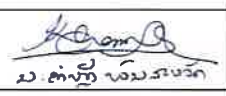
NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Quarterly Environment Monitoring Report
First Quarter of 2022

January to March 2022

A	25 August 2022				Final
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ABBREVIATIONS / ACRONYMS

AIP	Annual Implementation Plan
ADB	Asian Development Bank
BAC	Biodiversity Advisory Committee
BOF	Biodiversity Offset Framework
BOMC	Biodiversity Offset Management Committee
BOMP	Biodiversity Offset Management Plan
BOMU	Biodiversity Offset Management Unit
BSP	Biodiversity Service Provider
CA	Concession Agreement between the NNP1PC and GOL
CAP	Corrective Action Plan
CCA	Community Conservation Agreement
CDP	Community Development Plan
COD	Commercial Operation Date
CVC	Conventional Vibrated Concrete
CWC	Civil Works Contract
DAFO	District Agriculture and Forestry Office
DD	Data Deficient of IUCN conservation status
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
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

1 EXECUTIVE SUMMARY

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

During Q1 2022, NNP1PC continued to develop and improve some pending documents relating to ISO14001:2015 and they were then finalized and approved by the relevant divisions. NNP1PC completed one session training on waste management and safety awareness and two emergency exercises on Fire Fighting and Evacuation and the Hazardous Material Spill Response. The Stage 2 of ISO14001:2015 Certification Audit by SGS was conducted on 21-24 February 2022. Some activities related to the corrective action of the ISO14001:2015 certification audit per the external auditor's recommendations were in progress such as revising and updating the environmental aspects. The official ISO14001:2015 certification is still being processed by the audit company (SGS) and is expected to be submitted to NNP1PC in Q2 2022.

EMO received four Detailed Work Program (DWP) & Site Specific Environmental and Social Management and Monitoring Plans (SS-ESMMP) for review and approval. Two Observations of Non-Compliance (ONCs) and two Non-Compliance Reports (NCRs) were active (two ONCs and one NCR were carried over from last quarter, one NCR was newly opened) during Q1 2022. Out of these, two ONCs and one NCR were resolved, one NCR is unresolved.

The operation and adjustment of the newly constructed wastewater treatment systems continued in Q1 2022. EMO and ADM conducted routine inspections, monitoring and adjustments to identify the factors causing non-compliance with the effluent standards. EMO has reviewed the monitoring results and expects to implement relevant corrective actions in Q2 2022.

During Q1 2022, EMO continued to monitor the progress of revegetation at 31 sites (except borrow pit P1, that was recently occupied by EDL) including the former LILAMA10 camp and the spoil disposal site for Phouhomxay Village irrigation canal that the EMU did not accept during their site visit in January 2021. Finally, the EMU of Bolikhan District had no comments to the ongoing rehabilitation of the construction sites during their mission in January 2022. Due to some rain events during this quarter, germination of seedlings has started. No significant reduction in vegetation coverage and/or increase in erosion were observed.

A total of 64.7 m^3 solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, a decrease of 11.3 m^3 compared with Q4 2021. A total of 68.1 m^3 solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed of at the Houay Soup Landfill, a decrease of 10.7 m^3 compared with Q4 2021. No recyclable waste was stored at the Community Waste Bank with no recyclables received in Q1 2022.

The environmental flow requirements have been monitored in accordance with the ESMMP-OP and the results show full compliance with the requirements, except for the thalweg water depth

measurements that indicated some depths below the required 0.5 m at 5.7 km from the Re-regulation Dam during times with dam discharge less than 30 m^3/s.

The concentration of dissolved oxygen (DO) at the surface level in R05 (Main Reservoir immediately upstream of the main dam) ranged between 6.4 mg/L and 9.6 mg/L. In addition, the DO concentrations in Nam Chiane, Nam Phouan, Nam Xao and Nam Houay Soup were above 6 mg/L.

The DO concentrations at the surface level in the Re-regulation Reservoir (R07) were between 5.3 and 6.8 mg/L.

The DO levels in Nam Ngiep downstream the Re-regulation Dam (NNG05) during the quarter were between 5.4 mg/L and 9.7 mg/L for the first few kilometres gradually increasing to above 6 mg/L over the following 25 km.

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

The management activities as per the approved Watershed Management AIP2021 under the component of forest cover maintenance and reservoir management progressed during this reporting period.

The management activities as per the approved NC-NX Biodiversity Offset Management AIP2021 under the component of law enforcement and community outreach progressed during this reporting period.

The five species that dominated the fish catch by weight in Q1 2022 include one species *Oreochromis niloticus* and four species group of Hampala, *Sikukia gudgeri* and *Amblyrhynchichthys truncates*, *Barbonymus* and *Hypsibarbus*, and *Poropuntius* that are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species, except *Sikukia gudgeri* is classified as Data Deficient species (DD). The recorded catch of threatened species includes three Vulnerable species (VU).

2 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 Bolikhan 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 2022**. 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.

3 ENVIRONMENTAL MANAGEMENT AND MONITORING

The environmental management and monitoring activities reported in this section document the implementation of the relevant sub-plans and programmes of the Environmental and Social Management and Monitoring Plan for the Operation Phase during Q1 2022.

3.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

During Q1 2022, NNP1PC continued to develop and improve some pending documents relating to ISO14001:2015 which were then finalized and approved by the relevant divisions. NNP1PC completed one session training on waste management and safety awareness and two emergency exercises on Fire Fighting and Evacuation and the Hazardous Material Spill Response. The Stage 2 of **ISO14001:2015** Certification Audit by SGS was conducted on 21-24 February 2022. Some activities related to the corrective action of the ISO14001:2015 certification audit per the external auditor's recommendations were in progress such as revising and updating the environmental aspects. At the end of Q1 2022, the official ISO14001:2015 certification was still being processed by the accredited company (SGS) and is expected to be submitted to NNP1PC in Q2 2022.

The progress on establishing the EMS according to **ISO14001:2015** follows the tentative work plan as shown in **Table 3-1**.

TABLE 3-1: *ENVIRONMENTAL MANAGEMENT SYSTEM WORK PLAN*

Item	ISO14001:2015 Work Plan	Year 2020		Year 2021				Year 2022	
		Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	Continue to prepare EMS documents								
2	**NNP1PC Environmental Policy announcement**								
3	NNP1PC ISO Committee establishment								
4	Training relevant staff on: - Requirement and Interpretation of ISO14001:2015 - Organization Context and Risk Management for ISO14001 - ISO14001:2015 Document Information - ISO14001:2015 Internal Audit								
5	Implement the EMS procedures and processes								
6	ISO14001:2015 Internal Audit								
7	Implement the corrective actions and preventive actions according to the Internal Audit								
8	Management Review by NNP1PC Management								
9	ISO 14001:2015 Assessment and Certification Audit – **Stage 1** (***remote audit*** on the documentation review)								
10	Implement the corrective actions and preventive actions according to the Stage 1 Audit								
11	ISO 14001:2015 Assessment and Certification Audit – **Stage 2** (***remote audit, 4 man-days***)								
12	Implement the corrective actions and preventive actions according to the Stage 2 Audit – No Corrective Action Request raised during the Stage 2 Audit								
13	**Certify of ISO14001:2015 with a successful completion of the audit**								
	Completed activities per the plan								
	Plan to achieve the activities								

PHOTOGRAPH 1: WASTE MANAGEMENT AWARENESS AND SAFETY TRAINING


PHOTOGRAPH 2: HAZARDOUS MATERIAL SPILL RESPONSE EXERCISE


PHOTOGRAPH 3: FIRE FIGHTING AND EVACUATION EXERCISE


PHOTOGRAPH 4: STAGE 2 OF ISO14001:2015 ACCREDITATION AUDIT REMOTELY BY SGS (THAILAND)


3.2 CONTRACTOR SS-ESMMPS

During Q1 2022, the Environment Management Office (EMO) of NNP1PC received four Detailed Work Program (DWPs) & Site Specific Environmental and Social Management and Monitoring Plans (SS-ESMMPs), for review and approval. All of these submitted documents were cleared as shown in **Table 3-2** and more details can be found in **Appendix 1**.

