 septic tanks and inspecting the air blowers and

¹ The values in brackets indicate the applicable standard

Site	ID	WWTS	Key Non-Compliance Issues ¹ in Q2-2023	Corrective Actions
				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.	- TSS (<50 mg/L): Non-compliance in 1 out of 6 samplings. Q2 means 41 mg/L. - COD (<125 mg/L): Non-compliance in 1 out of 6 samplings. Q2 means 71 mg/L. - Ammonia-nitrogen (<10 mg/L): Non-compliance in 4 out of 6 samplings. Q2 mean 15.3 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 4 out of 6 samplings. Q2 mean 21.2 mg/L. - Total Phosphorus (<2 mg/L): Non-compliance in 5 out of 6 samplings. Q2 mean 3.2 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 2 out of 6 samplings. Q2 mean 6,845 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 4 out of 6 samplings. Q2 mean 10,243 MPN/100 mL.	As above

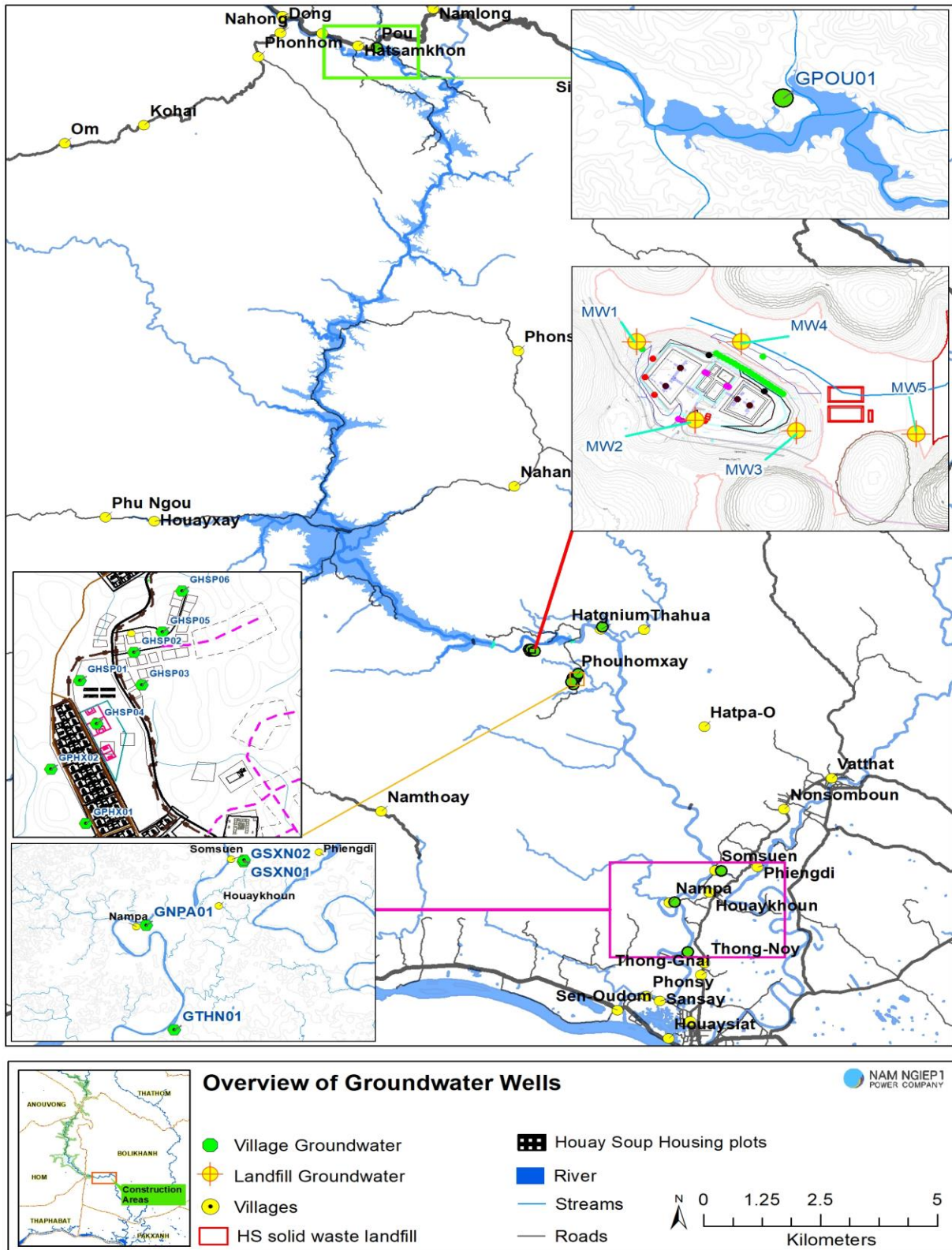
2.7.3 Groundwater Quality Monitoring

During Q2 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 2-15** and the groundwater monitoring data is presented in **Appendix 4.3**.

FIGURE 2-15: 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 April 2023.

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

Pou Village: all monitored parameters complied with the standard, except faecal coliform and *E. coli* bacteria for GPOU01 in June 2023.

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.

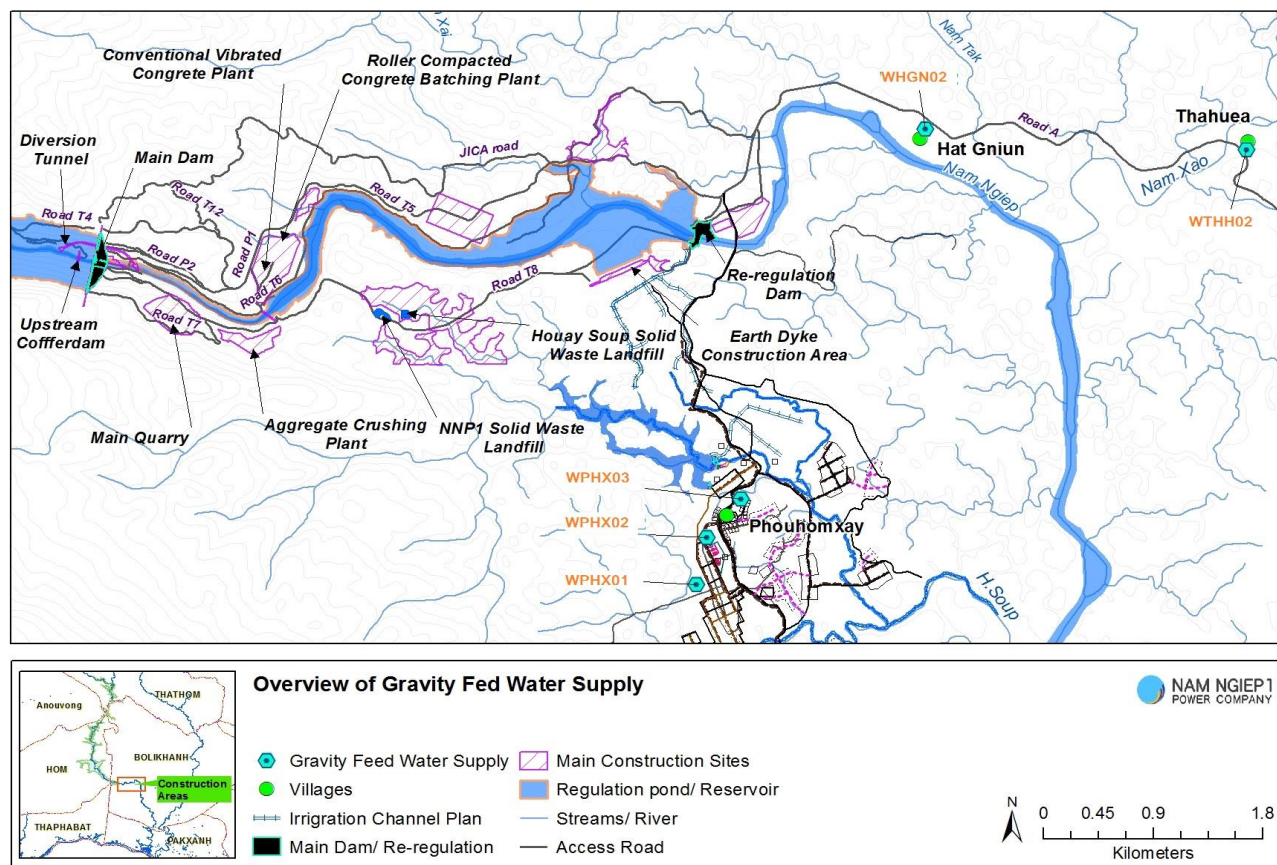
The community water supply systems related to the NNP1 hydropower project are under Nam Saat system with the monitoring requirements identify in the Minister's Decision on the Water Quality Standard Management for Drinking and Domestic Use, No. 561/MoH dated 27 February 2014.

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.

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

TABLE 2-17: THE GFWS MONITORING RESULT IN Q2 2023

Date	Parameter (Unit)	Site Name	Tha Heua Village	Hat Gnuin Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
		Guideline				
25-Apr-23	Faecal Coliform (MPN/100 mL)	0	27	240		
10-May-23		0	23	79		
22-Jun-23		0	14	70	170	46
25-Apr-23	E.Coli Bacteria (MPN/100 mL)	0	79	350		
10-May-23		0	8	27		
22-Jun-23		0	14	49	110	33

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 Q1 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 due to the water pump of two boreholes were broken. However, in April 2023, the two broken boreholes were repaired and put back into operation.

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 2-17**.

FIGURE 2-17: LANDFILL LEACHATE MONITORING LOCATION

The monitoring results in Q2 2023 indicate compliance with the applicable standards for all monitored parameters, except for total coliform for Houay Soup Landfill Leachate (June 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 Q2 2023 are summarized in **Table 2-18**.

TABLE 2-18: NON-COMPLIANCES RELATING TO WATER QUALITY MONITORING IN Q2 2023

No	Non-compliance Issues	Corrective Actions	Status
1	During turbine discharge (June 2023) and combination of turbine and gate discharges (May 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 water quality monitoring program and discussed the results with the LTA during the May 2023 visit; - The 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

No	Non-compliance Issues	Corrective Actions	Status
2	Effluents discharged from the Wastewater Treatment Systems (WWTS) at OSOV1, OSOV2 and the Main Dam exceeded the National Effluent Standard Guideline for some parameters	In May and June 2023, EMO, ADM and TD conducted a monthly joint 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.	- Closely monitoring the system operation and maintenance.
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 (Tha Heua, Hat Gnuin, and Phouhomxay Village) were not complied with the National Drinking Water Quality Standard	- Site observations were conducted during the routine water sampling, it was observed that livestock was roaming around the water intake areas and faeces from livestock and birds may contribute to the presence of bacterial contamination. It is not feasible 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, and were encouraged to boil water before drinking. - Continue monitoring.

No	Non-compliance Issues	Corrective Actions	Status
	on Faecal Coliform and <i>E.coli</i> parameters.	The villagers were informed about the monitoring results and were advised to boil water before drinking.	
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.

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 June 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 the Xaysomboun Watershed and Reservoir Protection Office (WRPO) informed the NNP1 EMO team that they still had not received any further information from the Xaysomboun Province Department of Energy and Mines as of the end of June 2023.
- The Xaysomboun PAFO agreed to update the NNP1 EMO team 15 working days after the meeting. The Head of Xaysomboun WRPO did not share a meeting agenda and confirmation of district availability as of the end of June 2023. He confirmed his unavailability because of other assignments within the forestry section of Xaysomboun PAFO.
- The Head of Xaysomboun PAFO agreed to review the patrol team establishment to have the district military personnel engaged in the patrolling work. A meeting should be organized among the NNP1 EMO, Xaysomboun WRPO, and Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS) before implementing the patrolling work, once the WRPO has received the AIP2022 funds. The Head of Xaysomboun PAFO assigned the Head of Xaysomboun WRPO to discuss further with the Xaysomboun WRPO about the arrangement but there was no further conclusion as of the end of June 2023.
- The Head of Xaysomboun WRPO finally agreed to check the readiness of the Xaysomboun WRPO sub-office at Vangkhiew in Hom District. He assigned the province and district WRPO team to conduct the site visit together with the NNP1 EMO team on 20 June 2023. The Minutes of the Meeting (MOM) was signed on 23 June 2023 in which Xaysomboun WRPO to report the results of the inspection to the Head of Xaysomboun PAFO including the schedule and budget for fixing

and purchasing some items. The plan will be submitted to and agreed upon with the EMO team no later than 14 July 2023. The Head of Xaysomboun WRPO has not yet prepared the official assignment for the staff to be based in the sub-office as of the end of June 2023. This means that the sub-office operation will be further delayed.

- The Head of Xaysomboun WRPO informed that Xaysomboun WRPO has sent out an invitation letter to the Contractor on 9 June 2023 for the discussion on 12 June 2023. But the Contractor was not available in June 2023. The construction is expected to be further delayed until the meeting is organized and a decision is made on the work.

3.1.1.2 Bolikhamxay Watershed and Reservoir Protection Office (WRPO)

In April 2023, the forest and reservoir patrolling were not conducted due to delays in fund transfer from the Forest Protection Fund (FPF) office of Department of Forestry (DOF) - Ministry of Agriculture and Forestry (MAF) to Bolikhamxay WRPO under the approved AIP2023. In addition, the Bolikhamxay WRPO still could not fix the broken boat engine. The monthly meeting was also cancelled due to the Lao New Year holiday, the unavailability of the Head of Bolikhamxay WRPO and some of the patrol members.

Bolikhamxay WRPO organized the Monthly Meeting on 4 May 2023 participated by the NNP1 EMO and BSP-WCS team. The key discussions are the following;

- The patrolling in March 2023 found that the land reservation, rubber tapping, forest encroachment, forest fire, and livestock within the NNP1 watershed are increasing. These issues should be discussed and solved as soon as possible among Bolikhamxay and Xaysomboun WRPO because most of the offenders are from the Xaysomboun Province.
- Bolikhamxay WRPO clarified that the forest patrolling in March 2023 was only conducted for two days because five of the patrol members were sick and needed to return for medical treatment. Bolikhamxay WRPO confirmed that the patrol budget was used to pay for the treatment and the detailed expenditure will be included in the Bolikhamxay WRPO's monthly report.
- Bolikhamxay WRPO agreed to rent a boat engine to continue the reservoir patrolling.
- Bolikhamxay WRPO requested to organize a meeting among NNP1 and WRPOs to discuss the delays in fund disbursement. NNP1 EMO recommended Bolikhamxay WRPO to further communicate and discuss with Xaysomboun WRPO and FPF DOF-MAF about their proposal.
- BSP-WCS and NNP1 EMO also recommended Bolikhamxay WRPO to further follow up and collect pending information on matters discussed in the previous meeting including access road improvement from Nahan village to the NNP1 reservoir, the forest encroachment and rubber tapping on the compensated rubber trees, and the action by Bolikhamxay Province Forest Inspection (POFI) on the logging case.

Bolikhamxay WRPO commenced the reservoir and forest patrol in May and June 2023 using the remaining budget from the AIP2022 and the budget from AIP2023 respectively.

Bolikhamxay WRPO organized the Monthly Meeting on 21 June 2023 with participation of the NNP1 EMO and the BSP-WCS team. The key discussions are summarized below:

- The forest patrol found land conversion for grassland, wildlife tracks, and a wooden snare. The reservoir patrol observed forest fire around H. Xou, H. Hok, and H. Khai and land conversion but did not meet the offenders.
- Forest and reservoir patrolling will be resumed in which the reservoir patrol team will focus on H. Katha, H. Xou, and H. Hok, while the forest patrol team will focus on TPZ1 at Ban Phonsong. The patrolling is subject to the re-allocation within the first 6 months budgets of AIP 2023. Bolikhamxay WRPO will submit an official letter to NNP1 EMO for acknowledgment.
- Bolikhamxay WRPO also plans to collect the village land use information at Nahan, HatGnuin, Phonsong, and Phouhomxay in July 2023 and the results will be reported to the Bolikhamxay Watershed and Reservoir Protection Committee (WRPC) for further advice.
- BSP-WCS also presented the draft Law Enforcement Strategy (LES).
- Bolikhamxay WRPO received a call from the village authority of Phonsong and noted that the Kha E-Co Company is doing mining exploration in Ban Phonsong. Bolikhamxay WRPO will further coordinate and gather information from the relevant offices at the district and provincial level about this.

3.1.1.3 NNP1PC EMO

There was no activity implemented under the NNP1 EMO watershed livelihood program during Q2 2023 because the team's engagement with other assignments including the follow-up on the outstanding issues with the Xaysomboun WRPO, checking the Xaysomboun WRPO sub-office, and the follow-up on funds disbursement to Xaysomboun WRPO.