TABLE 3-2*: DOCUMENTS REVIEWED DURING Q1 2022*

Document Name	Rev. 1	Rev. 2	Rev. 3	Approved
DWP SS-ESMMP for Repairing of damaged irrigation canal and leveling the Access Roads in PHX Resettlement Village	√	√		√
DWP SS-ESMMP for Remedial Right Bank Abutment of Main Dam	√			√
DWP SS-ESMMP for Monitoring Work	√			√
DWP SS-ESMMP for Maintenance Works 2022	√			√

3.3 RESULTS OF COMPLIANCE INSPECTIONS AT CONSTRUCTION SITES

Due to the Corvid-19 situation and the GOL's lockdown measures continued during Q1 2022, the regular joint site inspections were still suspended at some areas such as at villages and in Zone 2UR during the reporting period. However, the Compliance team conducted joint site inspections at the construction sites for the wastewater treatment system improvement and modification at OSOV1, OSOV2, and the Main Powerhouse including the Main Dam's grouting work and the Contractor's temporary camp (rental houses). EMO issued one Non-Compliance Report (Level 1) to the NNP1PC-ADM related to the continued non-compliance with some effluent discharge standards since completion of improvements to the wastewater treatment systems in Q3 2021.

During Q1 2022, EMO conducted weekly independent site inspections and bi-weekly joint site inspections at a total of 14 sites. These included the two sites that are still not fully rehabilitated as previously commented by the EMU, four main operation sites, two temporary contractor camps, three construction sites, two landfills and one construction waste disposal site. An increase of one monitoring site compared with Q4 2021.

Two Observations of Non-Compliance (ONCs) and two Non-Compliance Reports (NCRs) were active (two ONCs and one NCR were carried over from last quarter, one NCR was newly opened) during Q1 2022. Out of these, two ONCs and one NCR were resolved, one NCR is unresolved.

The status of the ONCs and NCRs is summarized in **Table 3-3**, and **Figure 3-1** and **Figure 3-2**. The details of ONCs and NCRs are presented in **Appendix 2** with the progress of corrective actions and its status.

TABLE 3-3: *STATUS OF NON-COMPLIANCE REPORT DURING Q1 2022*

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

FIGURE 3-1*: STATUS OF ONCS DURING Q1 2022*

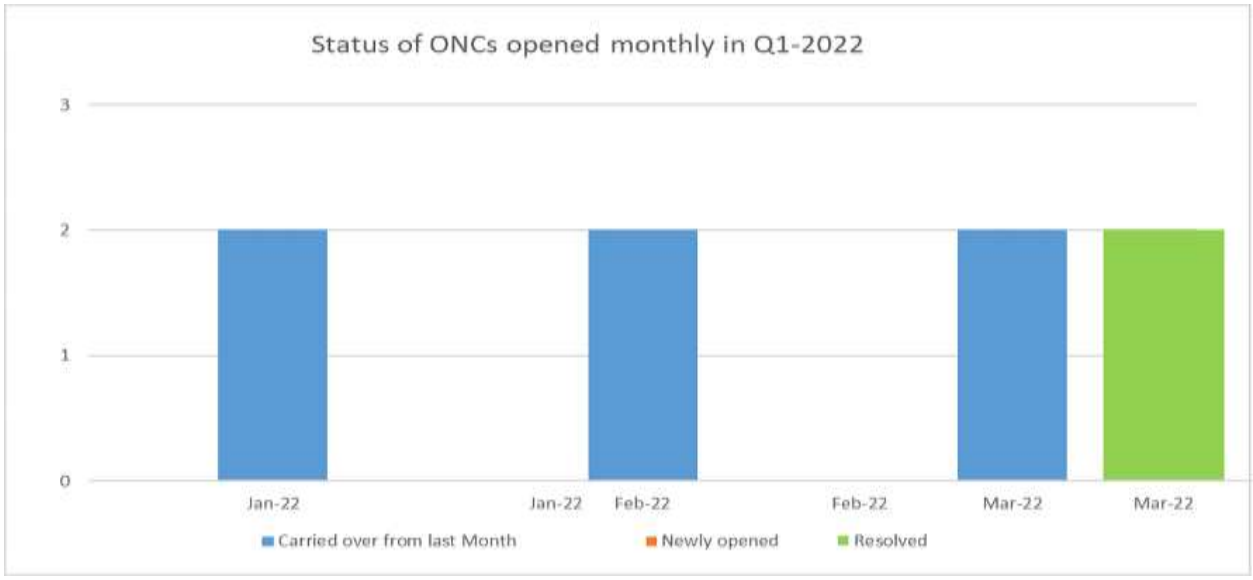
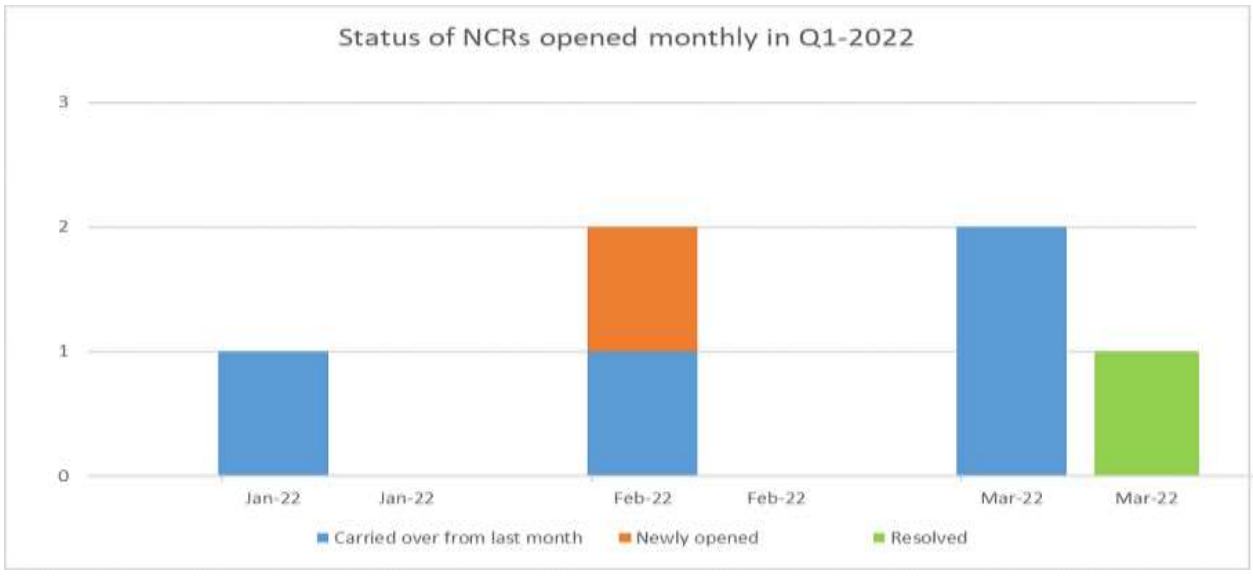


FIGURE 3-2*: STATUS OF NCRS DURING Q1 2022*



PHOTOGRAPH 1: JOINT SITE INSPECTION AND HAZARDOUS MATERIAL MANAGEMENT AUDIT AT RE-REGULATING POWERHOUSE	**PHOTOGRAPH 1: JOINT SITE INSPECTION FOR THE FIRE HYDRANT AT MAIN OSOV1**
	
PHOTOGRAPH 2: SITE INSPECTION AT NNP1PC FUEL STORAGE AREA	**PHOTOGRAPH 3: SITE INSPECTION AT MAIN DAM REMEDIAL ABUTMENT AREA**
	

3.4 RESULTS OF SITE DECOMMISSIONING AND REHABILITATION

During Q1 2022, EMO continued to monitor the progress of revegetation at 31 sites (except for borrow pit P1 that was recently occupied by EDL) including the former LILAMA10 camp and the spoil disposal site for Phouhomxay Village irrigation canal that the EMU did not accept during their site visit in January 2021. Finally, the EMU of Bolikhan District had no comments to the ongoing rehabilitation of the construction sites during their mission in January 2022. Due to some rain events during this quarter, germination of seedlings has started. No significant reduction in vegetation coverage and/or increase in erosion were observed.

The status of site rehabilitation and revegetation is the same as last quarter as summarized in **Table 3-4** and as indicated in **Figure 3-3** and the adjoining photographs in **Figure 3-4**. The next assessment of site rehabilitation and revegetation status is scheduled to be conducted at the end of Q2 2022.

TABLE 3-4: *SUMMARY STATUS OF CONSTRUCTION SITES REHABILITATION AS OF DECEMBER 2021*

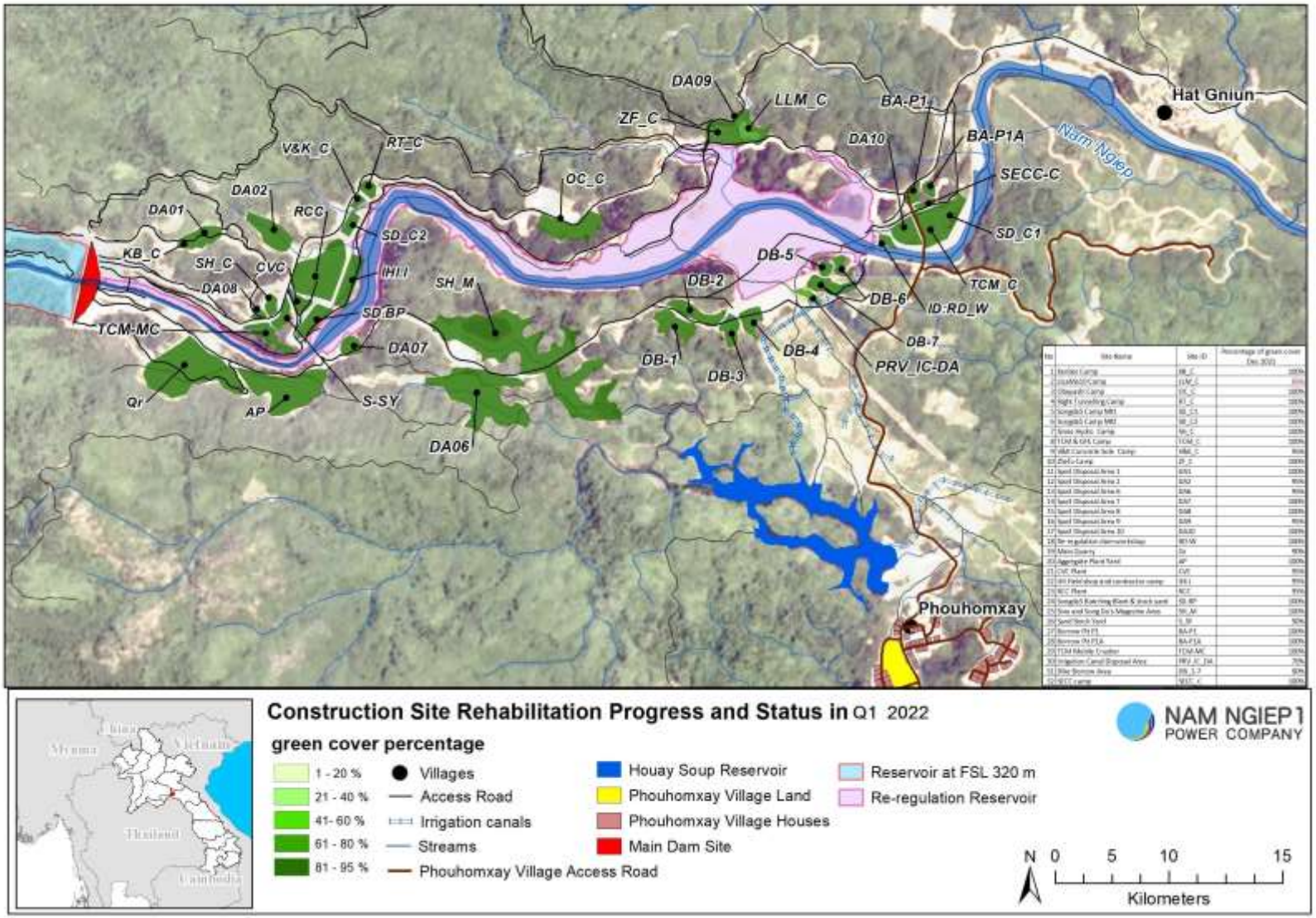
No	Site Name	Status of Decommissioning	Percentage of Vegetation Cover Evaluation					
			Jun-2020	Sep-2020	Dec-2020	Mar-2021	Jun-2021	Sep-2021
01	TCM & GFE Camp	Completed	70%	90%	90%	90%	100%	100%
02	Spoil Disposal Area 7	Completed	-	98%	98%	98%	100%	100%
03	Spoil Disposal Area 9	Completed	-	75%	75%	75%	90%	95%
04	Spoil Disposal Area 10	Completed	80%	95%	95%	95%	100%	100%
05	Borrow Pit P1	No need for decommissioning, it is currently occupied by the EDL	-	95%	95%	95%	100%	100%
06	Borrow Pit P1A	No need for decommissioning	-	80%	80%	80%	95%	100%
07	TCM Mobile Crusher	Completed	-	90%	90%	90%	100%	100%
08	Dike Borrow Areas	No need for decommissioning	-	75%	75%	75%	85%	90%
09	SECC camp	Completed	-	90%	90%	90%	100%	100%
10	KENBER Camp	Completed	80%	95%	95%	95%	100%	100%
11	LILAMA10 Camp	Completed	5%	20%	40%	45%	50%	65%
12	Obayashi Camp	Completed	80%	90%	90%	90%	95	100%
13	Right Tunnelling Camp	Completed	70%	90%	90%	90%	95	100%
14	Songda5 Camp N#1	Completed	90%	98%	98%	98%	100%	100%
15	Songda5 Camp N#2	Completed	80%	95%	95%	95%	100%	100%
16	Sino Hydro Camp	Completed	80%	95%	95%	95%	100%	100%
17	V&K Concrete Sole Camp	Completed	50%	70%	70%	70%	85%	95%
18	Zhefu Camp	Completed	60%	75%	75%	75%	100%	100%
19	Spoil Disposal Area 1	Completed	80%	90%	90%	90%	100%	100%
20	Spoil Disposal Area 2 & main dam workshop	Completed	60%	75%	75%	75%	90%	95%
21	Spoil Disposal Area 6	Completed	70%	75%	75%	75%	90%	95%

No	Site Name	Status of Decommissioning	Percentage of Vegetation Cover Evaluation					
			Jun-2020	Sep-2020	Dec-2020	Mar-2021	Jun-2021	Sep-2021
22	Spoil Disposal Area 8	No need for decommissioning	40%	60%	60%	60%	100%	100%
23	Re-regulation dam workshop	Completed	80%	85%	85%	85%	95%	100%
24	Main Quarry	Completed	50%	70%	70%	70%	85%	90%
25	Aggregate Plant Yard	Completed	80%	85%	85%	85%	95%	100%
26	CVC Plant	Completed	60%	70%	70%	70%	85%	95%
27	IHI Field shop and contractor camp	Completed	70%	85%	85%	85%	95%	95%
28	RCC Plant	Completed	50%	70%	70%	70%	80%	95%
29	Songda5 Batching Plant & Stock yard	Completed	80%	95%	95%	95%	100%	100%
30	Sino and Song Da's Magazine Area	Completed	70%	80%	80%	80%	95%	100%
31	Sand Stock Yard	No need for decommissioning	-	60%	60%	60%	75%	90%
32	Phouhomxay Village's Irrigation Canal Spoil Disposal Area	No need for decommissioning	-	5%	10%	15%	20%	70%

Notes:

- 'No need for decommissioning' means no construction site or installed equipment to be removed.
- The figures in red mean the unsatisfactory revegetation.

FIGURE 3-3*: REVEGETATION SITES MAP DURING Q1 2022*



The photos in **Figure 3-4** below present the vegetation cover of two sites (the former LILAMA10 camp and the Irrigation rock disposal area). The overall status of vegetation cover percentage in Q1 2022 can be said that they are maintained with the same of Q4 2021, but the green colour was slightly changed due to some rain events during this quarter.

FIGURE 3-4*: THE STATUS OF VEGETATION COVER OF THE TWO PENDING SITES DURING Q1 2022 COMPARED WITH THE PREVIOUS QUARTER*

FORMER LILAMA10 CAMP COMPARE Q4 2021 AND Q1 2022	
Q4 2021 **Approx. 65% vegetation cover** 	Q1 2022 **Approx. 65% vegetation cover** 
PHOUHOMXAY VILLAGE'S IRRIGATION CANAL SPOIL DISPOSAL AREA COMPARES Q4 2021 AND Q1 2022	
Q4 2021 **Approx. 70% vegetation cover** 	Q1 2022 **Approx. 70% vegetation cover** 

A handover plan of decommissioned and rehabilitated sites back to the GOL is under preparation. A site inspection and meeting with GoL on the hand-over is scheduled to be held in April 2022.

3.5 WASTE MANAGEMENT AT THE CONSTRUCTION SITES

3.5.1 General Waste Management

A total of 64.7 m^3 solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, a decrease of 11.3 m^3 compared with Q4 2021.

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

Due to the continuation of COVID-19 measures, many local recycling businesses and vendors

have not yet resumed their recyclable waste trading in the areas surrounding the Project. Only some high value recycle waste such as scrap metal and aluminium cans were traded in the surrounding communities in Q1 2022. The amount of recyclable waste managed on site during the reporting period is shown in **Table 3-5**.