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

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

No.	Actions	Target date	Status as of June 2023
1	Financial Management Manual (FMM) for WPROs and NC-NX BOMU		
	Approval	Q2 2022 (original) Q2 2023 (new)	Completed: - After further internal discussion between and Director General (DG) of DOF-MAF and the FPF DOF-MAF then the Financial Management Manual (FMM) was signed/endorsed by the DG of DOF-MAF on 15 May 2023. - FPF DOF-MAF agreed to circulate the soft file of the approved Financial Management to WRPOs and BOMU for their reference. The soft copy was circulated by NNP1 EMO on 16 June 2023. NNP1 also agreed to provide financial support to print 50 copies of FMM through the NNP1 procurement department. The books are expected to be ready in July or August 2023 and will be circulated to relevant offices afterward.
2	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 In progress 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 third quarter 2023.
b	The operation of Xaysomboun WRPO sub-office at Hom District	Jan 2022 (original) Q2 2023 (new)	The Head of Xaysomboun WRPO finally agreed to check the readiness of the Xaysomboun WRPO sub-office at Vangkhiew in Hom District. He assigned the province and district WRPO team to conduct the site visit together with the NNP1 EMO team on 20 June 2023. The Minutes of the Meeting (MOM) was signed on 23 June 2023 in which Xaysomboun WRPO to report the results of the inspection to the Head of Xaysomboun PAFO including the schedule and budget for fixing and purchasing some items. The plan will be submitted to and agreed upon

No.	Actions	Target date	Status as of June 2023
			with the EMO team no later than 14 July 2023. The Head of Xaysomboun WRPO has not yet prepared the official assignment for the staff to be based in the sub-office as of the end of June 2023. This means that the sub-office operation will be further delayed.
c	Checkpoints in the NNP1 sub-catchment	Dec 2020 (original) Q2 2023 (new)	The Head of Xaysomboun WRPO informed that Xaysomboun WRPO has sent out an invitation letter to the Contractor on 9 June 2023 for the discussion on 12 June 2023. But the Contractor was not available in June 2023. The construction is expected to be further delayed until the meeting is organized and a decision is made on the work.
d	TPZ demarcation in the NC-NX offset site	Jan 2022 (original) Q2 2023 (new)	The Head of Xaysomboun WRPO proposed to organized the meeting after receiving the AIP2022 fund which is still not yet transferred until the end of June 2023.
e	Reservoir fishery management	Jan 2022 (original) Q2 2023 (new)	The Head of Xaysomboun WRPO did not share a meeting agenda and confirmation of district availability as of the end of June 2023. He confirmed his unavailability because of other assignments within the forestry section of Xaysomboun PAFO.

3.1.2 Preparation of Annual Implementation Plan (AIP) 2022

3.1.2.1 Xaysomboun WRPO

The fund transfer was not completed as of the end of June 2023 despite their close follow-up with FPF DOF-MAF.

3.1.2.2 Bolikhamxay WRPO

Bolikhamxay WRPO informed that their AIP2022 fund for the remaining quarter of 2022 was transferred by DOF-MAF on 2 November 2022.

3.1.3 Preparation of Annual Implementation Plan (AIP) 2023

3.1.3.1 Xaysomboun WRPO

NNP1 EMO, Xaysomboun WRPO, and BSP-WCS planned to discuss the revised plan after the Law Enforcement (LE) training in the first week of April 2023, but the Head of Xaysomboun WRPO was on leave. EMO finalized the plan based on the 2023 timeline, future utilization of the AIP2022 fund, and the pending activities since 2020. The activity budget will be further revised if there are no actions until May 2023. NNP1 EMO shared the revised version of the plan with BSP-WCS for review and confirmation on 11 April 2023. The BSP-WCS team provided their review on 21 April 2023 and proposed an immediate follow-up with the Xaysomboun WRPO. NNP1 EMO further reviewed the plan and shared it with the Head of Xaysomboun WRPO in the first week of May 2023. NNP1 EMO and BSP-WCS proposed to discuss with Xaysomboun WRPO in the third week of May 2023. The Head of Xaysomboun WRPO informed the NNP1 EMO that he will lead the internal discussion with his team, but he was not available until the end of June 2023 because of his assignment for another project (Lao Landscapes and Livelihoods Project) and personal leave.

3.1.3.2 Bolikhamxay WRPO

NNP1PC transferred the fund for the two quarters of 2023 of the approved Bolikhamxay AIP2023 totalling **529,527,000 LAK** to FPF DOF-MAF on 10 April 2023. The Head of Bolikhamxay WRPO informed during the discussion with EMO, ADB, and IAP on 25 May 2023 that they planned to request FPF DOF-MAF to organize a meeting among WRPOs and FPF DOF-MAF about the clarity on the role and responsibility of the official assignment of FPF DOF-MAF team per agreement No. 0535/DoF dated on 6 February 2023 as well as to deal with the delays in fund disbursement. Bolikhamxay WRPO received the funds from FPF DOF-MAF on 7 June 2023. They are preparing the request for the second two-quarter funds of the approved AIP2023 to avoid further delays in fund transfer and implementation of activities.

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

The Bolikhamxay Biodiversity Offset Management Unit (BOMU) informed NNP1 EMO on 10 April 2023 that Bolikhamxay PAFO management have advised to progress with the approval of the Nam Chouane-Nam Xang (NC-NX) and its Totally Protected Zone (TPZ) boundary after completing updating the village land use plans. NNP1 EMO requested BOMU to reconsider the advice to avoid further delays and possible new proposals from villagers to adjust the boundaries. The training for the Participatory Land Use Planning (PLUP) updating was organized from 24-26 April

2023. The first site visit of PLUP updating for collecting information on the current situation in the three Nam Chouane-Nam Xang (NC-NX) villages in Viengthong District was conducted from 27 April to 16 May 2023. BOMU together with NNP1 EMO and BSP-WCS is reviewing and analysing the collected information. The results will be presented, discussed, and agreed upon with the community in September 2023 and the dissemination of updated PLUP is scheduled for October 2023. The site visit of PLUP updating in the three NC-NX villages in Xaychamphone District will be conducted at the end of third quarter 2023 and further process will be conducted in the last quarter 2023. The approval of NC-NX TPZ boundary is expected to be obtained in December 2023 subject to the completion of PLUP updating in Viengthong and Xaychamphone District.

Figure 3-1: REPRESENTATIVE PHOTOS FROM PLUP UPDATED ACTIVITY IN VIENGTHONG DISTRICT

	
PLUP updating meeting in Vangphieng Village	PLUP updating meeting in Vangphieng Village
	
PLUP updating meeting in Na Gngang Village	PLUP field survey in Na Gngang Village
	
PLUP updating meeting in Natan Village	PLUP data interview in Natan Village

b. Component 2 – Enforcement

The March 2023 patrolling was conducted from 21 March to 9 April 2023 focussing on the TPZ highest priority area including Nam Xi temporary sub-station and the nearby areas; Nam San and mountain ridges; Nam Sone; Nam Chang; as well as the TPZ high priority area including the Nam Ma and its tributaries. BOMU could not continue patrolling in April to June 2023 due delays in finalizing the AIP2023 and fund disbursement process from FPF DOF-MAF to BOMU (see **section 4.2.2**). There was only safeguarding for the three patrol sub-stations that was scheduled during April to June 2023 using the remaining budget from the AIP2022.

The results of patrolling in March 2023 are as follow:

Team	Patrolling Area/distance	Observations/Actions Taken
1	Safeguarding at Nam Xi temporary sub-station and carried out the forest patrolling in the nearby areas (Nam Xi, Houay Pong and Houay Xay Gnai) (14 days covering a distance of 158 km on forest patrolling)	The team discovered and destroyed an old hunting camp at a southern tributary of Nam Xi.
2	TPZ highest priority area including Nam San and some of its tributaries (16 days covering a distance of 64 km on forest patrolling)	No threats observed and recorded.
3	TPZ high priority area including Nam Ma, Nam Pang, Nam Sa Nga and some mountain ridges (15 days covering a distance of 70 km on forest patrolling)	The team discovered and destroyed a total of 5 fishing camps along Nam Ma. Three camps are old camps, one camp is new, and one camp is very recent.
4	TPZ highest priority area including Nam Sone, Nam Chang and some mountain ridges (16 days covering a distance of 78 km on forest patrolling)	The team discovered and destroyed an old fishing camp at Nam Chouan.

FIGURE 3-2: MAP OF PATROLLING TRACK IN MARCH 2023

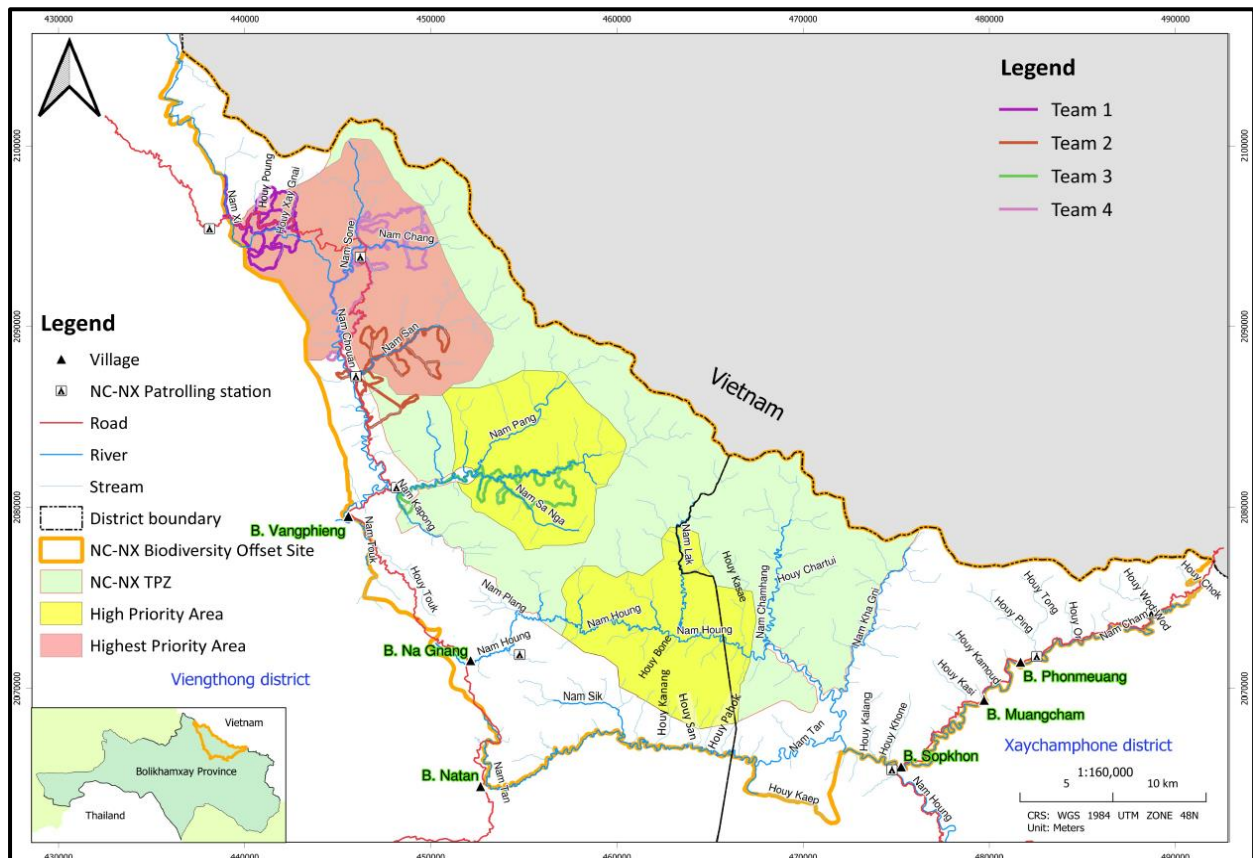


FIGURE 3-3: MAP OF THREATS IN MARCH 2023

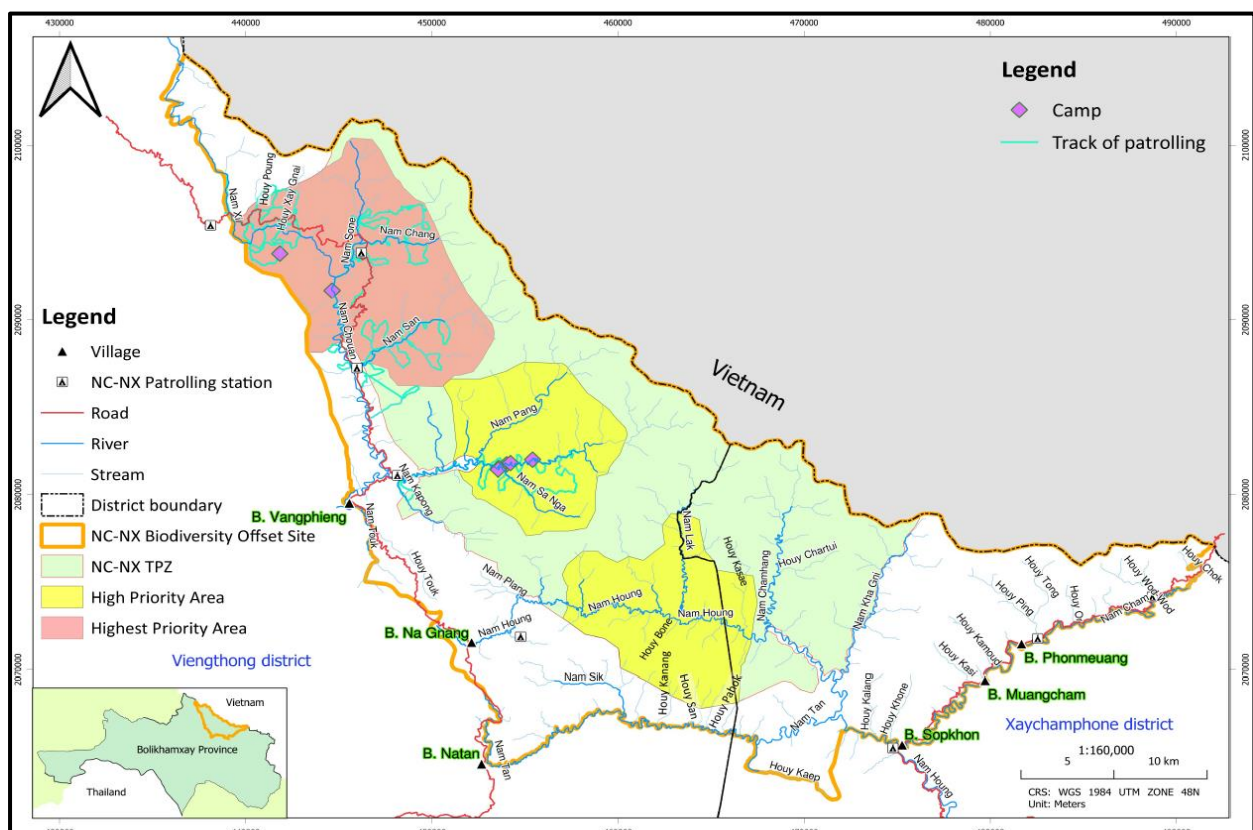


Figure 3-4: REPRESENTATIVE PHOTOS FOR MONTHLY PATROLLING IN MARCH 2023



c. Component 3 – Conservation Outreach

BOMU conducted the outreach campaign for the community, schools, and military in Xaychamphone and Viengthong District from 2 to 7 April 2023 and from 24 to 29 April 2023 respectively. BSP-WCS is in progress of preparing the report for the outreach activity.

Figure 3-5: REPRESENTATIVE PHOTOS OF OUTREACH IMPLEMENTATION IN XAYCHAMPHONE DISTRICT FROM 2-7 APRIL 2023





d. Component 4 – Conservation linked livelihood

The April 2023 monthly snare removal was conducted from 28 April - 9 May 2023 at the TPZ highest priority area including Nam Chang and Nam Sone. The results were discussed during the monthly meeting and the data was recorded in Spatial Monitoring and Reporting Tool (SMART) database. There were no activities in May and June 2023 related with the AIP2023 (see section 4.2.2).

NNP1 EMO, BOMU, BSP-WCS, Bolikhamxay PAFO Agriculture and Livestock Sections, Viengthong and Xaychamphone DAFO had a discussion on 23 June 2023 about the implementation of CDP activities under the AIP2023. The meeting concluded that there is a need for Bolikhamxay PAFO Agriculture Section to train the District Trainers after BOMU receives the AIP2023 funds which is tentatively scheduled for July 2023. The implementation of the CDP activities is expected to be commenced from August 2023.

3.2.2 Preparation of Annual Implementation Plan (AIP) 2023

The Head of Bolikhamxay PAFO approved the BOMU AIP2023 on 19 April 2023 and BOMU submitted it to DOF-MAF on 8 May 2023. The FPF DOF-MAF submitted an official fund disbursement request for the first two-quarters of the approved Bolikhamxay Biodiversity Offset Management Unit (BOMU) AIP2023 on 16 June 2023. NNP1PC transferred the funds to FPF DOF-MAF on 30 June 2023.

4 FISHERY MONITORING

Four species groups and one species dominated the fish catch by weight in Q2 2023 as listed in **Table 4-1**. All species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species² except *Sikukia gudgeri* is classified as Data deficient (DD) and *Oreochromis niloticus* is an exotic species.