TABLE 3-5*: AMOUNTS OF RECYCLABLE WASTE DURING Q1 2022*

Source and Type of Recyclables		Unit	Total in Q1 2022 (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	52	0	**52**
3	Aluminium Can	kg	37	34	**3**
4	Paper/Cardboard	kg	70	0	**70**
5	Glass	kg	42	0	**42**
7	Scrap metal	Kg	5	0	**5**
Sub-Total 2		**kg**	**206**	**34**	**172**
Grand Total 1+2		**kg**	**206**	**34**	**172**

3.5.2 Hazardous Waste Management

The amounts of hazardous waste and hazardous materials that were collected, stored and disposed of during Q1 2022 are shown in **Table 3-6.**

During Q1 2022, no recycle waste and hazardous waste trade in the project area.

TABLE 3-6*: HAZARDOUS MATERIAL AND HAZARDOUS WASTE RECORDED DURING Q1 2022*

No.	Type of Hazardous Material	Unit	Total in Q1 2022	Used/ Disposed	Remaining
1	Diesel	Litre	16,204	10,617	**5,587**
2	Gasoline	Litre	2,950	1,560	**1,390**
3	Lubricant (Turbine oil)	Litre	12,315	207	**12,108**
4	Colour paint	Litre	242	0	**242**
5	Thinner	Litre	7	0	**7**
6	Grease oil	Litre	1,350	0	**1,350**
7	Gear Oil	Litre	216	132	**84**
8	Chlorine Liquid	Litre	93	12	**81**
9	Chlorine Powder	Kg	65	0	**65**
10	Sika	Litre	7	0	**7**
	Type of Hazardous Waste				
11	Used Oil (Hydraulic + Engine)	Litre	272	0	**272**
12	Used oil mixed with water	Litre	920	0	**920**
13	Empty used oil drum/container (drum 200L)	Unit	3	0	**3**

No.	Type of Hazardous Material	Unit	Total in Q1 2022	Used/ Disposed	Remaining
14	Contaminated soil, sawdust and textile material	M3	0.48	0	**0.48**
15	Used tyre	Piece	21	5	**16**
16	Empty used chemical drum/container (drum 20L)	Unit	8	2	**6**
17	Lead acid batteries	Unit	9	0	**9**
18	Empty paint and spray cans	Can	138	8	**130**
19	Halogen/fluorescent bulbs	Unit	263	0	**263**
20	Empty cartridge (Ink)	Piece	176	10	**166**
21	Clinic Waste	Kg	16	8.5	**7.2**

3.5.3 Animal Fodder (Pig Feed) Collection Programme

During Q1 2022, local villagers collected 491 kg food waste from the Owner's Site Office and Village (OSOV) for feeding their animals.

3.5.4 Community Solid Waste Management and Recycling Programme

Due to the continuation of COVID-19 measures, many local recycling businesses and vendors have not yet resumed their recyclable waste trading in the community area. No recycle waste trade activities in the community recycle waste bank with no recyclables received in Q1 2022.

3.5.5 Houay Soup Landfill

During Q1 2022, a total of 68.1 m^3 solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed of at the Houay Soup Landfill, a decrease of 10.7 m^3 compared with Q4 2021. Basic landfill maintenance was carried out which included fixing the fence, cleaning up the open ditches and mowing grass. The contractor also provided waste management awareness trainings to a Host Village (Hat Gniun) and the Resettlement Village (Phouhomxay) with support by EMO team.

Daily Waste collection from village

Daily Waste disposal at Houay Soup Landfill

Waste Management Awareness raising at Phouhomxay Village

Waste Management Awareness raising at Hat Gnuin Village

3.6 RESERVOIR OPERATIONS

3.6.1 Main Reservoir

The water level in the main reservoir and inflow to the reservoir since January 2020 are displayed in the graphs in **Figure 3-6** and **Figure 3-5**.

During Q1 2022, the mean daily inflow to the main reservoir was 50 m^3/s. The minimum daily inflow was 21 m^3/s, maximum daily inflow was recorded at 265 m^3/s, and 25th percentile of 35 m^3/s and 75th percentile of 51 m^3/s. As indicated in **Figure 3-5,** the inflow during the first half of Q1 2022 was lower compared to the same period in 2021 and during the second half of Q1 2022, the inflow was higher than the same period in 2021.

The reservoir water level was very low during the rainy season of 2021 and therefore throughout the Q1 2022 due to the reduction of rainfall in 2021 compared with the previous years.

The water level in the main reservoir decreased with 1.87 m from El. 298.56 m asl (01 January 2022) to El. 296.69 m asl. (14 February 2022) and then increased with 2.71 m to reach 299.4 m asl. at the end of March 2022.

FIGURE 3-5: ***INFLOW TO THE MAIN RESERVOIR***

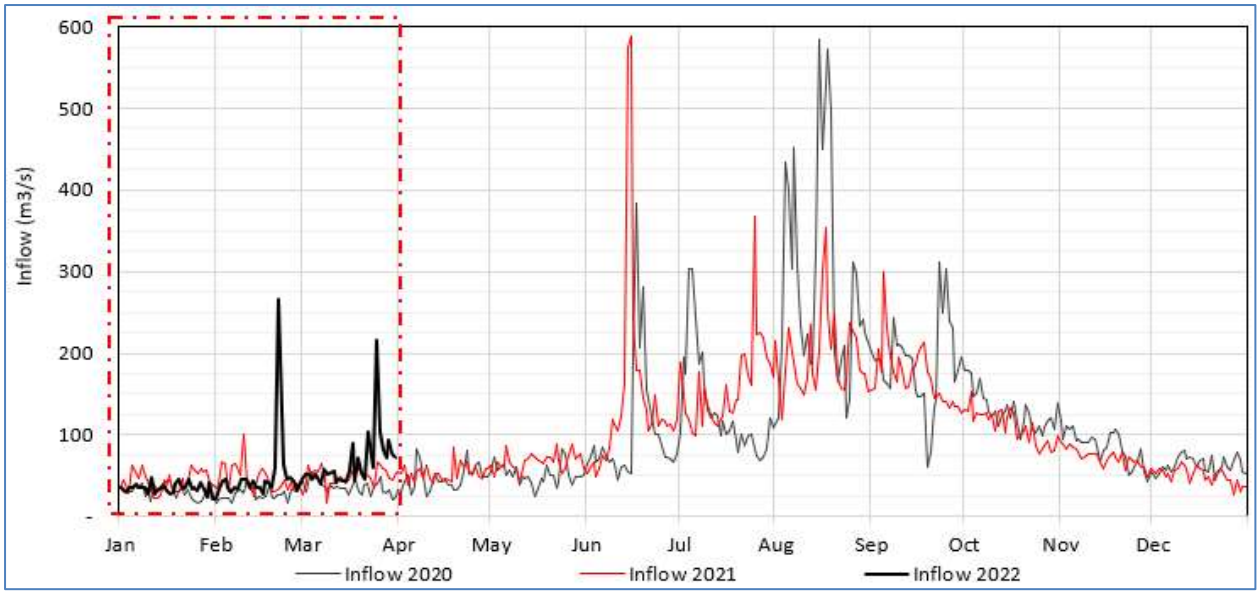
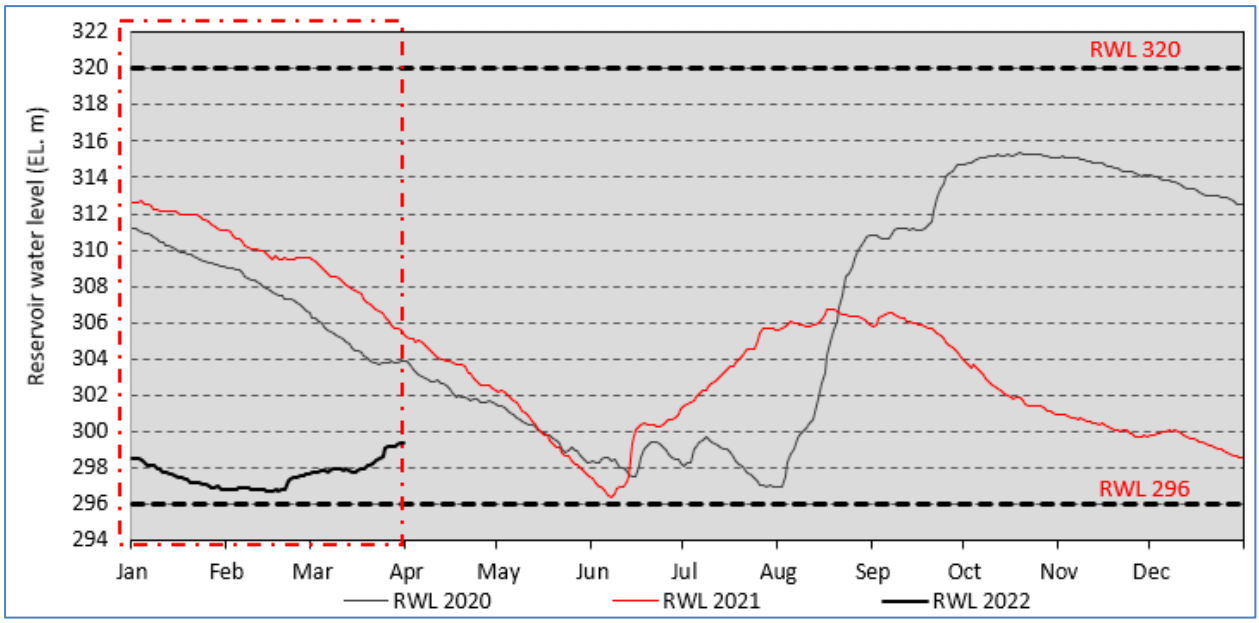


FIGURE 3-6: *WATER LEVEL OF THE MAIN RESERVOIR*



3.6.2 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 Q1 2022 are summarized in **Table 3-7**.

TABLE 3-7: *SUMMARY OF EFRS COMPLIANCE MONITORING IN Q1 2022*

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)	Seven measurements at 4 measuring points located within 5.7 km from the re-regulation dam did not comply during times with dam discharge less than 30 m^3/s
3	Maximum rate of change (both rise and fall, separately) in stage of 0.6 m per hour	100% of hourly fluctuations comply
4	Maximum fluctuation in stage of 1.7 m over 24-hour (this requirement is about range and determines the maximum difference in stage height over 24-hour periods)	100% of 24-hour fluctuations comply
5	Maximum fluctuation in stage of 1.7 m over 7-days (this requirement is about range and determines the maximum difference in stage height over 7-day periods)	All 7-day fluctuations comply

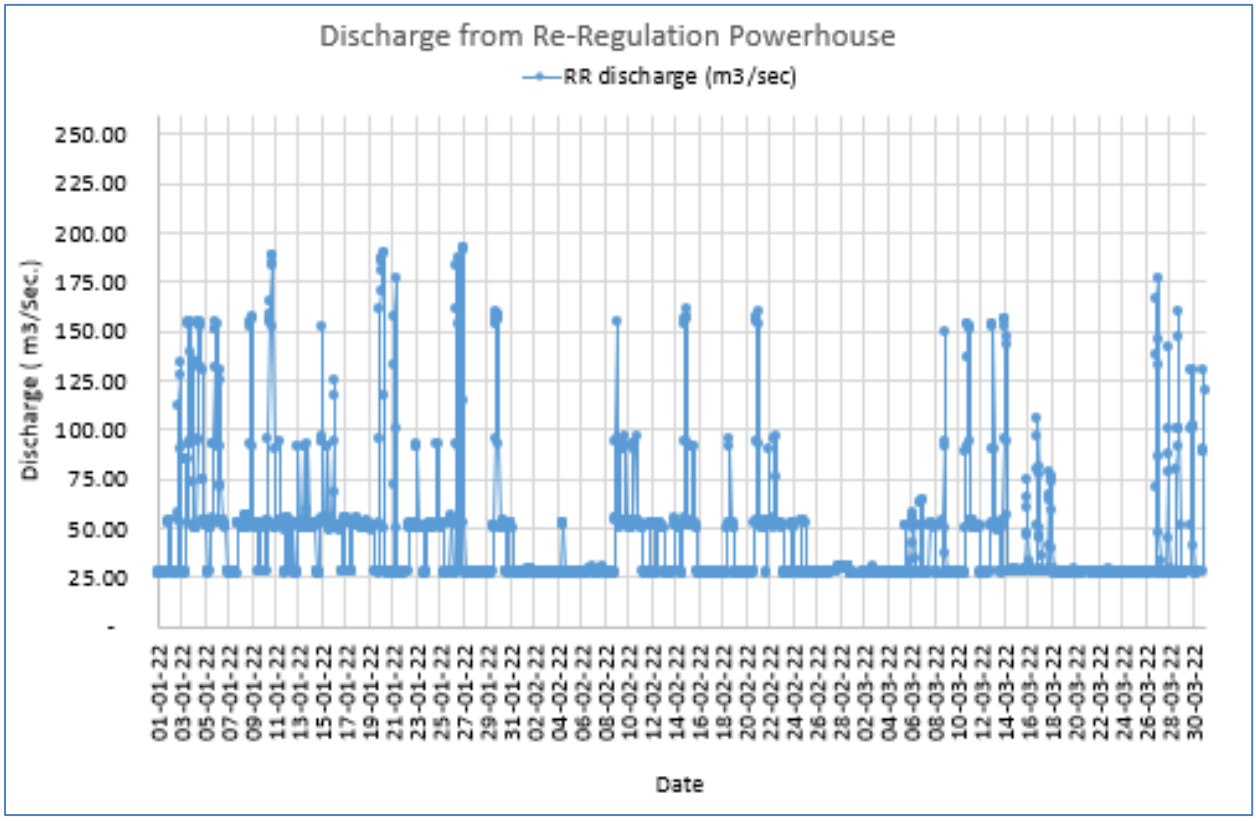
3.6.2.1 Minimum Flow Requirements

The discharge monitoring data for the re-regulation dam during Q1 2022 indicates that the minimum flow requirement of 27 m^3/s has been met at all times. The Re-regulation Dam discharge graph can be found in **Figure 3-7.**

During Q1 2022, the mean discharge from the re-regulation dam was about 55 m^3/s in January 2022 and about 39 m^3/s and 38 m^3/s in February and March 2022 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 3-7: *DISCHARGE FROM THE RE-REGULATION DAM DURING Q1 2022*



3.6.2.2 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 3-8.** 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 were measured across the river channel where visual observations or boat navigation indicate shallow waters to ensure that the measurements represent the river thalweg.

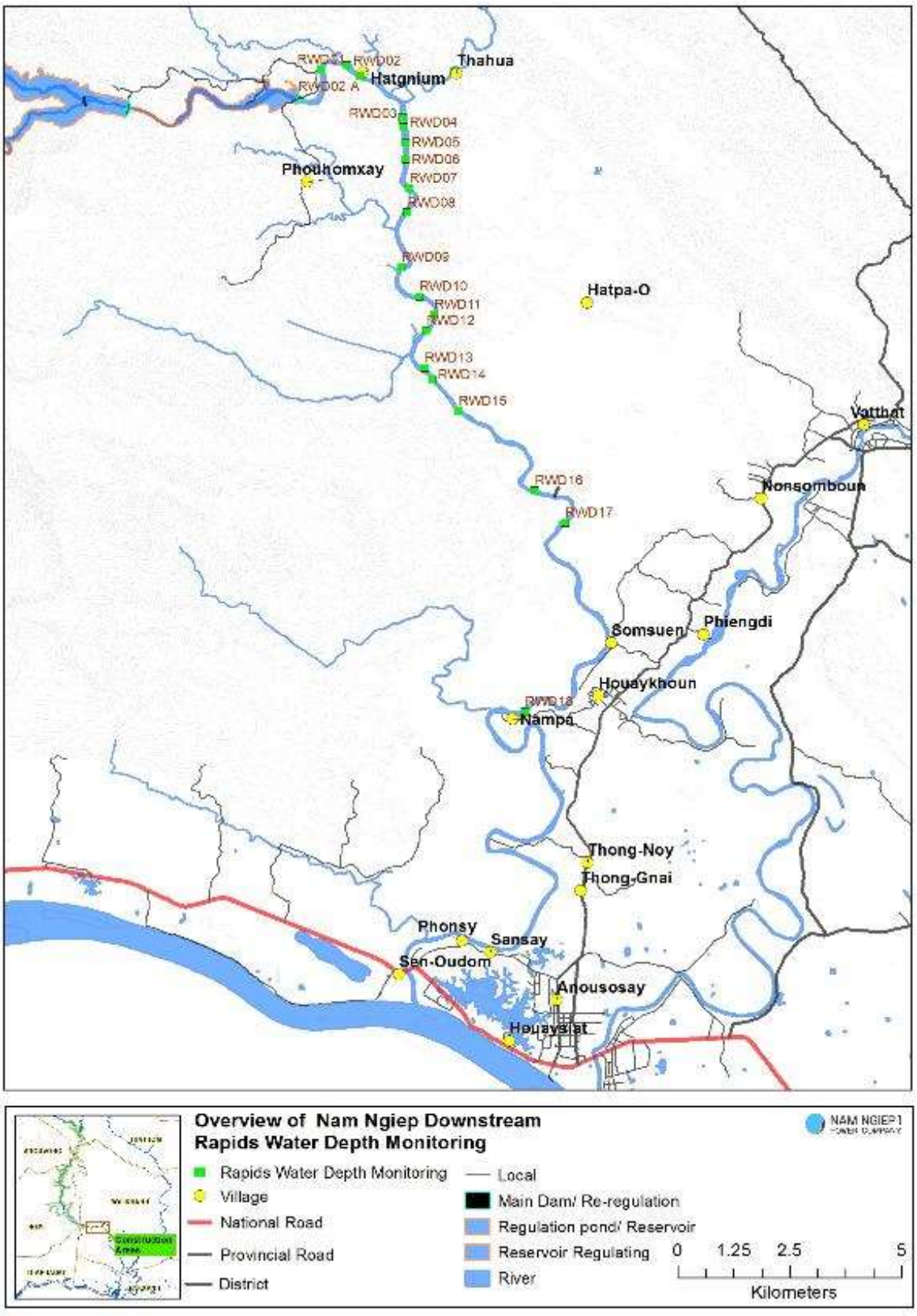
The results of the monitoring during Q1 2022 are presented in **Table 3-8**. The seven monitoring missions at the low discharge (<30 m^3/s) recorded four measuring points located within 5.7 km downstream of the re-regulation dam had a depth of less than 0.5 m but there were no difficulties navigating the boat except a station at RWD05 (5.7 km downstream the Re-regulating Dam). There were no complaints related to the water depth less than 0.5 m downstream the Re-regulation dam during the reporting period.