TABLE 4-1: FISH SPECIES DOMINATING THE FISH CATCH IN Q2 2023

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Hampala dispar</i> , <i>Hampala macrolepidota</i>	ປາສຸດ	424.8	LC
<i>Poropuntius normani</i> , <i>Poropuntius laoensis</i> , <i>Poropuntius carinatus</i>	ປາຈາດ	370.9	LC
<i>Sikukia gudgeri</i> , <i>Amblyrhynchichthys truncatus</i>	ປາຂາວຊາຍ	269.3	DD, LC
<i>Oreochromis niloticus</i>	ປານິນ	224.8	LC
<i>Mastacembelus armatus</i> , <i>Mastacembelus favus</i>	ປາຫຼາດ	223.8	LC

The recorded catch of Threatened species (IUCN Red List classification) in Q2 2023 are presented in **Table 4-2**. The list includes three species that are classified as Vulnerable species (VU).

Table 4-2: Threatened Species of Q2 2023 Fish Catch

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Cirrhinus cirrhosus</i>	ປາແກງ/ປານວນຈັນ	6.7	VU
<i>Scaphognathops bandanensis</i>	ປາປ້ຽນ/ປາວຽນໄຟ	123	VU
<i>Tor sinensis</i>	ປາແດງ	36.4	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.

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.

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

	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
Species																																
<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 Q2 2023. The catch is divided in 3 areas including above the main dam, below the main dam and Mekong area. Main biodiversity indicators in Q2 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 Q2 2023

Biodiversity Indicators	Mekong	Below dam	Above dam
Total species and groups	38	52	46
Single species	28	37	31
Species groups	10	15	15
Top 15 species (% total catch weight)	93.32%	82.46%	90.71%
Proportion for species groups	25.16%	59.51%	57.62%
Diversity index (Shannon)	2.4684	2.9866	2.6632

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

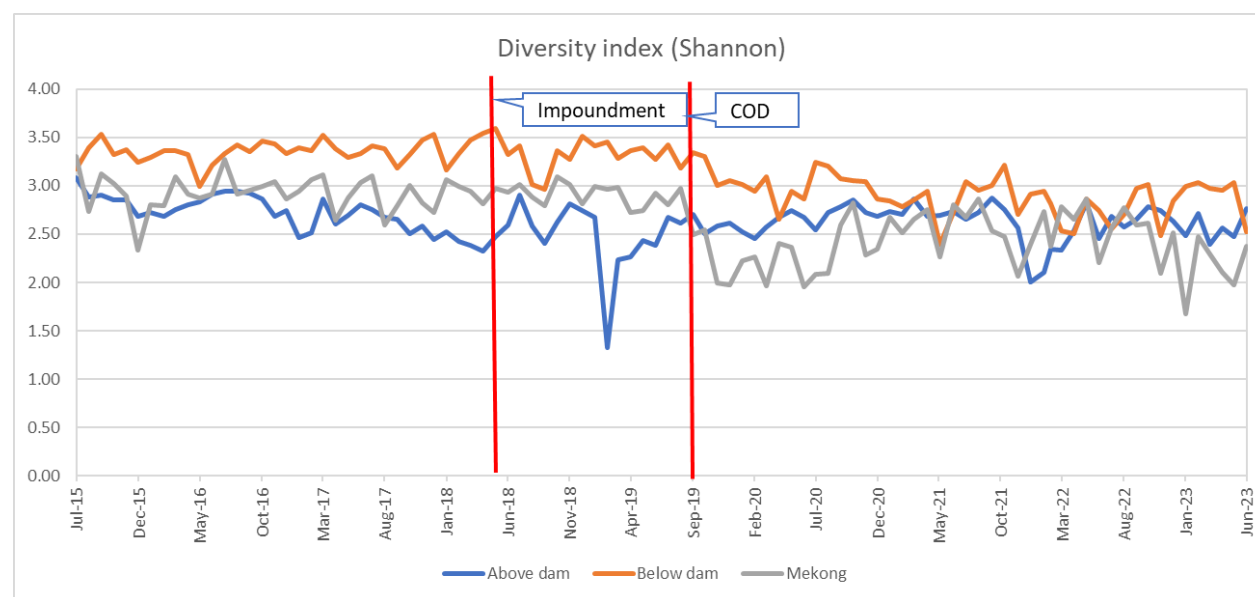


FIGURE 4-1: FISH DIVERSITY INDEX (SHANNON) BY FISHING ZONE FROM JULY 2015 TO JUNE 2023

The mean daily fish catch per household from July 2015 to June 2023 is displayed in **Figure 4-2** and the mean fish catch per household per fishing day for Q2 from 2016 to 2023 are shown in **Table 4-5**.

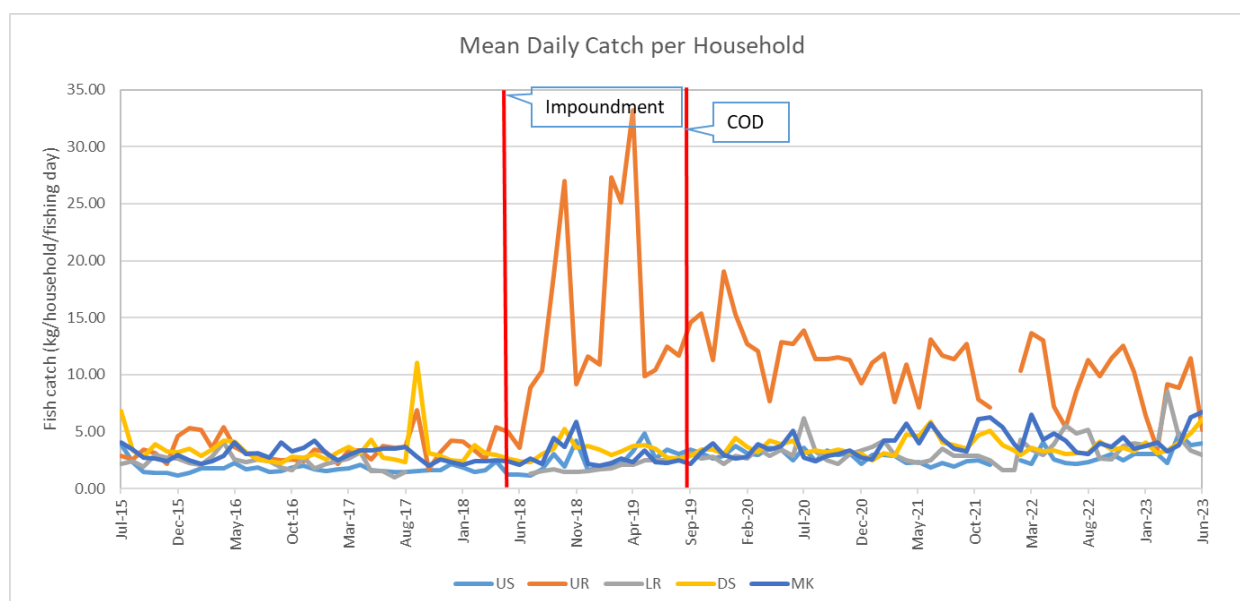


FIGURE 4-2: MEAN DAILY FISH CATCH PER HOUSEHOLD FROM JULY 2015 TO JUNE 2023

TABLE 4-5: MEAN DAILY FISH CATCH PER HOUSEHOLD FOR Q2 FROM 2016 TO 2023

Fishing Zone	Q2 2016 (kg)	Q2 2017 (kg)	Q2 2018 (kg)	Q2 2019 (kg)	Q2 2020 (kg)	Q2 2021 (kg)	Q2 2022 (kg)	Q2 2023 (kg)
Upstream	1.92	1.73	1.61	3.59	3.13	2.14	2.93	4.20
Upper reservoir	4.05	3.21	4.66	17.85	11.06	10.34	8.55	8.49
Lower reservoir	2.98	2.09	NA	2.37	3.08	2.41	4.13	3.60
Downstream	3.85	3.35	2.65	3.67	4.10	5.06	3.19	5.01
Mekong	3.31	3.39	2.30	2.65	4.06	5.13	4.44	5.59

The survey results in Q2 2023 indicate that Nam Ngiep is the main fishing habitat for the upstream and downstream zones, while the main fishing habitat for the upper reservoir, lower reservoir and Mekong zones are the reservoir, tributaries and streams and Mekong respectively. The proportion of fishing habitats in Q2 2023 are displayed in **Table 4-6**.

TABLE 4-6: PROPORTION OF THE CATCH REPORTED BY MAIN HABITATS (%) IN Q2 2023

Habitats	US	UR	LR	DS	MK
Mekong	0.0%	0.0%	0.0%	5.7%	95.8%
Nam Ngiep	41.4%	12.3%	0.0%	56.9%	0.3%
Nam Xan	0.0%	0.0%	0.0%	0.0%	0.0%
Reservoir	30.5%	83.5%	27.7%	0.0%	0.0%
Tributary and stream	27.5%	3.0%	68.8%	29.4%	0.0%
Wetland	0.5%	1.2%	3.6%	6.6%	3.9%
Others	0.0%	0.0%	0.0%	1.3%	0.0%

Total reported fish and other aquatic animal (OAA) catch (proportion of OAA) for the same 7-day period in Q2 from 2016 to 2023 are shown in **Figure 4-3**.

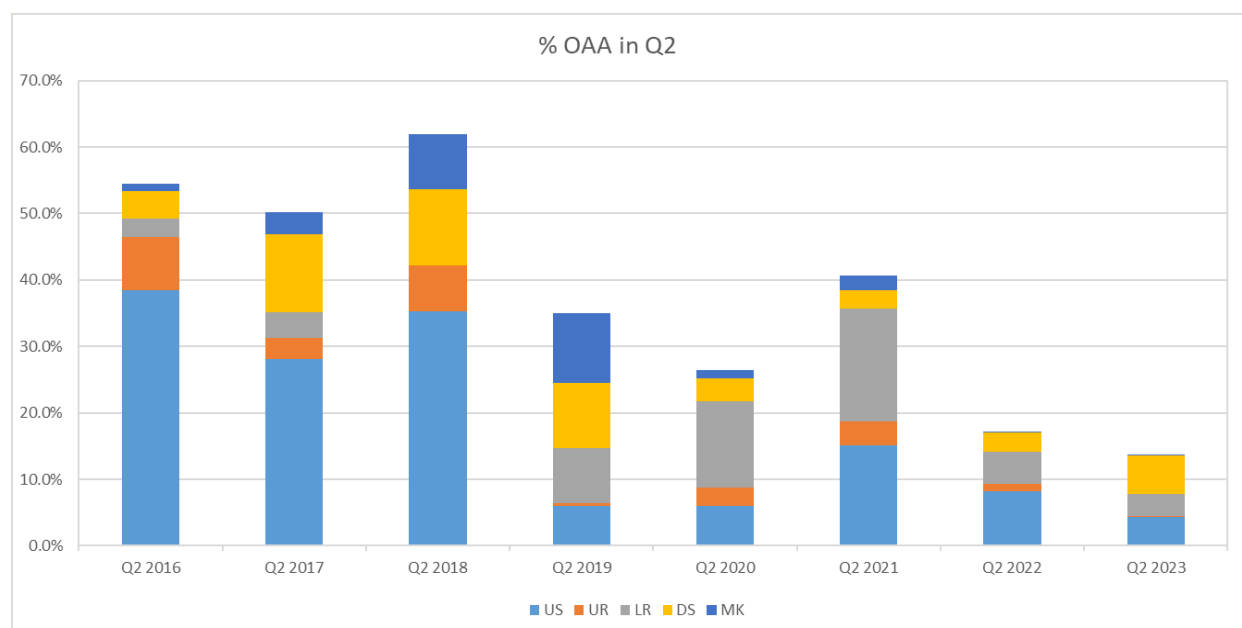


FIGURE 4-3: PROPORTION OF OAA TO THE TOTAL REPORTED KILOGRAM (KG) OF FISH AND OAA FOR A 7-DAY PERIOD BY FISHING ZONE IN Q2 FROM 2016 TO 2023

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 June 2023) are provided in **Table 5-1**.

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

Type of Incidents	LTI	RI	NM	PD	FI	MVI	Total
No. of Incidents in Q2, 2023	0	0	0	0	0	0	0
Cumulative Total Incidents to 30 June 2023	0	3	0	0	0	1	4

LEGEND: LTI - Lost Time Incident

RI	-	Recordable Injury ³
NM	-	Near Miss
PD	-	Property Damage
FI	-	Fire Incident
MVI	-	Motor Vehicle Incident

There were no incidents or accident reported in Q2 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.

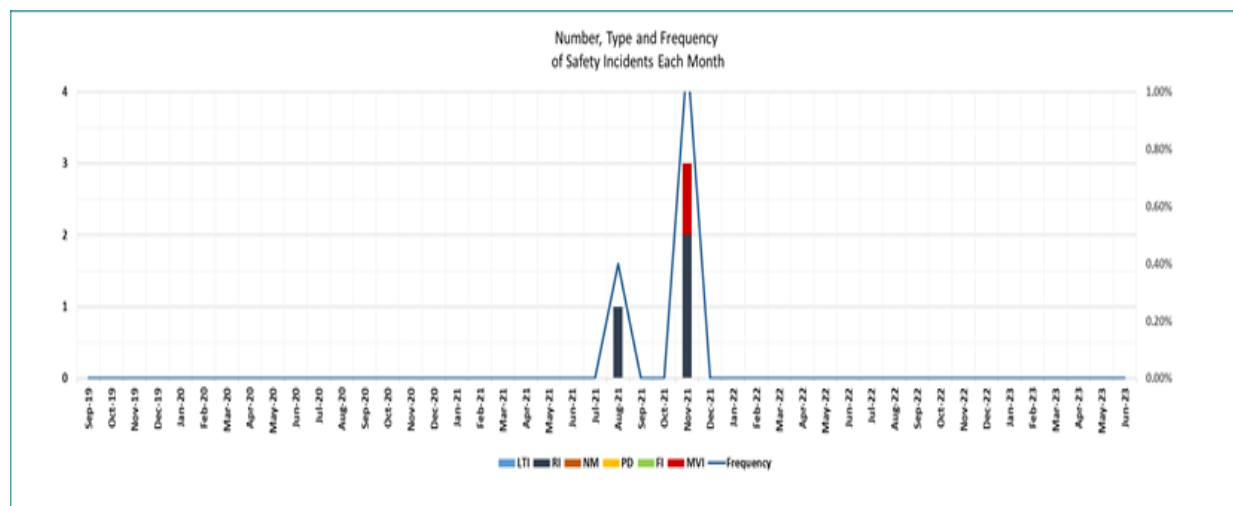


FIGURE 5-1: NUMBER, TYPE AND FREQUENCY OF SAFETY INCIDENTS SINCE SEPTEMBER 2019 TO 30 JUNE 2023

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.

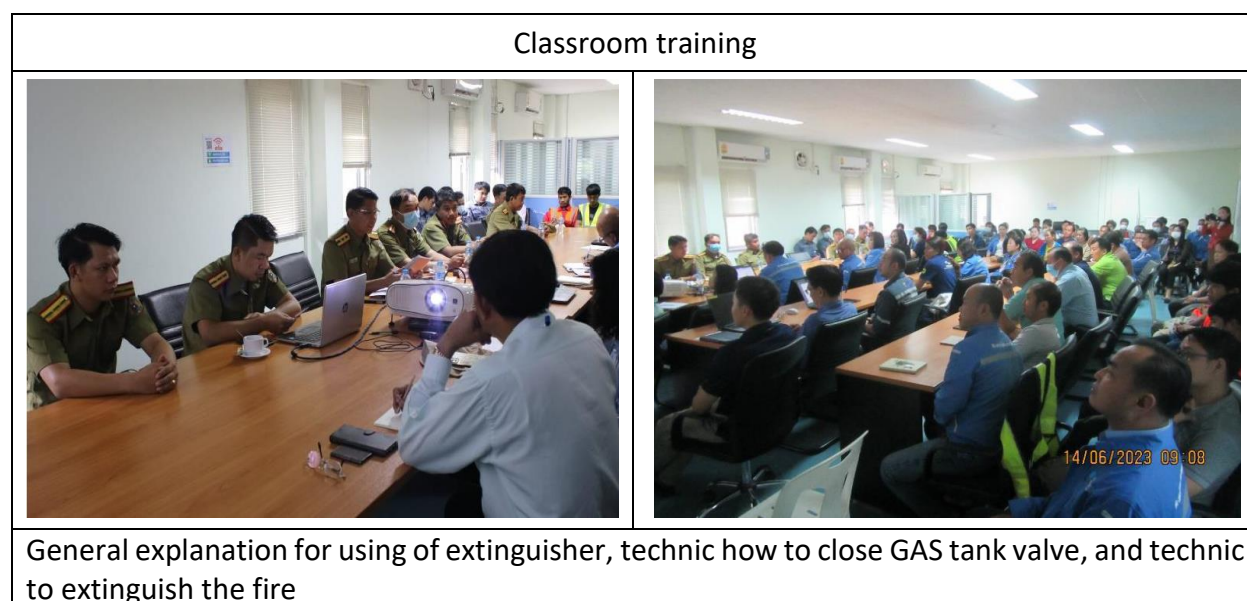
³ An **injury** or illness is **recordable** if it involves restricted work or transfer to another job. An employee is said to be on “restricted work” when he or she is unable to perform one or more routine functions of the job, beginning on the day after the **injury** or illness occurs

5.1.1 Health and Safety Training and Emergency Drills

There were two training events and drills during the Q2 2023.