According to the recommendation by Lenders' Technical Advisor (LTA) during the virtual site visit on 21 to 26 November 2021, NNP1PC will continue to monitor the situation at the critical sites under conditions with discharge of less than 30 m^3/s. NNP1PC plans to modify the riverbed in order to provide a channel for boats to pass these sites in Q2 of 2022.

TABLE 3-8: ***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 (m3/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)
26-Jan-22	52.3	0.70	0.63	0.71	0.75	0.78	0.52	0.79	0.8	0.84	0.82	0.85	0.9	0.88	0.97	1.06	1.16	1.2	1.25	0.8
3-Feb-22	27.5	0.47	0.4	0.48	0.53	0.57	0.30	0.58	0.6	0.68	0.5	0.57	0.65	0.57	0.73	0.85	0.92	0.95	1	0.65
10-Feb-22	27.3	0.45	0.38	0.46	0.51	0.55	0.28	0.56	0.58	0.66	0.53	0.6	0.7	0.65	0.83	0.95	1.05	1.1	1.21	0.8
16-Feb-22	27.1	0.44	0.37	0.45	0.5	0.54	0.27	0.55	0.57	0.65	0.51	0.56	0.64	0.56	0.72	0.84	0.9	0.93	0.98	0.62
25-Feb-22	27.2	0.43	0.36	0.44	0.49	0.53	0.26	0.54	0.56	0.64	0.5	0.55	0.66	0.58	0.74	0.87	0.94	0.97	1.02	0.67
4-Mar-22	28.5	0.43	0.35	0.44	0.48	0.52	0.26	0.55	0.56	0.65	0.51	0.57	0.66	0.59	0.73	0.85	0.92	0.95	1	0.65
10-Mar-22	27.2	0.45	0.37	0.46	0.5	0.54	0.28	0.57	0.58	0.67	0.54	0.6	0.7	0.63	0.77	0.89	0.96	0.99	1.04	0.69
17-Mar-22	28.2	0.48	0.4	0.49	0.53	0.57	0.31	0.6	0.61	0.71	0.6	0.65	0.76	0.69	0.84	0.96	1.03	0.99	1.12	0.76

FIGURE 3-8: ***LOCATION MAP OF RIVER DEPTH MONITORING POINTS***



3.6.2.3 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 0.6 m per hour.
2. Requirements on the range in fluctuations over 24-hour periods and 7-day periods respectively, which is set at a maximum of 1.7 m for both periods. In other words, the range requirements determine the maximum difference in stage height over 24-hour periods and 7-day periods respectively.

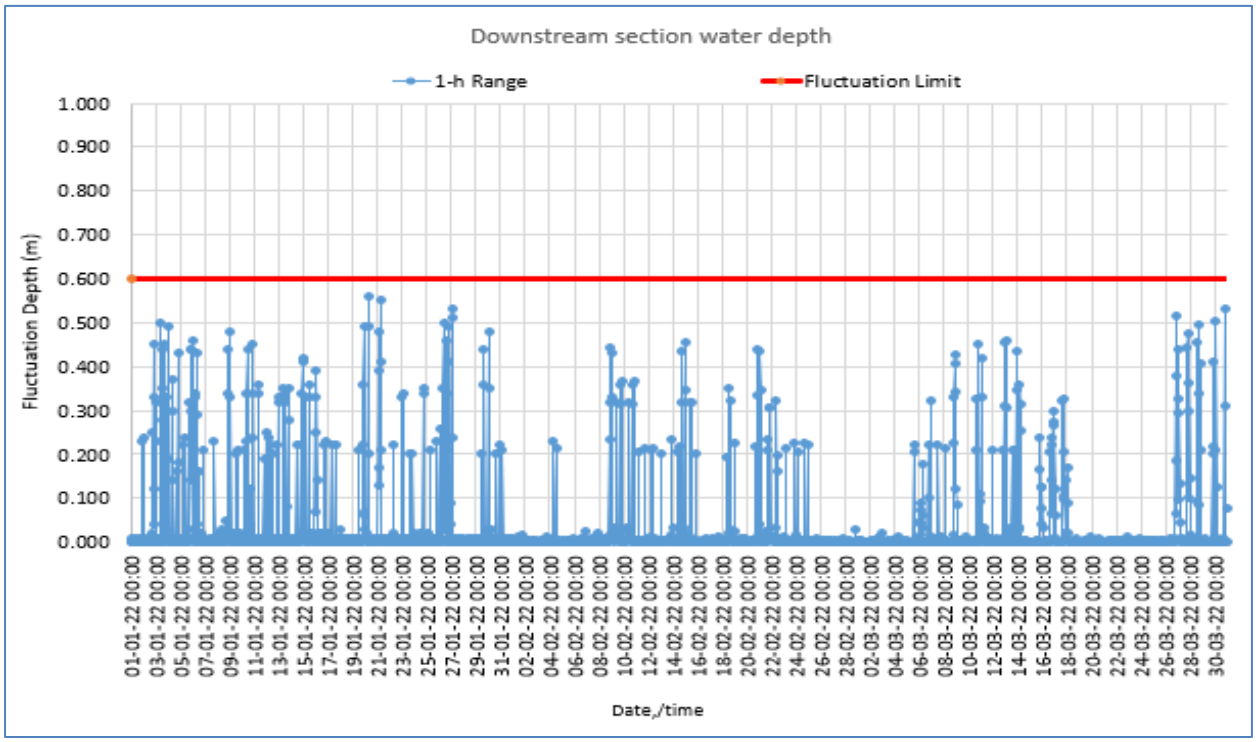
For the 0.6 m in 1-hour maximum fluctuation EFR, the cumulative rises and falls are calculated from the hourly water level recordings.

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

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

During Q1 2022, 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 3-9**.