1. Fire Prevention and Basic Fire Fighting training and drills conducted by Bolikhamxay Provincial Police Office on 14 June, 2023. The objectives of the drill are: (a) To identify any weakness in the fire fighting and evacuation strategy; (b) To familiarise occupants and new occupants with procedures; (c) To receive the new knowledge from an external trainer like the provincial police department about the Laos law requirements, the fire accident report to police station, lessons from past fire accidents in Bolikhamxay Province, in Laos and oversea countries, the specification of fire extinguisher types and uses, inspection of fire extinguishers, how to extinguish the LPG gas fire, how to use the fire extinguishers; (d) complying with the Laos law on fire prevention of 24 December 2007, the notice letter of provincial of Bolikhamxay police office date 02 March 2023 and the notice letter of provincial governor head office 04 December 2019; and (e) identifying positive and negative reactions of staff with designated responsibilities such as using of fire extinguishers and extinguish of the LPG gas. The drill was participated by a total of 80 people including 20 females including 47 NNP1PC staffs, 12 EGAT O&M staffs, 12 PKCC staffs, 7 KGS staffs, 1 LSSE staffs, and 1 ISOS staff. Certificates were issued by Bolikhamxay Provincial Police Office at the end of the training and drill.
2. Annual Flooding Event Training and Evacuation Drills to NNP1PC staffs from different department on 13, 16 and 20 of June 2023. The report is being prepared and the detail will be shared in the Q3 2023 report.

FIGURE 5-2 REPRESENTATIVE PHOTOGRAPHS OF FIRE PREVENTION AND BASIC FIRE FIGHTING TRAINING AND DRILLS





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 second quarter 2023.

6 External missions and visits

The joint ADB, IAP, and LTA mission was conducted during 15-27 May 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 Q2 2023

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 4 July 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 its accessibility to everyone to be confirmed in August 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 accessible before 14 July 2023. 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 agreed to conduct the drill in mid-August 2023.

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 4 July 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.
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 our recent field monitoring and measurement, no boat navigation difficulties were observed. However, in

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 4 July 2023)
					October 2023, at the beginning of the dry season, NNP1PC will conduct interviews with inhabitants, who use boats, to gather and assess complaints and feedback related 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	<u>Follow-up:</u> - XSB-PAFO will lead a meeting about FCMP involving two district DAFOs (Home and Thathom districts), the village authorities and the community representatives. This meeting has not yet been organized, despite the continuous follow-up by NNP1PC. <u>Completed:</u> - On 27 Jun 2023, NNP1PC submitted the letter to the DEB-MEM, with carbon copies to the XSB Provincial Governor as the chair

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 4 July 2023)
					of XSB WRPC, DESIA-MONRE, and DOF-MAF. This letter (called by ADB as 'escalation letter') aims to seek guidance on addressing the CA non-compliance activities and the unresolved delays activities from XSB WRPO. NNP1 anticipate that the guidance received will expedite the pending activities at XSB Province.
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: - Due to personal leave and involvement in other projects, the Head of XSB WRPO was unavailable to engage in any follow-up discussions with the NNP1PC EMO and BSP-WCS. - For further information, please refer to point 3 on the escalation letter addressed to the central GOL offices.
5	Irrigation system	Section with Category A damage.	Make reinforcement as soon as possible, before collapse of the section.	-	In progress: - NNP1PC discussed and plans to repair it in 2023.
		Pump for providing irrigation water; installation work started.	Confirm operation of pump	30 June 2023	In progress: - NNP1PC plans to complete the installation of the pump in early August 2023. It was delayed because the operation condition resulted in the low water level of the re-regulation dam.

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 4 July 2023)
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> - NNP1PC will close the two holes by filling the earth material in July 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. - 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 Manageme	Inform ADB and IAP of Mr. Vansy's decision on the financial		-	<u>Follow-up:</u>

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 4 July 2023)
	nt Manual (FMM)	manual by June 15, 2023			- NNP1PC consulted with the Head of FPF DOF-MAF regarding the objection to the approved FMM that the Head of XSB WRPO raised. The Head of FPF DOF-MAF clarified that the FMM was prepared in line with extensive discussions involving relevant GOL committees (WRPOs and BOMU), including the finalization workshops in Dec 2022 and Jan 2023. FPF DOF-MAF confirmed that no official comments or objections were received regarding the final draft FMM before the Director General of DOF-MAF approval in May 2023. Therefore, it is unlikely that the objection raised solely by the Head of XSB WRPO will lead to a revision of the approved FMM. - On 23 Jun 2023, the Head of XSB WRPO informed NNP1PC that he did not consult with the Head of XSB PAFO yet on the objection to the approved FMM. They plan to submit the letter to FPF DOF-MAF in July 2023. EMO will continue to follow up with XSB WRPO. - For further information, please refer to point 3 on the escalation letter addressed to the central GOL offices.

No	Aspect	Issue Description	Corrective Action Requests	Requested Timeline	Corrective Actions by NNP1PC (As of 4 July 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 will share the technical proposals with ADB after the NNP1PC bidding committee meeting in July 2023 and will refer to the NNP1PC Procurement Policy for the selection process.
11	MoU Meeting	Set a date for the next MoU meeting (ADB-NN1-WCS)		-	<u>In progress:</u> - NNP1PC proposes to organize the next MoU meeting after receiving guidance as outlined in point 3 of the escalation letter.
12	Next joint ADB-LTA-IAP mission	Agree on the dates for the next mission.		-	<u>In progress:</u> - NNP1PC proposes: ➤ 4 October 2023 for an online mission to follow up on the CAP. ➤ 1-6 May 2024 for an onsite mission of the environmental and social teams. Hopefully, the roads to the offset site still be accessible.

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

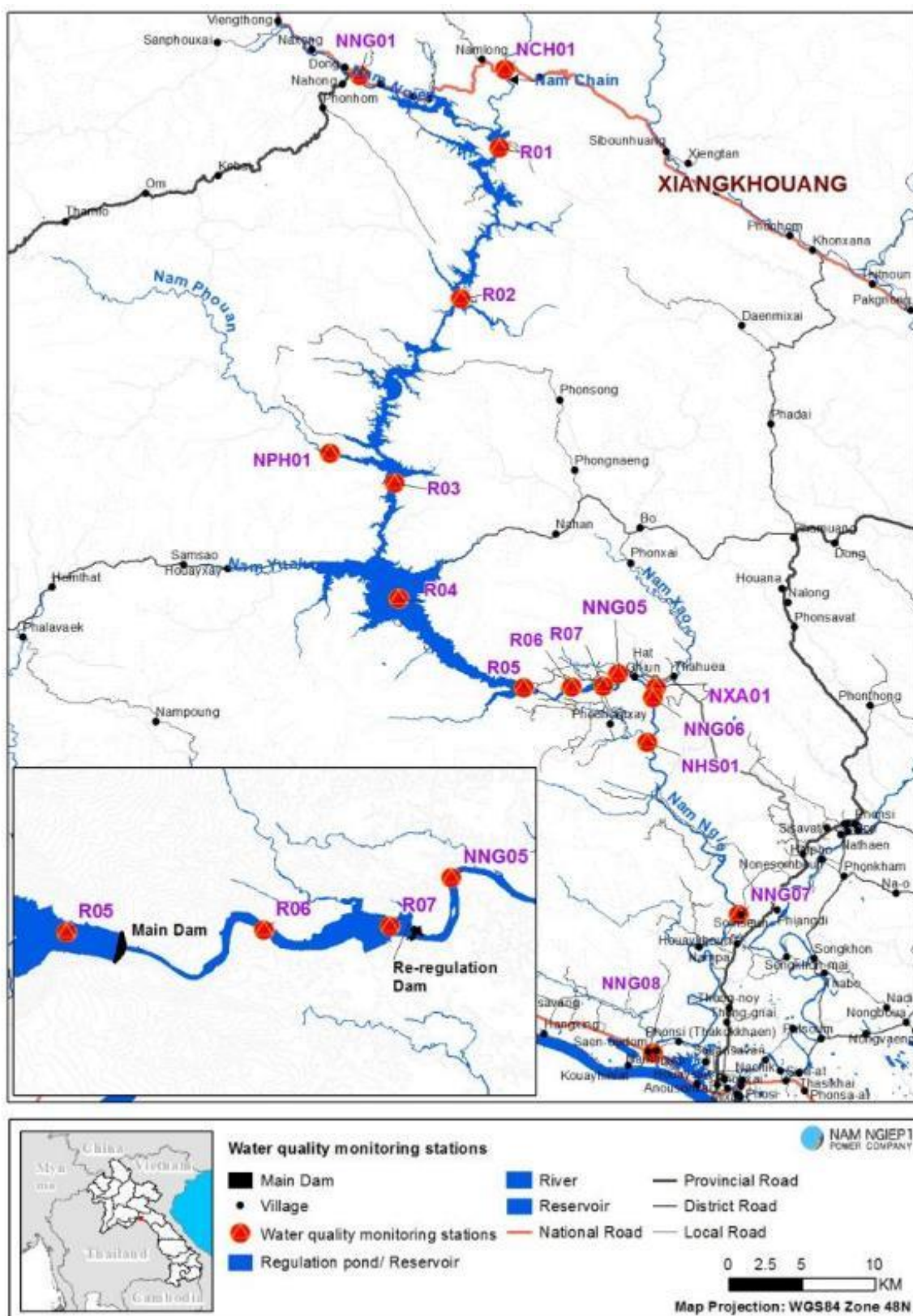
SITE CODES AND LOCATION STATION FOR SURFACE WATER QUALITY MONITORING

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

MONITORING FREQUENCY FOR SURFACE WATER QUALITY PARAMETERS

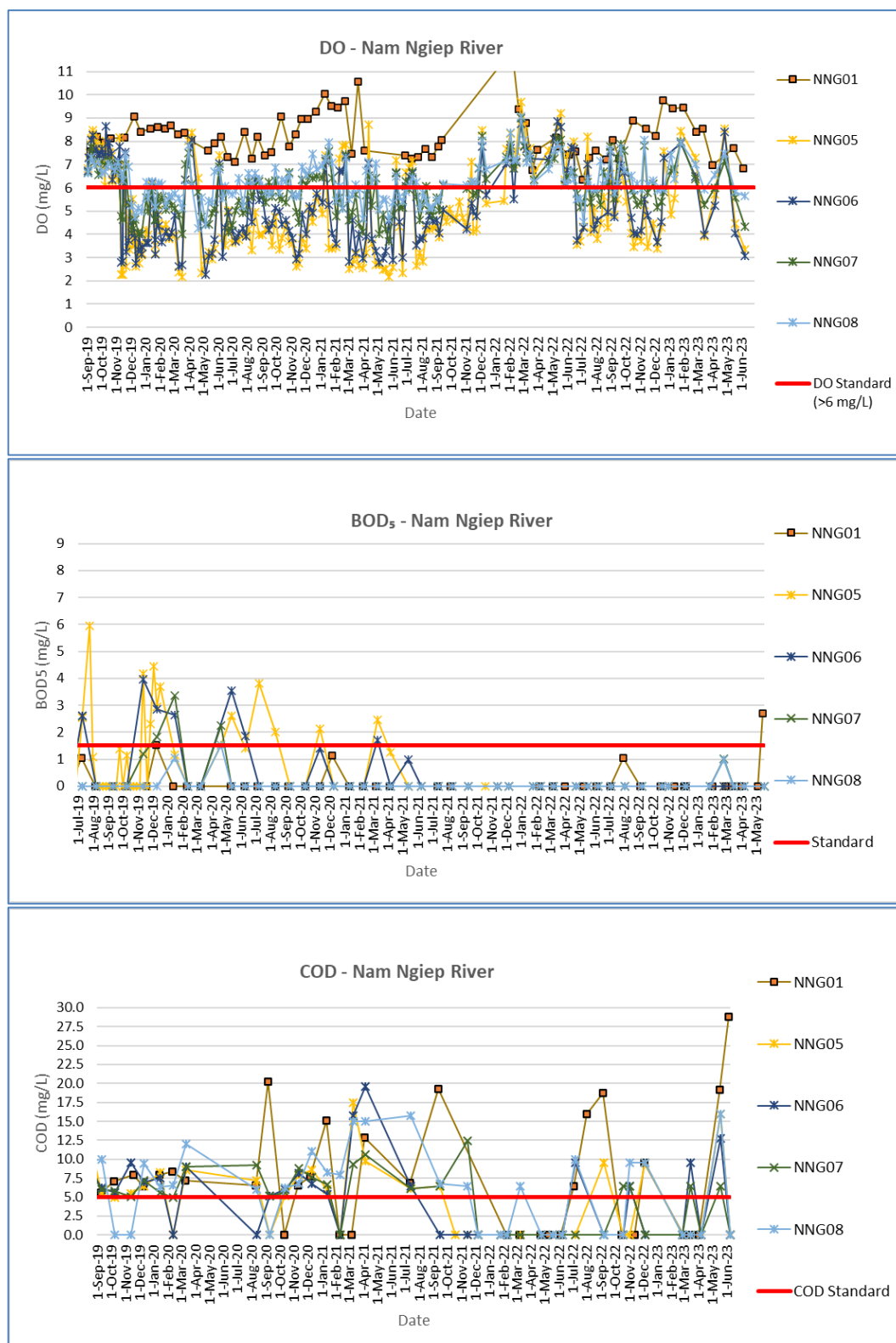
Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/L), Conductivity (µs/cm), Temperature (°C), Turbidity (NTU).	- Main Reservoir: R01, R02, R03, R04, R05; - Re-regulation Reservoir: R06 and R07.
Monthly	pH, DO (%), DO (mg/L), Conductivity (µs/cm), Temperature (°C), Turbidity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

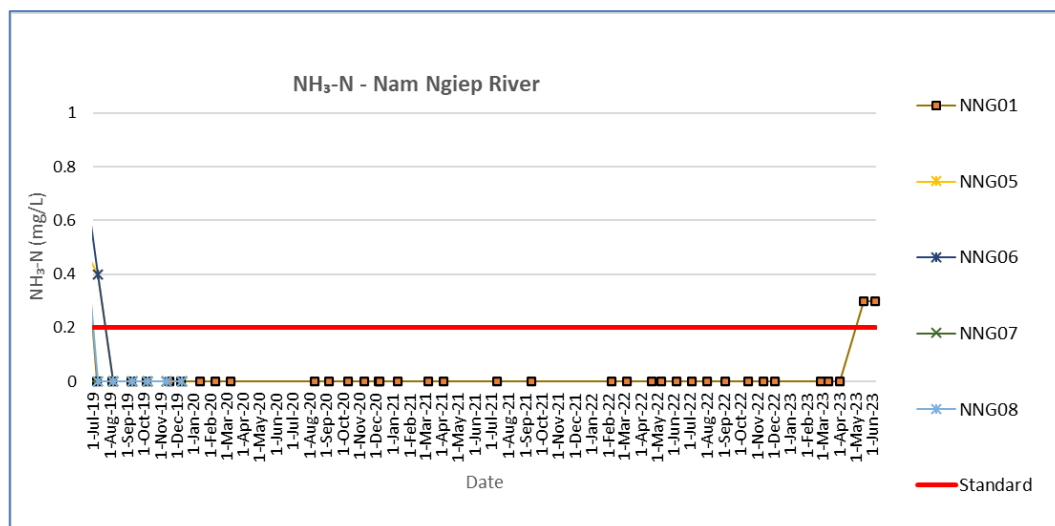
SURFACE WATER QUALITY MONITORING LOCATIONS



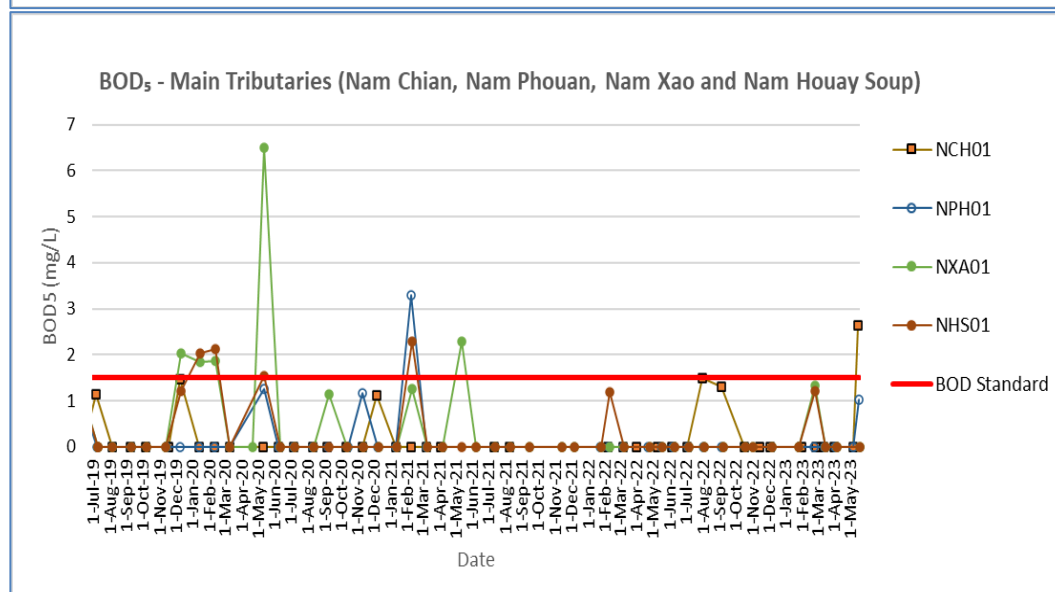
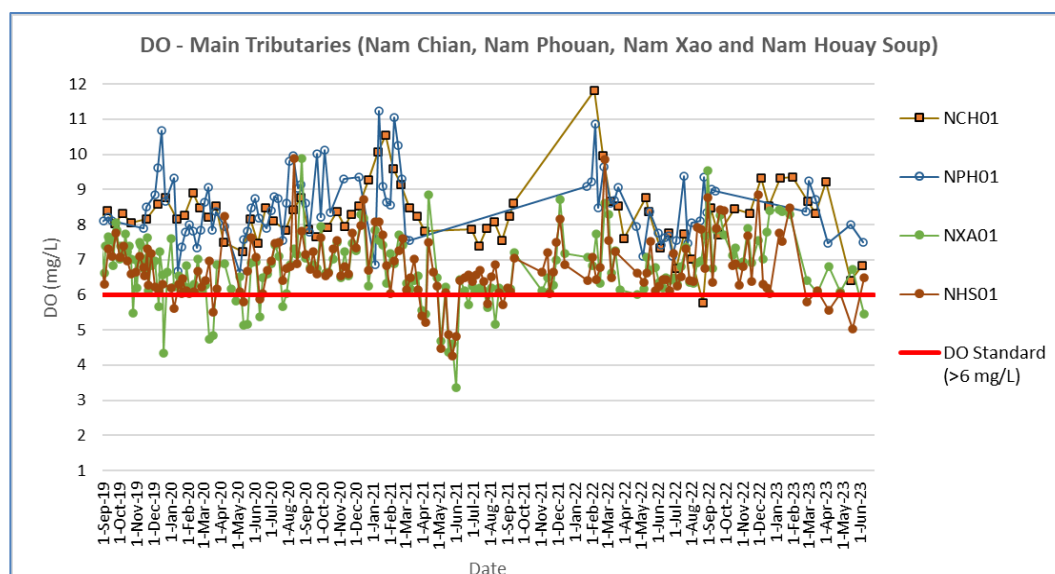
APPENDIX 3: KEY TRENDS OF WATER QUALITY MONITORING FROM JANUARY 2020 TO END OF JUNE 2023 (ONLY PARAMETERS THAT EXCEEDED THE STANDARDS)

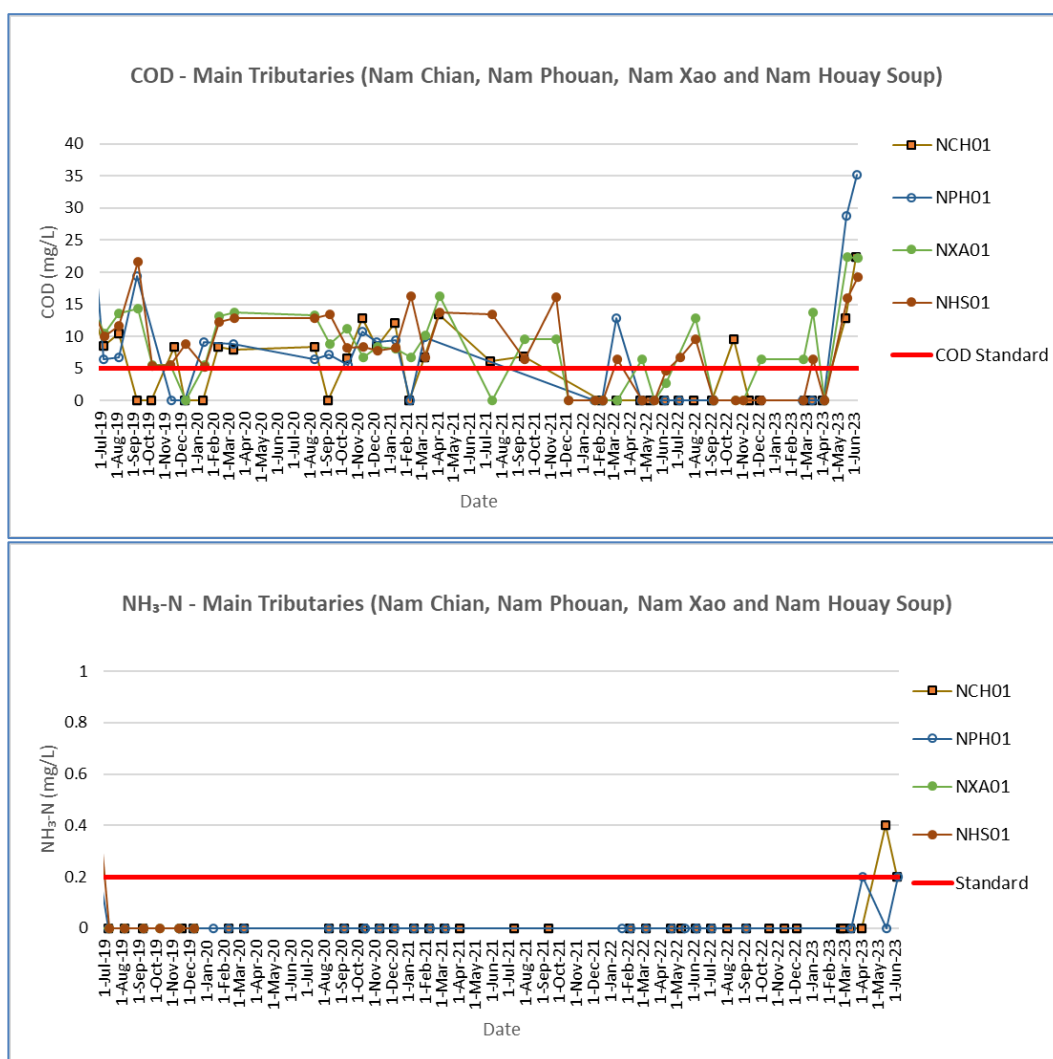
Nam Ngiep Surface Water



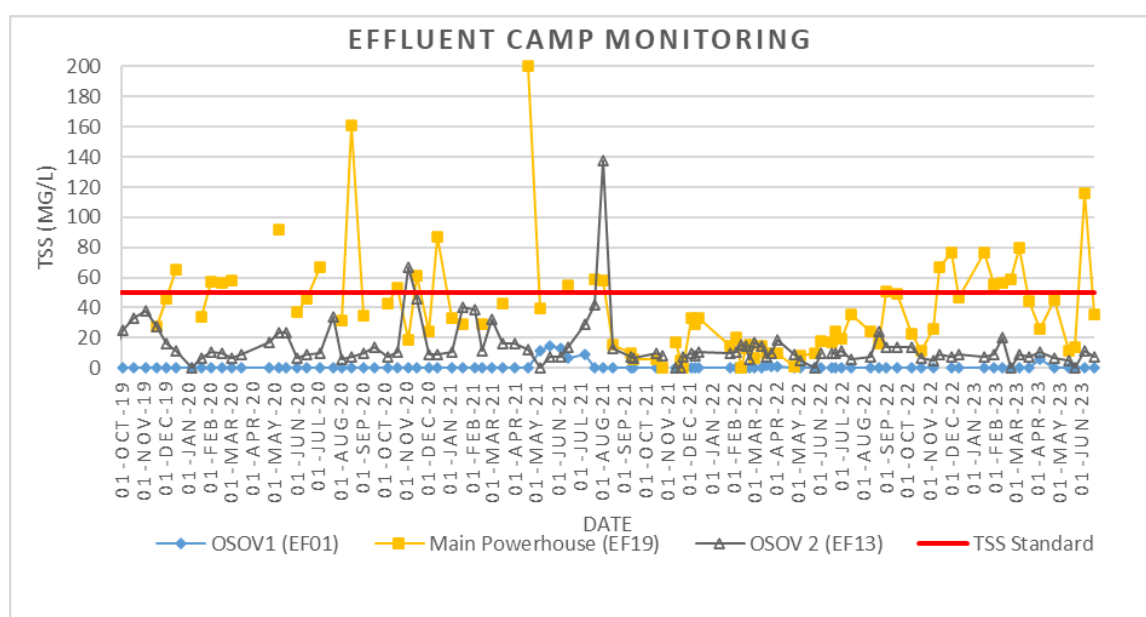


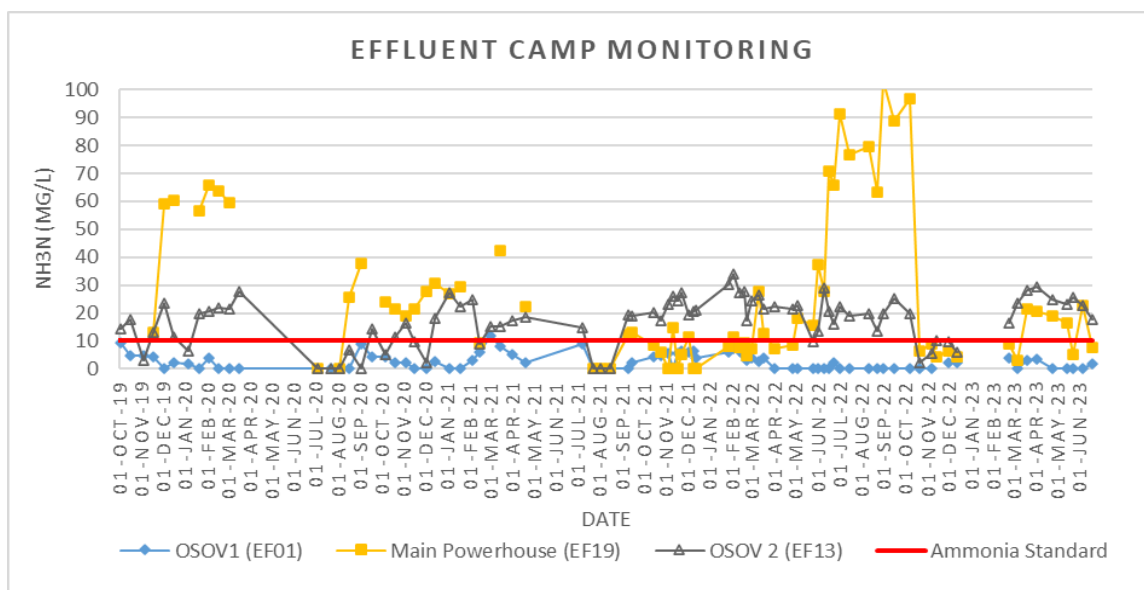
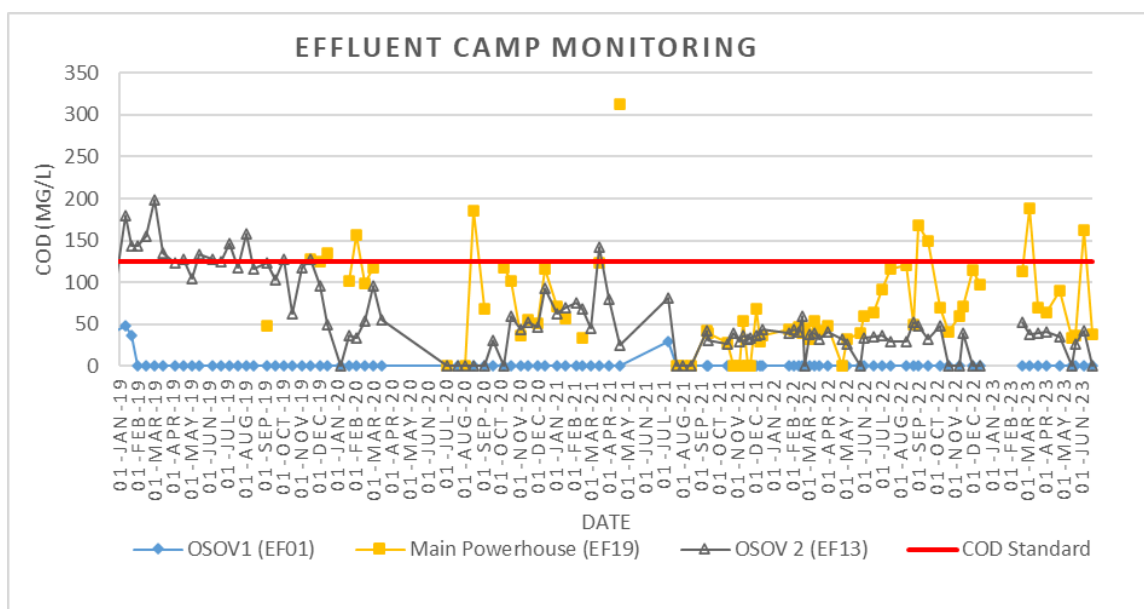
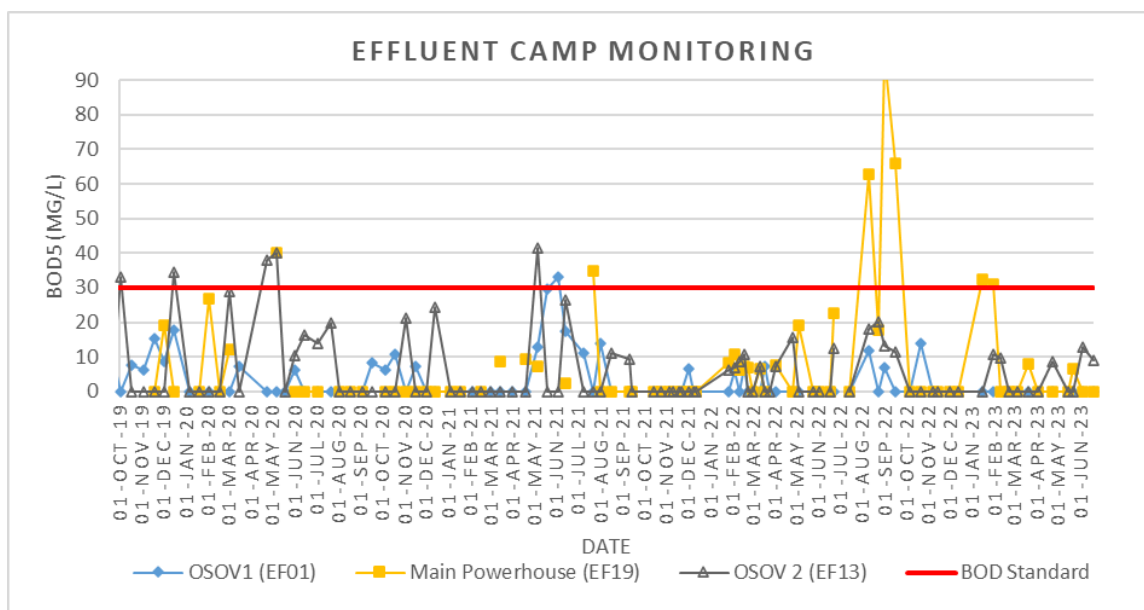
Key Water Quality Parameters for the Nam Ngiep Tributaries: Nam Chian, Nam Phouan, Nam Xao, Nam Houay Soup