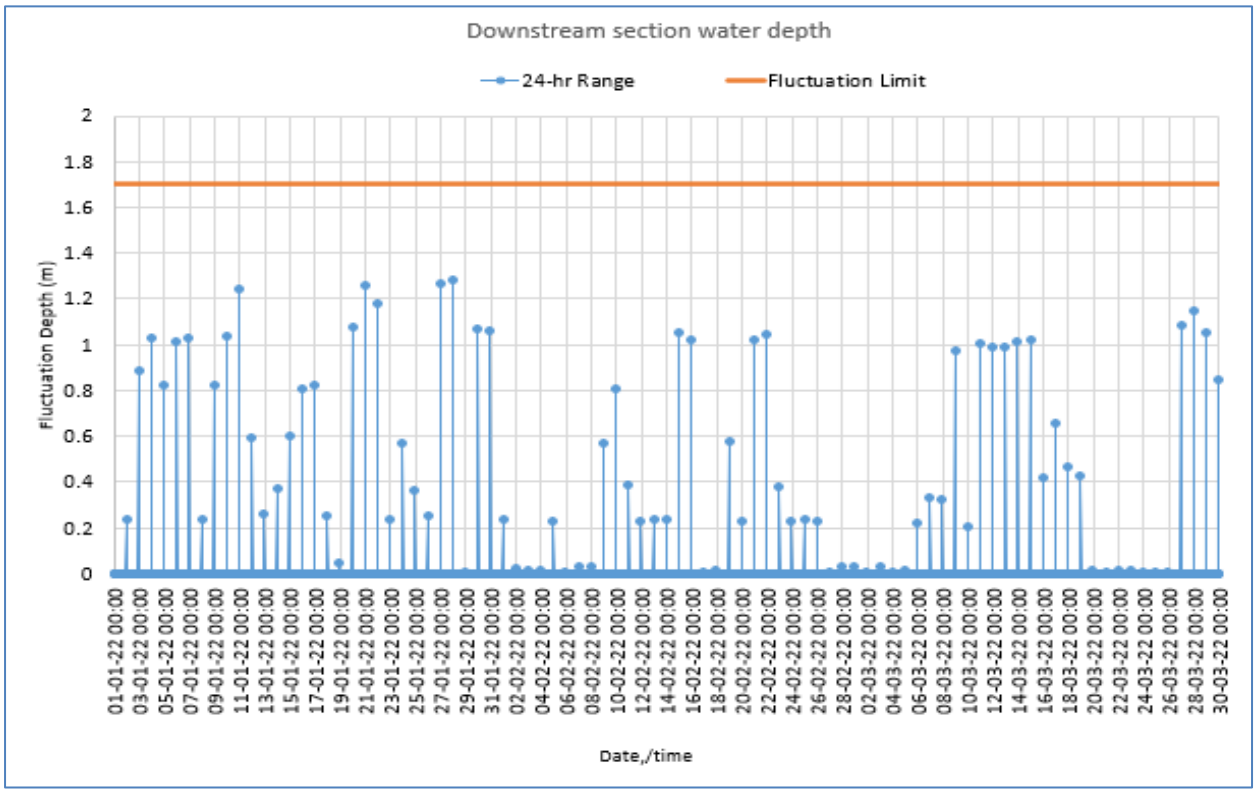
FIGURE 3-9: *HOURLY STAGE HEIGHT FLUCTUATIONS DURING Q1 2022*



During Q1 2022, the maximum range in stage of 1.7 m over 24-hour was complied with for all 24-hour periods (00:00 – 23:00).

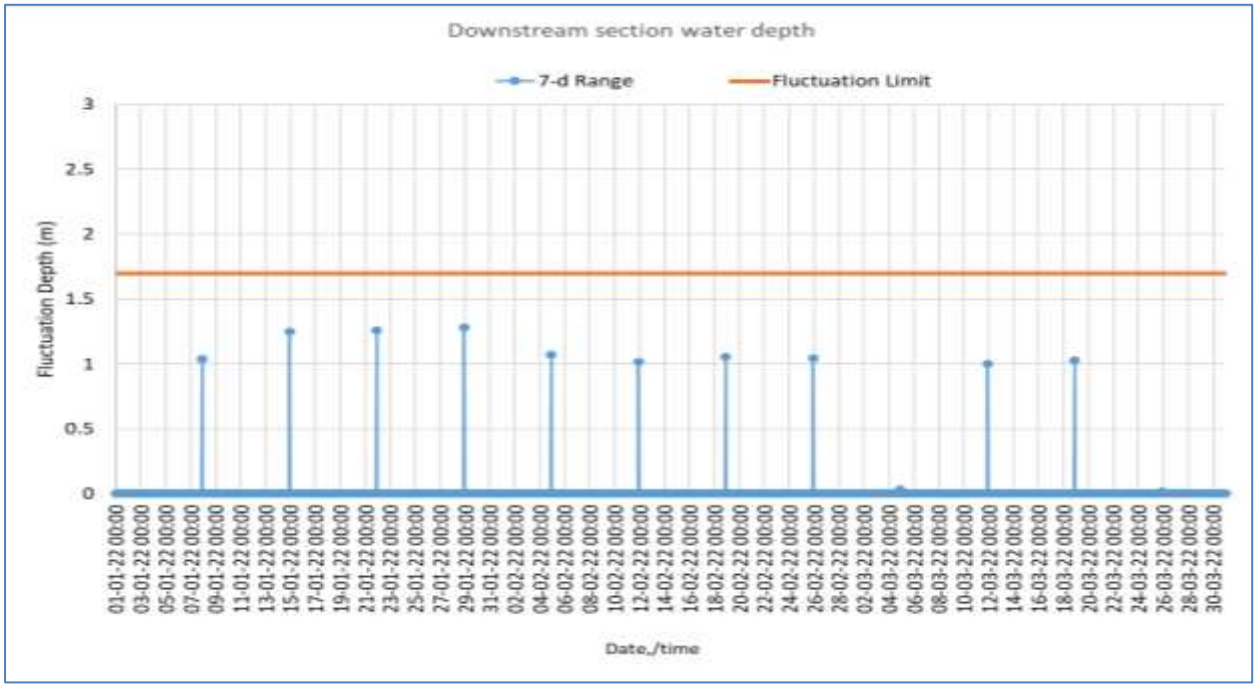
The results of the monitoring are presented in **Figure 3-10.**

FIGURE 3-10: *24-HOUR STAGE HEIGHT DIFFERENCE (M) DURING Q1 2022*



During Q1 2022, 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 3-11**.

FIGURE 3-11: *7-DAY STAGE HEIGHT DIFFERENCE (M) DURING Q1 2022*



3.7 WATER QUALITY MONITORING

3.7.1 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 3** and all surface water quality data for Q1 2022 are listed in **Appendix 5.1**

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 3-12,** the DO long profile measurement as timeseries are presented in **Figure 3-13**, and the full set of DO surface water quality data are shown in **Table 3-9**.

The water temperature and DO depth profiles in the main reservoir at R05 during Q1 2021, Q4 2021 and Q1 2022 are presented in **Figure 3-14** to **Figure 3-16.**

FIGURE 3-12: ***DISSOLVED OXYGEN IMMEDIATELY UPSTREAM AND DOWNSTREAM OF THE MAIN DAM***

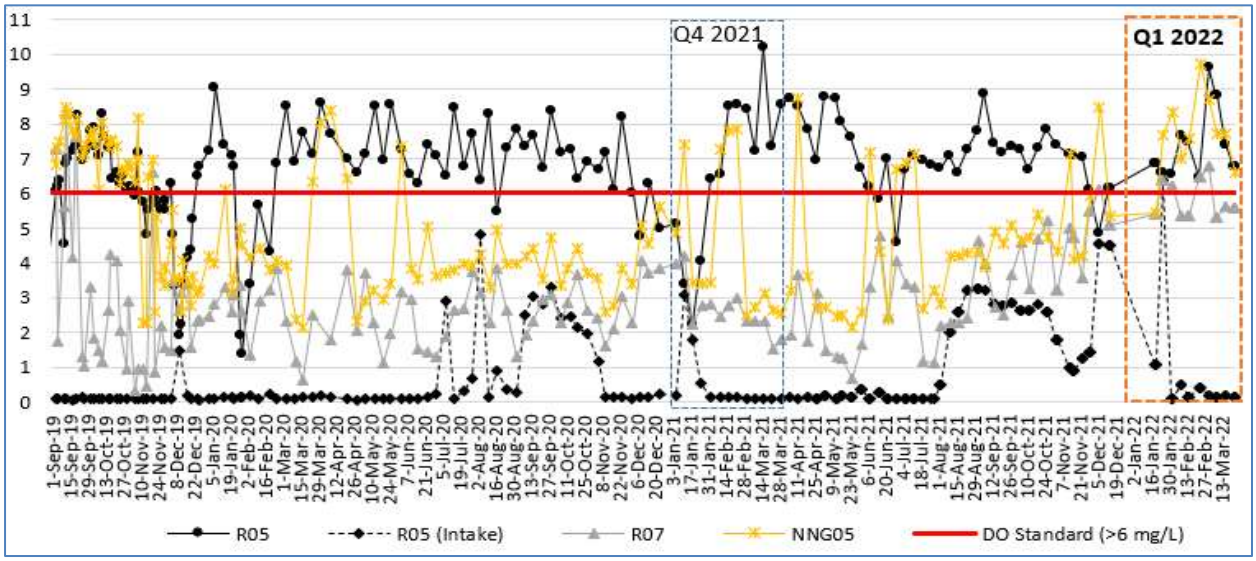
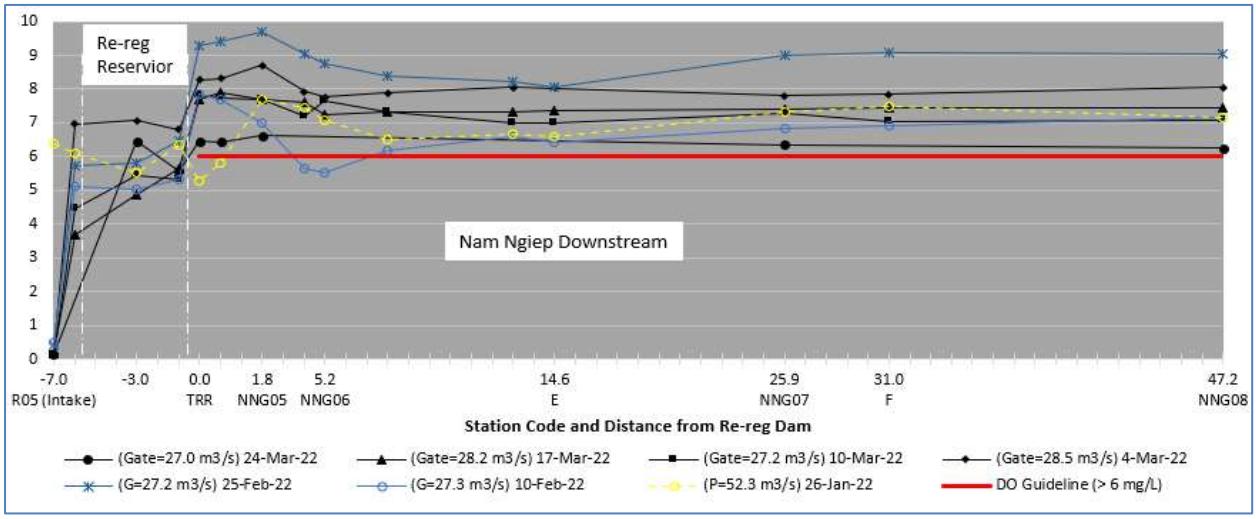