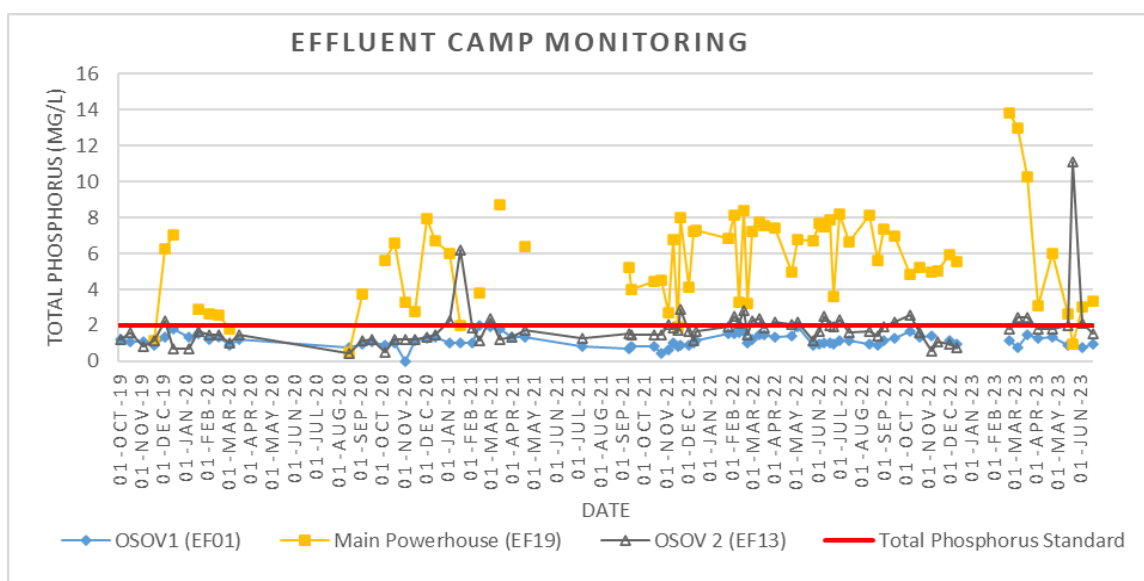
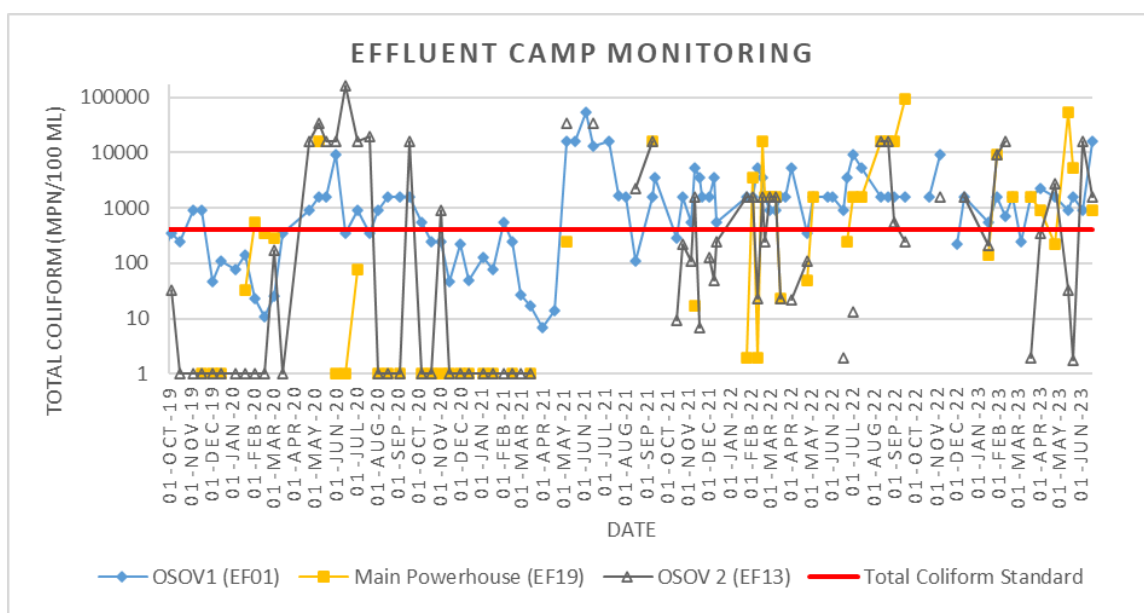
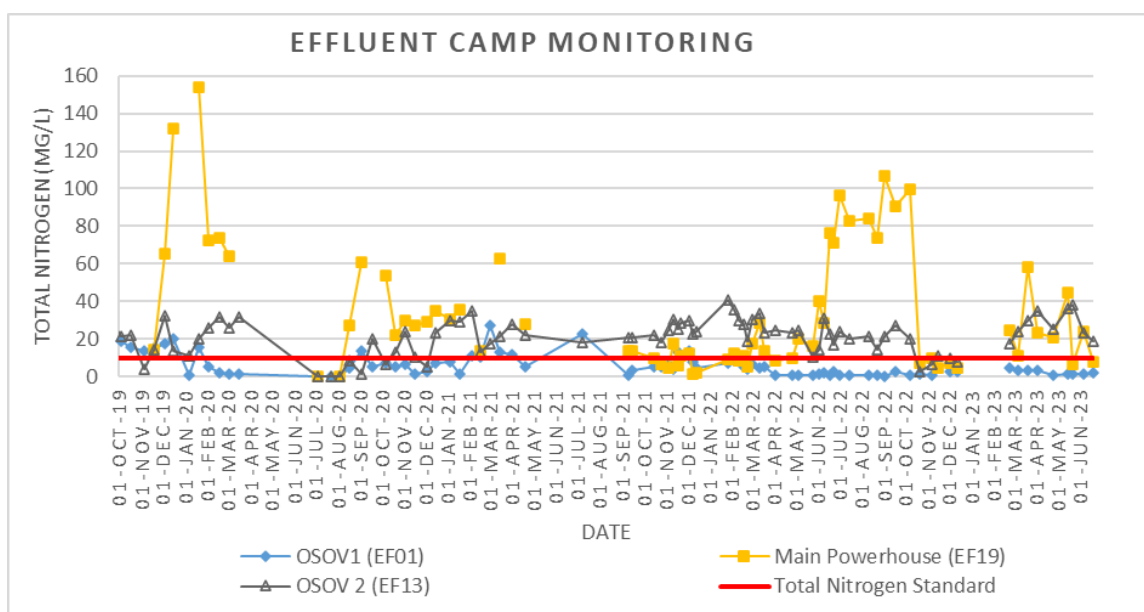




Camps' Effluent Water Quality Trends (Since October 2019 – June 2023)







APPENDIX 4: WATER QUALITY MONITORING DATA**APPENDIX 4-1: SURFACE WATER QUALITY MONITORING – Q2 2023**

		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																
2-Apr-23	pH	5.0 - 9.0	6.92												7.1			
4-Apr-23	pH	5.0 - 9.0		6.72	6.64	6.55										6.95		
5-Apr-23	pH	5.0 - 9.0					6.6	6.73	6.6	6.5								
7-Apr-23	pH	5.0 - 9.0									6.63	6.69	6.78	6.89			7.05	6.5
10-Apr-23	pH	5.0 - 9.0		7.02	6.8	6.6												
11-Apr-23	pH	5.0 - 9.0					6.68	6.75	6.85	8.94								
26-Apr-23	pH	5.0 - 9.0					6.76	6.8	6.8	6.93								
27-Apr-23	pH	5.0 - 9.0									6.83	6.9	7.08	7.16			7.26	7.1
2-May-23	pH	5.0 - 9.0		7.15	6.7	6.65												
3-May-23	pH	5.0 - 9.0					6.65	6.79	6.88	6.9								
9-May-23	pH	5.0 - 9.0		6.88	6.74	6.6												
10-May-23	pH	5.0 - 9.0					6.57	6.71	6.85	6.77								
16-May-23	pH	5.0 - 9.0	6.74												6.91			
17-May-23	pH	5.0 - 9.0		6.92	6.79	6.65										7.15		
18-May-23	pH	5.0 - 9.0					6.88	6.9	6.6	6.85								
19-May-23	pH	5.0 - 9.0									6.52	6.63	6.85	6.96			7.12	6.9
24-May-23	pH	5.0 - 9.0					6.55	6.73	6.87	6.91								
25-May-23	pH	5.0 - 9.0		6.57	6.7	6.66												
29-May-23	pH	5.0 - 9.0					6.8	6.88	6.58	6.67								
30-May-23	pH	5.0 - 9.0		6.8	6.77	6.72												
6-Jun-23	pH	5.0 - 9.0	6.48												6.83			
7-Jun-23	pH	5.0 - 9.0		6.92	6.76	6.83										7.1		
8-Jun-23	pH	5.0 - 9.0					6.56	6.75	6.87	6.94								
9-Jun-23	pH	5.0 - 9.0									6.63	6.75	6.85	7.02			7.22	6.98

		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																
13-Jun-23	pH	5.0 - 9.0		6.91	6.85	6.74												
14-Jun-23	pH	5.0 - 9.0					6.55	6.45	6.77	6.83								
20-Jun-23	pH	5.0 - 9.0		7.3	6.65	6.6												
21-Jun-23	pH	5.0 - 9.0					6.4	6.45	6.3	6.35								
27-Jun-23	pH	5.0 - 9.0					6.65	6.6	6.7	6.76								
28-Jun-23	pH	5.0 - 9.0		6.95	6.5	6.55												
2-Apr-23	Sat. DO (%)		82.4											112.2				
4-Apr-23	Sat. DO (%)			92.9	103.7	97.7									93.1			
5-Apr-23	Sat. DO (%)						105.6	103.4	37.5	39								
7-Apr-23	Sat. DO (%)										68.3	62.1	71.5	79			87.3	66.9
10-Apr-23	Sat. DO (%)			96	115.9	113.1												
11-Apr-23	Sat. DO (%)						117	116.9	34.1	36.9								
26-Apr-23	Sat. DO (%)						103.9	104.7	29.8	39.1								
27-Apr-23	Sat. DO (%)										102.1	101.2	86.4	91.3			79.7	74.8
2-May-23	Sat. DO (%)			80.4	110.7	108												
3-May-23	Sat. DO (%)						96.6	89.3	23.5	32.9								
9-May-23	Sat. DO (%)			89.3	110.9	111.3												
10-May-23	Sat. DO (%)						118.1	110.1	25.3	26.6								
16-May-23	Sat. DO (%)		97.9												89.4			
17-May-23	Sat. DO (%)			90.7	113	107.3										100.6		
18-May-23	Sat. DO (%)						106.6	111.4	16.8	22.5								
19-May-23	Sat. DO (%)										53.4	49	68.1	71.5			87.3	62.1
24-May-23	Sat. DO (%)						95.4	98.8	14.3	27.8								
25-May-23	Sat. DO (%)			81.5	93.3	97.7												
29-May-23	Sat. DO (%)						111	107.6	18.5	35.4								
30-May-23	Sat. DO (%)			94.1	125.7	128.4												
6-Jun-23	Sat. DO (%)		88.4												96			

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
7-Jun-23	Sat. DO (%)			79.5	95.5	102.2										93.6		
8-Jun-23	Sat. DO (%)						87.7	86.1	22.5	29.2								
9-Jun-23	Sat. DO (%)										40.7	36.7	52.5	69.6			70.3	80.6
13-Jun-23	Sat. DO (%)			75.5	79.9	90.6												
14-Jun-23	Sat. DO (%)						100.1	94.3	41.8	39.8								
20-Jun-23	Sat. DO (%)			90.8	80.8	86.8												
21-Jun-23	Sat. DO (%)						88.3	81	41.6	50.5								
27-Jun-23	Sat. DO (%)						85.6	76.8	30.4	29.4								
28-Jun-23	Sat. DO (%)			78.3	65.5	92.3												
2-Apr-23	DO (mg/L)	>6.0	6.97												9.22			
4-Apr-23	DO (mg/L)	>6.0		7.14	8	7.59										7.47		
5-Apr-23	DO (mg/L)	>6.0					8.32	8.22	3.2	3.27								
7-Apr-23	DO (mg/L)	>6.0																
10-Apr-23	DO (mg/L)	>6.0		7.46	8.88	8.76												
11-Apr-23	DO (mg/L)	>6.0					9.1	9.14	2.9	3.13								
26-Apr-23	DO (mg/L)	>6.0					7.94	8.11	2.57	3.26								
27-Apr-23	DO (mg/L)	>6.0									8.53	8.42	7.14	7.47			6.1	6.05
2-May-23	DO (mg/L)	>6.0		6.43	8.24	8.08												
3-May-23	DO (mg/L)	>6.0					7.38	6.87	1.98	2.76								
9-May-23	DO (mg/L)	>6.0		7.27	8.32	8.35												
10-May-23	DO (mg/L)	>6.0					8.88	8.26	2.14	2.26								
16-May-23	DO (mg/L)	>6.0	7.72												6.42			
17-May-23	DO (mg/L)	>6.0		7.14	8.37	8.08										7.99		
18-May-23	DO (mg/L)	>6.0					8.02	8.39	1.43	1.9								
19-May-23	DO (mg/L)	>6.0									4.47	4.06	5.59	5.82			6.73	5.04
24-May-23	DO (mg/L)	>6.0					7.15	7.45	1.18	2.28								
25-May-23	DO (mg/L)	>6.0		6.64	7.01	7.28												

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline					8.02	7.94	1.53	2.91								
29-May-23	DO (mg/L)	>6.0																
30-May-23	DO (mg/L)	>6.0		7.08	9.1	9.36												
6-Jun-23	DO (mg/L)	>6.0	6.82												6.83			
7-Jun-23	DO (mg/L)	>6.0		6.24	6.99	7.55										7.51		
8-Jun-23	DO (mg/L)	>6.0					6.54	6.47	1.85	2.37								
9-Jun-23	DO (mg/L)	>6.0									3.36	3.07	4.34	5.64			5.45	6.48
13-Jun-23	DO (mg/L)	>6.0		6.16	6.06	6.79												
14-Jun-23	DO (mg/L)	>6.0					7.5	7.18	3.38	3.21								
20-Jun-23	DO (mg/L)	>6.0		6.89	6.14	6.58												
21-Jun-23	DO (mg/L)	>6.0					6.7	6.3	3.35	4.02								
27-Jun-23	DO (mg/L)	>6.0					6.52	5.92	2.45	2.35								
28-Jun-23	DO (mg/L)	>6.0		6.45	5.02	6.87												
2-Apr-23	Conductivity (µs/cm)		108												77			
4-Apr-23	Conductivity (µs/cm)			98	98	83										82		
5-Apr-23	Conductivity (µs/cm)						82	81	88	89								
7-Apr-23	Conductivity (µs/cm)										89	90	89	88			208	29
10-Apr-23	Conductivity (µs/cm)			95	95	84												
11-Apr-23	Conductivity (µs/cm)						82	81	87	88								
26-Apr-23	Conductivity (µs/cm)						82	81	88	87								
27-Apr-23	Conductivity (µs/cm)										86	89	89	87			198	80
2-May-23	Conductivity (µs/cm)			112	96	86												
3-May-23	Conductivity (µs/cm)						82	82	87	87								
9-May-23	Conductivity (µs/cm)			102	97	85												
10-May-23	Conductivity (µs/cm)						82	82	87	86								
16-May-23	Conductivity (µs/cm)		104												121			
17-May-23	Conductivity (µs/cm)			103	102	87										99		
18-May-23	Conductivity (µs/cm)						82	81	88	88								

		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																
19-May-23	Conductivity (µs/cm)										88	89	89	89			171	64
24-May-23	Conductivity (µs/cm)						82	81	88	87								
25-May-23	Conductivity (µs/cm)			103	98	88												
29-May-23	Conductivity (µs/cm)						83	81	89	88								
30-May-23	Conductivity (µs/cm)			124	98	89												
6-Jun-23	Conductivity (µs/cm)		138												37			
7-Jun-23	Conductivity (µs/cm)			98	108	87										85		
8-Jun-23	Conductivity (µs/cm)						82	80	90	88								
9-Jun-23	Conductivity (µs/cm)										89	90	87	83			124	35
13-Jun-23	Conductivity (µs/cm)			88	108	87												
14-Jun-23	Conductivity (µs/cm)						80	80	86	86								
20-Jun-23	Conductivity (µs/cm)			103	101	84												
21-Jun-23	Conductivity (µs/cm)						82	82	85	86								
27-Jun-23	Conductivity (µs/cm)						82	81	88	88								
28-Jun-23	Conductivity (µs/cm)			105	103	87												
2-Apr-23	Temperature (°C)		24.22												25.28			
4-Apr-23	Temperature (°C)			28.98	28.77	28.45										26.44		
5-Apr-23	Temperature (°C)						27.65	27.14	23.39	24.25								
7-Apr-23	Temperature (°C)										24.24	23.99	24.04	24.63			28.23	25.19
10-Apr-23	Temperature (°C)			28.95	29.27	28.62												
11-Apr-23	Temperature (°C)						28.28	28.1	23.46	23.89								
26-Apr-23	Temperature (°C)						29.27	28.52	23.58	24.24								
27-Apr-23	Temperature (°C)										24.2	24.52	24.98	25.53			29.27	26.4
2-May-23	Temperature (°C)			26.81	30.66	30.55												
3-May-23	Temperature (°C)						29.33	28.86	23.73	24.45								
9-May-23	Temperature (°C)			25.71	30.42	30.44												
10-May-23	Temperature (°C)						30.36	30.14	23.79	24.16								

		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-May-23	Temperature (°C)		27.61												33.11			
17-May-23	Temperature (°C)			27.86	30.93	30.16										27.07		
18-May-23	Temperature (°C)						30.22	30.1	24.21	24.95								
19-May-23	Temperature (°C)										24.41	24.9	25.25	25.62			30.38	28.59
24-May-23	Temperature (°C)						30.4	30.22	24.72	25.6								
25-May-23	Temperature (°C)			27.69	30.49	30.85												
29-May-23	Temperature (°C)						32.51	31.34	24.84	25.18								
30-May-23	Temperature (°C)			30.68	32.46	32.24												
6-Jun-23	Temperature (°C)		28.83												26.64			
7-Jun-23	Temperature (°C)			27.97	31.96	31.24										26.63		
8-Jun-23	Temperature (°C)						30.69	30.18	25.26	26.1								
9-Jun-23	Temperature (°C)										25.14	25.23	25.47	25.92			28.52	25.6
13-Jun-23	Temperature (°C)			25.7	29.9	30.4												
14-Jun-23	Temperature (°C)						30.41	29.57	26.1	26.41								
20-Jun-23	Temperature (°C)			26.92	29.76	30.26												
21-Jun-23	Temperature (°C)						29.69	28.75	26.45	27.02								
27-Jun-23	Temperature (°C)						29.55	28.85	26.52	26.75								
28-Jun-23	Temperature (°C)			25.25	29.41	30.62												
2-Apr-23	Turbidity (NTU)		2.52												1.77			
4-Apr-23	Turbidity (NTU)			8.67	2.59	2.97										4.67		
5-Apr-23	Turbidity (NTU)						2.98	1.07	2.08	1.96								
7-Apr-23	Turbidity (NTU)										2	2.24	3.09	8.12			4.49	9.61
10-Apr-23	Turbidity (NTU)			5.7	3.47	1.85												
11-Apr-23	Turbidity (NTU)						1.78	1.32	1.59	1.84								
26-Apr-23	Turbidity (NTU)						2.64	1.42	1.21	1.31								
27-Apr-23	Turbidity (NTU)										1.6	1.8	2.18	5.59			3.13	3.95
2-May-23	Turbidity (NTU)			38.6	2.55	1.51												

		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																
3-May-23	Turbidity (NTU)						2.48	1.66	1.17									
9-May-23	Turbidity (NTU)			112	2.61	2.46												
10-May-23	Turbidity (NTU)						2.98	1.77	1.39	1.43								
16-May-23	Turbidity (NTU)		54.5												53.6			
17-May-23	Turbidity (NTU)			234	10.3	2.75										54.4		
18-May-23	Turbidity (NTU)						2.57	1.84	1.75	1.69								
19-May-23	Turbidity (NTU)										2.69	2.59	2.44	10.2			5.63	4.74
24-May-23	Turbidity (NTU)						3.24	1.91	2.2	2.12								
25-May-23	Turbidity (NTU)			353	6.12	2.72												
29-May-23	Turbidity (NTU)						3.08	1.68	2.6	3.96								
30-May-23	Turbidity (NTU)			862	4.44	2.35												
6-Jun-23	Turbidity (NTU)		878												73.5			
7-Jun-23	Turbidity (NTU)			710	4.36	3.5										134		
8-Jun-23	Turbidity (NTU)						4.21	2.28	1.72	2.5								
9-Jun-23	Turbidity (NTU)										2.4	6.98	9.13	17			115	8.63
13-Jun-23	Turbidity (NTU)			554	9.03	3.06												
14-Jun-23	Turbidity (NTU)						3.42	1.89	1.95	5.88								
20-Jun-23	Turbidity (NTU)			260	3.84	3.56												
21-Jun-23	Turbidity (NTU)						3.5	1.89	2.65	2.74								
27-Jun-23	Turbidity (NTU)						3.98	2.35	1.89	2.96								
28-Jun-23	Turbidity (NTU)																	
2-Apr-23	TSS (mg/L)		<5												<5			
4-Apr-23	TSS (mg/L)			9.8		<5										37.45		
5-Apr-23	TSS (mg/L)						<5	<5	<5	<5								
7-Apr-23	TSS (mg/L)										<5	<5	<5	8.93			<5	9.6
16-May-23	TSS (mg/L)		216												54.76			
17-May-23	TSS (mg/L)			351.6		<5										78.46		

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir					Re-Regulation Reservoir/Within		Downstream					Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
18-May-23	TSS (mg/L)						<5	<5	<5	<5	<5	<5	<5	6.8			<5	<5
19-May-23	TSS (mg/L)						<5	<5	<5	<5								
6-Jun-23	TSS (mg/L)		581												64.29			
7-Jun-23	TSS (mg/L)			802.3		26.52										196.32		
8-Jun-23	TSS (mg/L)						<5	<5	<5	<5								
9-Jun-23	TSS (mg/L)										<5	<5	16.06	<5			58.79	5
2-Apr-23	BOD ₅ (mg/L)	<1.5	<1												<1			
4-Apr-23	BOD ₅ (mg/L)	<1.5		<1		<1										<1		
5-Apr-23	BOD ₅ (mg/L)	<1.5					<1	<1	<1	<1								
7-Apr-23	BOD ₅ (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
16-May-23	BOD ₅ (mg/L)	<1.5	2.71												2.63			
17-May-23	BOD ₅ (mg/L)	<1.5		1.17		<1										1.03		
18-May-23	BOD ₅ (mg/L)	<1.5					<1	<1	<1	<1								
19-May-23	BOD ₅ (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
6-May-23	BOD ₅ (mg/L)	<1.5	<1												<1			
7-May-23	BOD ₅ (mg/L)	<1.5		1.11		<1										<1		
8-May-23	BOD ₅ (mg/L)	<1.5					1.16	<1										
9-May-23	BOD ₅ (mg/L)	<1.5																
2-Apr-23	COD (mg/L)	<5.0	<5												<5			
4-Apr-23	COD (mg/L)	<5.0														<5		
5-Apr-23	COD (mg/L)	<5.0							<5	<5								
7-Apr-23	COD (mg/L)	<5.0									<5	<5	<5	<5			<5	<5
16-May-23	COD (mg/L)	<5.0																
17-May-23	COD (mg/L)	<5.0	19.2												12.8			
18-May-23	COD (mg/L)	<5.0							6.4	12.8						28.8		
19-May-23	COD (mg/L)	<5.0									16	12.8	6.4	16			22.4	16
6-Jun-23	COD (mg/L)	<5.0	28.8												22.4			

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir					Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream		
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
7-Jun-23	COD (mg/L)	<5.0														35.2		
8-Jun-23	COD (mg/L)	<5.0							<5	6.7								
9-Jun-23	COD (mg/L)	<5.0									<5	<5	<5	<5			22.2	19.2
2-Apr-23	NH ₃ -N (mg/L)	<0.2	<0.2												<0.2			
4-Apr-23	NH ₃ -N (mg/L)	<0.2		0.2		<0.2										0.2		
5-Apr-23	NH ₃ -N (mg/L)	<0.2					<0.2	<0.2										
16-May-23	NH ₃ -N (mg/L)	<0.2	0.3												0.4			
17-May-23	NH ₃ -N (mg/L)	<0.2		<0.2		<0.2										<0.2		
18-May-23	NH ₃ -N (mg/L)	<0.2					<0.2	<0.2										
6-Jun-23	NH ₃ -N (mg/L)	<0.2	0.3												0.2			
7-Jun-23	NH ₃ -N (mg/L)	<0.2		0.4		0.6										0.2		
8-Jun-23	NH ₃ -N (mg/L)	<0.2					0.3	<0.2										
2-Apr-23	NO ₃ -N (mg/L)	<5.0	<0.02												<0.02			
4-Apr-23	NO ₃ -N (mg/L)	<5.0		<0.02		<0.02										<0.02		
5-Apr-23	NO ₃ -N (mg/L)	<5.0					<0.02	<0.02										
16-May-23	NO ₃ -N (mg/L)	<5.0	0.33												0.17			
17-May-23	NO ₃ -N (mg/L)	<5.0		0.27		0.06										0.07		
18-May-23	NO ₃ -N (mg/L)	<5.0					0.07	0.06										
6-Jun-23	NO ₃ -N (mg/L)	<5.0	0.17												0.13			
7-Jun-23	NO ₃ -N (mg/L)	<5.0		0.31		0.11										0.12		
8-Jun-23	NO ₃ -N (mg/L)	<5.0					0.1	<0.02										
2-Apr-23	Faecal coliform (MPN/100 mL)	<1,000	33												22			
4-Apr-23	Faecal coliform (MPN/100 mL)	<1,000														5		
7-Apr-23	Faecal coliform (MPN/100 mL)	<1,000									11	8	79	130			110	33

		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-May-23	Faecal coliform (MPN/100 mL)	<1,000	540												130			
17-May-23	Faecal coliform (MPN/100 mL)	<1,000														110		
19-May-23	Faecal coliform (MPN/100 mL)	<1,000									27	22	49	240			540	920
6-Jun-23	Faecal coliform (MPN/100 mL)	<1,000	430												1,600			
7-Jun-23	Faecal coliform (MPN/100 mL)	<1,000														1,600		
9-Jun-23	Faecal coliform (MPN/100 mL)	<1,000									9	11	350	79			350	220
2-Apr-23	Total Coliform (MPN/100 mL)	<5,000	170												79			
4-Apr-23	Total Coliform (MPN/100 mL)	<5,000														14		
7-Apr-23	Total Coliform (MPN/100 mL)	<5,000									27	14	170	220			170	39
16-May-23	Total Coliform (MPN/100 mL)	<5,000	920												540			
17-May-23	Total Coliform (MPN/100 mL)	<5,000														170		
19-May-23	Total Coliform (MPN/100 mL)	<5,000									110	79	79	350			920	1,600
6-Jun-23	Total Coliform (MPN/100 mL)	<5,000	1,600												1,600			
7-Jun-23	Total Coliform (MPN/100 mL)	<5,000														1,600		
9-Jun-23	Total Coliform (MPN/100 mL)	<5,000									220	110	1,600	1,600			1,600	1,600
2-Apr-23	TKN		<1.5												<1.5			
4-Apr-23	TKN			<1.5		<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																
5-Apr-23	TKN						<1.5	<1.5										
16-May-23	TKN		5.1												<1.5			
17-May-23	TKN															<1.5		
18-May-23	TKN						<1.5	<1.5										
6-Jun-23	TKN		5.5												<1.5			
7-Jun-23	TKN			6.2		<1.5										<1.5		
8-Jun-23	TKN						<1.5	<1.5										
2-Apr-23	TOC (mg/L)		1.43												1.02			
4-Apr-23	TOC (mg/L)															2.04		
5-Apr-23	TOC (mg/L)								1.35	1.4								
7-Apr-23	TOC (mg/L)										1.35	1.19	1.52	1.26			2.94	4.35
16-May-23	TOC (mg/L)		3.29												3.25			
18-May-23	TOC (mg/L)								1.11	0.92						3.9		
19-May-23	TOC (mg/L)										1.52	1.43	1.44	1.54			3.86	3.5
6-Jun-23	TOC (mg/L)		11.62												5.9			
7-Jun-23	TOC (mg/L)															14.28		
8-Jun-23	TOC (mg/L)								1.03	1.05								
9-Jun-23	TOC (mg/L)										1.23	1.19	1.52	1.88			5.02	7.59
4-Apr-23	Phytoplankton Biomass (g dry wt/m³)			4.2		0.4												
5-Apr-23	Phytoplankton Biomass (g dry wt/m³)						0.2	2										
2-Apr-23	Total Phosphorus (mg/L)		0.01												0.01			
4-Apr-23	Total Phosphorus (mg/L)			0.02		0.01										0.02		
5-Apr-23	Total Phosphorus (mg/L)						0.01	0.01										

		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-May-23	Total Phosphorus (mg/L)		0.02												0.03			
17-May-23	Total Phosphorus (mg/L)			0.03		0.02										0.03		
18-May-23	Total Phosphorus (mg/L)						0.01	0.01										
6-Jun-23	Total Phosphorus (mg/L)		0.06												0.02			
7-Jun-23	Total Phosphorus (mg/L)			0.06		<0.01										0.05		
8-Jun-23	Total Phosphorus (mg/L)						0.04	<0.01										
2-Apr-23	Total Dissolved Phosphorus (mg/L)		0.01												0.01			
4-Apr-23	Total Dissolved Phosphorus (mg/L)			0.01		<0.01										0.01		
5-Apr-23	Total Dissolved Phosphorus (mg/L)						<0.01	<0.01										
16-May-23	Total Dissolved Phosphorus (mg/L)		<0.01												0.01			
17-May-23	Total Dissolved Phosphorus (mg/L)			0.01		<0.01										0.01		
18-May-23	Total Dissolved Phosphorus (mg/L)						<0.01	<0.01										
6-Jun-23	Total Dissolved Phosphorus (mg/L)		0.02												0.01			
7-Jun-23	Total Dissolved Phosphorus (mg/L)			0.03		<0.01										0.01		
8-Jun-23	Total Dissolved Phosphorus (mg/L)						0.02	<0.01										
4-Apr-23	Hydrogen Sulfide (mg/L)			<0.02		<0.02												
5-Apr-23	Hydrogen Sulfide (mg/L)						<0.02	<0.02										

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						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-Apr-23	Turbidity (NTU)-bottom					15.6												
5-Apr-23	Turbidity (NTU)-bottom						0.97	0.83										
17-May-23	Turbidity (NTU)-bottom					7.67												
18-May-23	Turbidity (NTU)-bottom						1.18	1.21										
4-Apr-23	TSS (mg/L)-bottom					11.09												
5-Apr-23	TSS (mg/L)-bottom						<5	<5										
17-May-23	TSS (mg/L)-bottom					11.4												
18-May-23	TSS (mg/L)-bottom						14.28	<5										
7-Jun-23	TSS (mg/L)-bottom					29.07												
8-Jun-23	TSS (mg/L)-bottom						17.27	6.1										
4-Apr-23	BOD ₅ (mg/L)-bottom					<1												
5-Apr-23	BOD ₅ (mg/L)-bottom						<1	<1										
17-May-23	BOD ₅ (mg/L)-bottom					5.68												
18-May-23	BOD ₅ (mg/L)-bottom						5.18	6.12										
7-Jun-23	BOD ₅ (mg/L)-bottom					6.5										<1		
8-Jun-23	BOD ₅ (mg/L)-bottom						<1	<1										
4-Apr-23	NH ₃ -N (mg/L)-bottom					0.4												
5-Apr-23	NH ₃ -N (mg/L)-bottom						0.4	0.4										
17-May-23	NH ₃ -N (mg/L)-bottom					0.5												
18-May-23	NH ₃ -N (mg/L)-bottom						0.6	0.3										
7-Jun-23	NH ₃ -N (mg/L)-bottom					0.7												
8-Jun-23	NH ₃ -N (mg/L)-bottom						0.8	0.5										
4-Apr-23	NO ₃ -N (mg/L)-bottom					<0.02												
5-Apr-23	NO ₃ -N (mg/L)-bottom						<0.02	<0.02										
17-May-23	NO ₃ -N (mg/L)-bottom					0.07												
18-May-23	NO ₃ -N (mg/L)-bottom						0.06	0.07										

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
7-Jun-23	NO ₃ -N (mg/L)-bottom					0.12												
8-Jun-23	NO ₃ -N (mg/L)-bottom						<0.02	<0.02										
4-Apr-23	TKN-bottom					<1.5												
5-Apr-23	TKN-bottom						<1.5	<1.5										
17-May-23	TKN-bottom					<1.5												
18-May-23	TKN-bottom						<1.5	<1.5										
7-Jun-23	TKN-bottom					<1.5												
8-Jun-23	TKN-bottom						<1.5	<1.5										
4-Apr-23	Total Dissolved Phosphorus (mg/L)-bottom					<0.01												
5-Apr-23	Total Dissolved Phosphorus (mg/L)-bottom						0.03	0.01										
17-May-23	Total Dissolved Phosphorus (mg/L)-bottom					0.01												
18-May-23	Total Dissolved Phosphorus (mg/L)-bottom						0.02	0.05										
7-Jun-23	Total Dissolved Phosphorus (mg/L)-bottom					<0.01												
8-Jun-23	Total Dissolved Phosphorus (mg/L)-bottom						0.05	0.03										
4-Apr-23	Total Phosphorus (mg/L)-bottom					0.01												
5-Apr-23	Total Phosphorus (mg/L)-bottom						0.04	0.01										

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-Regulation Reservoir/Within		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
17-May-23	Total Phosphorus (mg/L)-bottom					0.03												
18-May-23	Total Phosphorus (mg/L)-bottom						0.04	0.08										
7-Jun-23	Total Phosphorus (mg/L)-bottom					0.02												
8-Jun-23	Total Phosphorus (mg/L)-bottom						0.08	0.06										
4-Apr-23	Hydrogen Sulfide (mg/L)-bottom					<0.02												
5-Apr-23	Hydrogen Sulfide (mg/L)-bottom						<0.02	<0.02										
4-Apr-23	Phytoplankton Biomass (g dry wt/m³)-bottom					2.6												
5-Apr-23	Phytoplankton Biomass (g dry wt/m³)-bottom						3.2	0.6										
17-May-23	Chlorophyll-A-bottom					1.64												
18-May-23	Chlorophyll-A-bottom						1.36	0.47										
17-May-23	Chlorophyll-A			4.55		2.31												
18-May-23	Chlorophyll-A						0.94	0.88										
7-Jun-23	Chlorophyll-A					4.01												
8-Jun-23	Chlorophyll-A			0.82			3.06	1.77										

APPENDIX 4-2: EFFLUENT CAMP MONITORING RESULTS – Q2 2023

		Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
03-Apr-23	pH	6.0 - 9.0	7.5	7.12	6.87
24-Apr-23	pH	6.0 - 9.0	6.68	6.86	6.74
15-May-23	pH	6.0 - 9.0	6.86	7.1	6.8
22-May-23	pH	6.0 - 9.0	6.89	7.1	7.3
05-Jun-23	pH	6.0 - 9.0	6.61	6.57	6.82
19-Jun-23	pH	6.0 - 9.0	6.89	6.84	6.6
03-Apr-23	Sat. DO (%)		53	87.7	66.5
24-Apr-23	Sat. DO (%)		65.3	49.9	47.6
15-May-23	Sat. DO (%)		61.8	89.6	51.4
22-May-23	Sat. DO (%)		91.5	116.9	90.6
05-Jun-23	Sat. DO (%)		54.3	73.4	56.8
19-Jun-23	Sat. DO (%)		67.9	72.3	53.8
03-Apr-23	DO (mg/L)		4.13	6.83	4.96
24-Apr-23	DO (mg/L)		4.91	3.91	3.52
15-May-23	DO (mg/L)		4.82	6.97	3.88
22-May-23	DO (mg/L)		6.9	8.85	6.64
05-Jun-23	DO (mg/L)		4.14	5.53	4.25
19-Jun-23	DO (mg/L)		5.39	5.62	4.12
03-Apr-23	Conductivity (µs/cm)		361	646	1564
24-Apr-23	Conductivity (µs/cm)		309	579	1123
15-May-23	Conductivity (µs/cm)		317	570	897
22-May-23	Conductivity (µs/cm)		345	609	815
05-Jun-23	Conductivity (µs/cm)		374	609	1053
19-Jun-23	Conductivity (µs/cm)		308	478	923
03-Apr-23	Temperature (°C)		28.15	28.14	30.32
24-Apr-23	Temperature (°C)		30.39	27.86	31.25
15-May-23	Temperature (°C)		28.16	28.22	30.42
22-May-23	Temperature (°C)		30.06	29.92	31.68
05-Jun-23	Temperature (°C)		29.43	30.21	31.59
19-Jun-23	Temperature (°C)		21.17	28.19	29.26
03-Apr-23	Turbidity (NTU)		2.08	10.7	22.8
24-Apr-23	Turbidity (NTU)		1.23	7.61	28.6
15-May-23	Turbidity (NTU)		1.11	6.15	
22-May-23	Turbidity (NTU)		0.81	6.11	12.5
05-Jun-23	Turbidity (NTU)		2.6	11.1	76.6
19-Jun-23	Turbidity (NTU)		1.34	6.97	24.5
03-Apr-23	TSS (mg/L)	<50	6.2	10.86	25.9
24-Apr-23	TSS (mg/L)	<50	<5	6.8	45.6
15-May-23	TSS (mg/L)	<50	<5	5.2	11.4
22-May-23	TSS (mg/L)	<50	<5	<5	14.01
05-Jun-23	TSS (mg/L)	<50	<5	11.71	116
19-Jun-23	TSS (mg/L)	<50	<5	7.46	35.28
03-Apr-23	BOD ₅ (mg/L)	<30	<6	<6	<6
24-Apr-23	BOD ₅ (mg/L)	<30	<6	8.82	<6
15-May-23	BOD ₅ (mg/L)	<30	<6	<6	<6
22-May-23	BOD ₅ (mg/L)	<30	<6	<6	6.69

		Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
05-Jun-23	BOD ₅ (mg/L)	<30	<6	12.78	<6
19-Jun-23	BOD ₅ (mg/L)	<30	<6	9.06	<6
03-Apr-23	COD (mg/L)	<125	<25	40.5	65
24-Apr-23	COD (mg/L)	<125	<25	35.5	90
15-May-23	COD (mg/L)	<125	<25	<25	34
22-May-23	COD (mg/L)	<125	<25	26.0	36
05-Jun-23	COD (mg/L)	<125	<25	42.5	162
19-Jun-23	COD (mg/L)	<125	<25	<25	38
03-Apr-23	NH ₃ -N (mg/L)	<10.0	3.3	29.4	20.8
24-Apr-23	NH ₃ -N (mg/L)	<10.0	<2	24.7	19.1
15-May-23	NH ₃ -N (mg/L)	<10.0	<10	23.2	16.5
22-May-23	NH ₃ -N (mg/L)	<10.0	<10	25.8	5.2
05-Jun-23	NH ₃ -N (mg/L)	<10.0	<2	22.6	22.7
19-Jun-23	NH ₃ -N (mg/L)	<10.0	1.8	17.8	7.7
03-Apr-23	Total Nitrogen (mg/L)	<10.0	3.6	34.8	23.6
24-Apr-23	Total Nitrogen (mg/L)	<10.0	1.0	25.1	20.6
15-May-23	Total Nitrogen (mg/L)	<10.0	1.5	36.3	44.7
22-May-23	Total Nitrogen (mg/L)	<10.0	1.6	38.1	6.3
05-Jun-23	Total Nitrogen (mg/L)	<10.0	1.4	23.6	24.2
19-Jun-23	Total Nitrogen (mg/L)	<10.0	1.9	19.1	8.0
03-Apr-23	Total Phosphorus (mg/L)	<2	1.28	1.8	3.1
24-Apr-23	Total Phosphorus (mg/L)	<2	1.38	1.8	6.0
15-May-23	Total Phosphorus (mg/L)	<2	0.9	2.0	2.6
22-May-23	Total Phosphorus (mg/L)	<2	0.99	11.1	0.9
05-Jun-23	Total Phosphorus (mg/L)	<2	0.79	2.1	3.0
19-Jun-23	Total Phosphorus (mg/L)	<2	0.98	1.6	3.3
03-Apr-23	Faecal Coliform (MPN/100 mL)	<400	320	140	220
24-Apr-23	Faecal Coliform (MPN/100 mL)	<400	920	1,700	170
15-May-23	Faecal Coliform (MPN/100 mL)	<400	130	0	35,000
22-May-23	Faecal Coliform (MPN/100 mL)	<400	170	0	5,400
05-Jun-23	Faecal Coliform (MPN/100 mL)	<400	240	9,200	0
19-Jun-23	Faecal Coliform (MPN/100 mL)	<400	5,400	1,600	280
03-Apr-23	Total coliform (MPN/100 mL)	<400	2,200	350	920
24-Apr-23	Total coliform (MPN/100 mL)	<400	1,600	2,800	220
15-May-23	Total coliform (MPN/100 mL)	<400	920	33	54,000
22-May-23	Total coliform (MPN/100 mL)	<400	1,600	2	5,400
05-Jun-23	Total coliform (MPN/100 mL)	<400	920	16,000	0
19-Jun-23	Total coliform (MPN/100 mL)	<400	16,000	1,600	920
03-Apr-23	Oil & Grease (mg/L)	<10.0	1.1	<1	1.2
15-May-23	Oil & Grease (mg/L)	<10.0	<1	<1	<1
05-Jun-23	Oil & Grease (mg/L)	<10.0	<1	2	2.5
03-Apr-23	Residual Chlorine (mg/L)	<1.0	N/A	0.30	0.54
24-Apr-23	Residual Chlorine (mg/L)	<1.0	N/A	0.02	0.39
15-May-23	Residual Chlorine (mg/L)	<1.0	N/A	0.68	0.05
22-May-23	Residual Chlorine (mg/L)	<1.0	N/A	0.40	0.05
05-Jun-23	Residual Chlorine (mg/L)	<1.0		0.01	0.23
19-Jun-23	Residual Chlorine (mg/L)	<1.0		0.05	0.55

APPENDIX 4-3: COMMUNITY GROUNDWATER QUALITY MONITORING RESULTS – Q2 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							
02-Apr-23	pH	6.5 - 9.2						6.62	6.77
25-Apr-23	pH	6.5 - 9.2			6.6	6.77	6.89		
26-Apr-23	pH	6.5 - 9.2	6.51	6.52					
10-May-23	pH	6.5 - 9.2	6.55	6.59					
12-May-23	pH	6.5 - 9.2			6.85	6.7	6.45		
16-May-23	pH	6.5 - 9.2						6.55	6.63
06-Jun-23	pH	6.5 - 9.2						6.52	6.7
19-Jun-23	pH	6.5 - 9.2			6.6	6.54	6.71		
22-Jun-23	pH	6.5 - 9.2	6.65	6.6					
02-Apr-23	Sat. DO (%)							82.6	89.5
25-Apr-23	Sat. DO (%)				90.8	98	79.6		
26-Apr-23	Sat. DO (%)		48.5	24.5					
10-May-23	Sat. DO (%)		74.5	68.1					
12-May-23	Sat. DO (%)				76.9	90.4	59.6		
16-May-23	Sat. DO (%)							81.5	112.5
06-Jun-23	Sat. DO (%)							90.3	105.1
19-Jun-23	Sat. DO (%)				74.7	84.4	88		
22-Jun-23	Sat. DO (%)		33	27.2					
02-Apr-23	DO (mg/l)							6.56	7.34
25-Apr-23	DO (mg/l)				7.02	7.65	6.1		
26-Apr-23	DO (mg/l)		3.95	2					
10-May-23	DO (mg/l)		5.96	5.56					
12-May-23	DO (mg/l)				6.06	7	4.46		
16-May-23	DO (mg/l)							6.4	8.96
06-Jun-23	DO (mg/l)							7.11	8.34
19-Jun-23	DO (mg/l)				5.42	6.54	6.91		
22-Jun-23	DO (mg/l)		2.58	2.19					
02-Apr-23	Conductivity (µS/cm)							31	430
25-Apr-23	Conductivity (µS/cm)				419	460	468		
26-Apr-23	Conductivity (µS/cm)		361	503					
10-May-23	Conductivity (µS/cm)		452	492					
12-May-23	Conductivity (µS/cm)				463	457	468		
16-May-23	Conductivity (µS/cm)							31	438
06-Jun-23	Conductivity (µS/cm)							34	444
19-Jun-23	Conductivity (µS/cm)				426	433	368		
22-Jun-23	Conductivity (µS/cm)		461	519					
02-Apr-23	Temperature (°C)							27.23	25.2
25-Apr-23	Temperature (°C)				28.4	27.94	29.31		
26-Apr-23	Temperature (°C)		26.29	25.93					

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							
10-May-23	Temperature (°C)		26.27	25.84					
12-May-23	Temperature (°C)				27.48	28.5	30.47		
16-May-23	Temperature (°C)							27.9	26.96
06-Jun-23	Temperature (°C)							27.69	27.13
19-Jun-23	Temperature (°C)				28.13	28.4	27.74		
22-Jun-23	Temperature (°C)		28.25	26.23					
02-Apr-23	Turbidity (NTU)	<20						4.98	0.6
25-Apr-23	Turbidity (NTU)	<20			2.2	0.36	1.21		
26-Apr-23	Turbidity (NTU)	<20	0.59	1					
10-May-23	Turbidity (NTU)	<20	0.65	0.56					
12-May-23	Turbidity (NTU)	<20			0.65	0.34	0.84		
16-May-23	Turbidity (NTU)	<20						8.35	1.03
06-Jun-23	Turbidity (NTU)	<20						11.8	4.04
19-Jun-23	Turbidity (NTU)	<20			0.66	0.52	7.07		
22-Jun-23	Turbidity (NTU)	<20	23.9	8.01					
02-Apr-23	Fecal coliform (MPN/100ml)	0						0	0
25-Apr-23	Fecal coliform (MPN/100ml)	0			2	0	79		
26-Apr-23	Fecal coliform (MPN/100ml)	0	0	0					
10-May-23	Fecal coliform (MPN/100ml)	0	0	0					
12-May-23	Fecal coliform (MPN/100ml)	0			0	4	27		
16-May-23	Fecal coliform (MPN/100ml)	0						0	0
06-Jun-23	Fecal coliform (MPN/100ml)	0						22	0
19-Jun-23	Fecal coliform (MPN/100ml)	0			0	0	220		
22-Jun-23	Fecal coliform (MPN/100ml)	0	0	0					
02-Apr-23	E.coli Bacteria (MPN/100ml)	0						0	0
25-Apr-23	E.coli Bacteria (MPN/100ml)	0			2	0	14		
26-Apr-23	E.coli Bacteria (MPN/100ml)	0	0	0					
10-May-23	E.coli Bacteria (MPN/100ml)	0	0	0					
12-May-23	E.coli Bacteria (MPN/100ml)	0			0	2	27		
16-May-23	E.coli Bacteria (MPN/100ml)	0						0	0
06-Jun-23	E.coli Bacteria (MPN/100ml)	0						22	0
19-Jun-23	E.coli Bacteria (MPN/100ml)	0			0	0	220		
22-Jun-23	E.coli Bacteria (MPN/100ml)	0	0	0					

APPENDIX 4-4: GRAVITY FED WATER SUPPLY QUALITY MONITORING RESULTS – Q2 2023

		Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline				
25-Apr-23	pH	6.5 - 8.5	6.81	6.58		
10-May-23	pH	6.5 - 8.5	6.32	6.53		
22-Jun-23	pH	6.5 - 8.5	6.9	6.85	7.02	6.98
25-Apr-23	Sat. DO (%)		97.2	95.3		
10-May-23	Sat. DO (%)		88.5	98.6		
22-Jun-23	Sat. DO (%)		89.2	89.9	95.2	88.3
25-Apr-23	DO (mg/L)		7.45	7.12		
10-May-23	DO (mg/L)		6.82	7.54		
22-Jun-23	DO (mg/L)		6.81	6.84	7.57	6.94
25-Apr-23	Conductivity (µS/cm)	<1,000	86	148		
10-May-23	Conductivity (µS/cm)	<1,000	84	129		
22-Jun-23	Conductivity (µS/cm)	<1,000	265	125	14	14
25-Apr-23	Temperature (°C)	<35	28.9	30.57		
10-May-23	Temperature (°C)	<35	28.9	29.2		
22-Jun-23	Temperature (°C)	<35	29.32	29.65	26.97	27.74
25-Apr-23	Turbidity (NTU)	<10	7.68	1.68		
10-May-23	Turbidity (NTU)	<10	4.7	1.38		
11-May-23	Turbidity (NTU)	<10	2.06	3.79	3	1.3
22-Jun-23	Turbidity (NTU)	<10	2.06	3.79	3	1.23
25-Apr-23	Faecal Coliform (MPN/100 mL)	0	27	240		
10-May-23	Faecal Coliform (MPN/100 mL)	0	23	79		
22-Jun-23	Faecal Coliform (MPN/100 mL)	0	14	70	170	46
25-Apr-23	E.coli Bacteria (MPN/100 mL)	0	79	350		
10-May-23	E.coli Bacteria (MPN/100 mL)	0	8	27		
22-Jun-23	E.coli Bacteria (MPN/100 mL)	0	14	49	110	33

APPENDIX 4-5: LANDFILL LEACHATE MONITORING RESULTS – Q2 2023

			Site Name	NNP1 Landfill Leachate		Houay Soup Landfill	
			Location	Pond No.04	Discharge Point	Last pond	Discharged Point
			Station	LL4	LL5	LL6	LL7
			Guideline				
Date	Parameter (Unit)						
15-May-23	pH	6.0-9.0				7.2	
5-Jun-23	pH	6.0-9.0				7.5	
15-May-23	Sat. DO (%)					101.1	
5-Jun-23	Sat. DO (%)					110.4	
15-May-23	DO (mg/L)					7.35	
5-Jun-23	DO (mg/L)					7.8	
15-May-23	Conductivity (µS/cm)					173	
5-Jun-23	Conductivity (µS/cm)					161	
15-May-23	Temperature (°C)					32.24	
5-Jun-23	Temperature (°C)					33.95	
15-May-23	Turbidity (NTU)					36	
5-Jun-23	Turbidity (NTU)					22.3	
15-May-23	BOD5 (mg/L)	<30				9.99	
5-Jun-23	BOD5 (mg/L)	<30				8.58	
15-May-23	COD (mg/L)	<125				68.8	
5-Jun-23	COD (mg/L)	<125				102	
15-May-23	Faecal Coliform (MPN/100mL)	<400				240	
5-Jun-23	Faecal Coliform (MPN/100mL)	<400				4	
15-May-23	Total Coliform (MPN/100mL)	<400				1,600	
5-Jun-23	Total Coliform (MPN/100mL)	<400				49	
15-May-23	Total Nitrogen (mg/L)	<10				2.85	
5-Jun-23	Total Nitrogen (mg/L)	<10				1.04	
15-May-23	Lead (mg/L)	<0.2				<0.01	
15-May-23	Copper (mg/L)					<0.005	
15-May-23	Iron (mg/L)					4.01	
15-May-23	Ammonia nitrogen (mg/L)	<10				<2	
5-Jun-23	Ammonia nitrogen (mg/L)	<10				<2	
15-May-23	Oil & Grease (mg/L)	<10				<1	
5-Jun-23	Oil & Grease (mg/L)	<10				1.1	