FIGURE 3-13: ***DISSOLVED OXYGEN LONG PROFILE MEASUREMENT FROM IMMEDIATELY UPPER MAIN DAM TO LOWER NAM NGIEP***



Main Reservoir

Figure 3-16 presents the DO and water temperature depth profile timeseries in the Main Reservoir (R04 and R05) from September 2018 to December 2021, the graphs clearly show seasonal variations in water temperatures and a deepening of the thermocline during periods with cooler water leading to a corresponding deepening of the oxycline.

The depth profile monitoring during Q1 2022 indicates formation of oxyclines in the main reservoir at the monitored stations at varying depths. The turn-over of water in the Main Reservoir at the upper layer was clearly observed in the water temperature and the Dissolve Oxygen depth profiles affected by the decrease of ambient temperature during the late cold-dry season.

When comparing Q1 2022 with Q4 2021 and Q1 2021, overall, Q1 2022 shows a slightly deeper thermocline and a corresponding deeper oxycline.

At R05 (the station closest to the main dam), the mean DO concentration was 7.3 mg/L in the upper 8.0 m (slightly higher than in both Q4 2021 and Q1 2021) and generally varied between 5.2 mg/L to 9.6 mg/L. DO concentrations below 2 mg/L were measured at depths starting from 24 m during January 2022, 20 m during February 2022 and 18 m during March 2022. The DO concentration at intake level had monthly mean DO concentrations that decreased from 3.7 mg/L in January 2022, to 0.2 mg/L in February 2022 and 0.1 mg/L in March 2022. Anoxic levels were from 24 m in January 2022 to 20 m in March 2022 corresponding to just below the intake.

R2, R3 and R4 showed a similar pattern of deepening or disappearance of the thermocline, equalization of DO in most of the water column during the cold spell in January and February 2022, followed by reappearance of the thermocline and a corresponding oxycline at depths between 6.5 m to 14 m over March 2022.

For R2, R3 and R4, anoxic conditions were only measured at R04, where anoxic conditions were found at depths between 30 m and 60 m in January 2022, between 28 m and 60 m in February 2022, and between 19 m and 55 m in March 2021.

Re-regulation Reservoir (R6 and R7)

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 DO concentrations at R06 have no significant change over the course of the quarter from a monthly average over the entire water column of 5.1 mg/L in January, 5.2 mg/L in February to 4.8 mg/L in March 2022. A similar pattern was found at R07. This corresponds well with the increase in DO concentrations at the intake level in the main reservoir although 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 Chiane (NCH01) and Nam Phouan (NPH01) had DO concentrations above 6 mg/L during Q1 2022

Downstream Stations

During Q1 2022, the discharge from the Re-regulation Dam mainly went through the gate and occasionally through the turbine (on 26 January 2022).

The downstream DO concentrations were above 6 mg/L (the National Surface Water Quality Standard). Further downstream from the dam, the DO concentrations generally increased reaching about 9 mg/L at NNG07 located 25 km from the dam (not considering measurements during periods only with gate discharge).

No dead fish was observed in Nam Ngiep downstream during Q1 2022.

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 3-14: ***MAIN RESERVOIR DISSOLVED OXYGEN AT THE END OF Q1 2022***

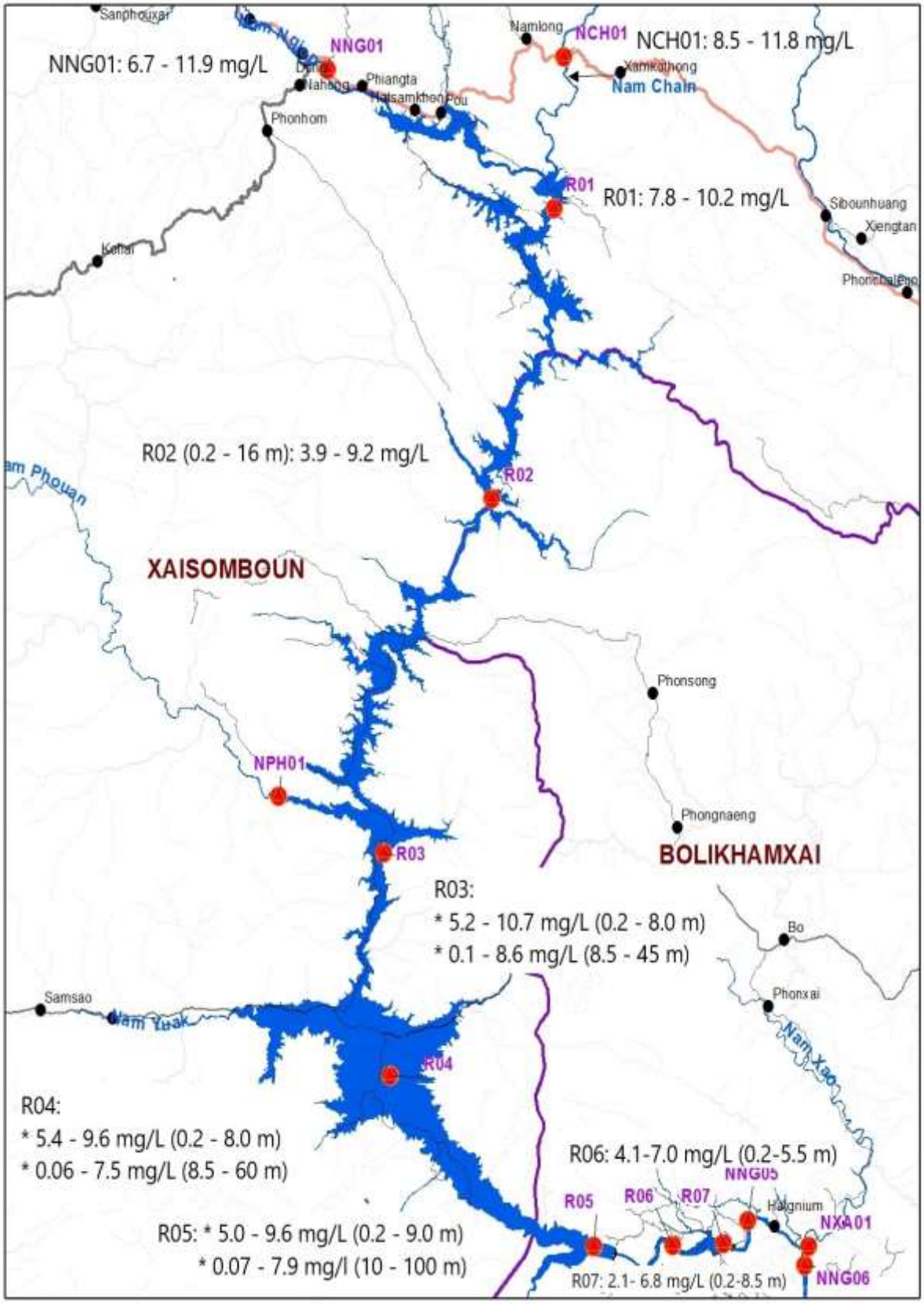


FIGURE 3-15: ***WATER TEMPERATURE AND DISSOLVED OXYGEN – DEPTH PROFILES IN THE MAIN RESERVOIR IMMEDIATELY UPSTREAM OF THE MAIN DAM (R05)***

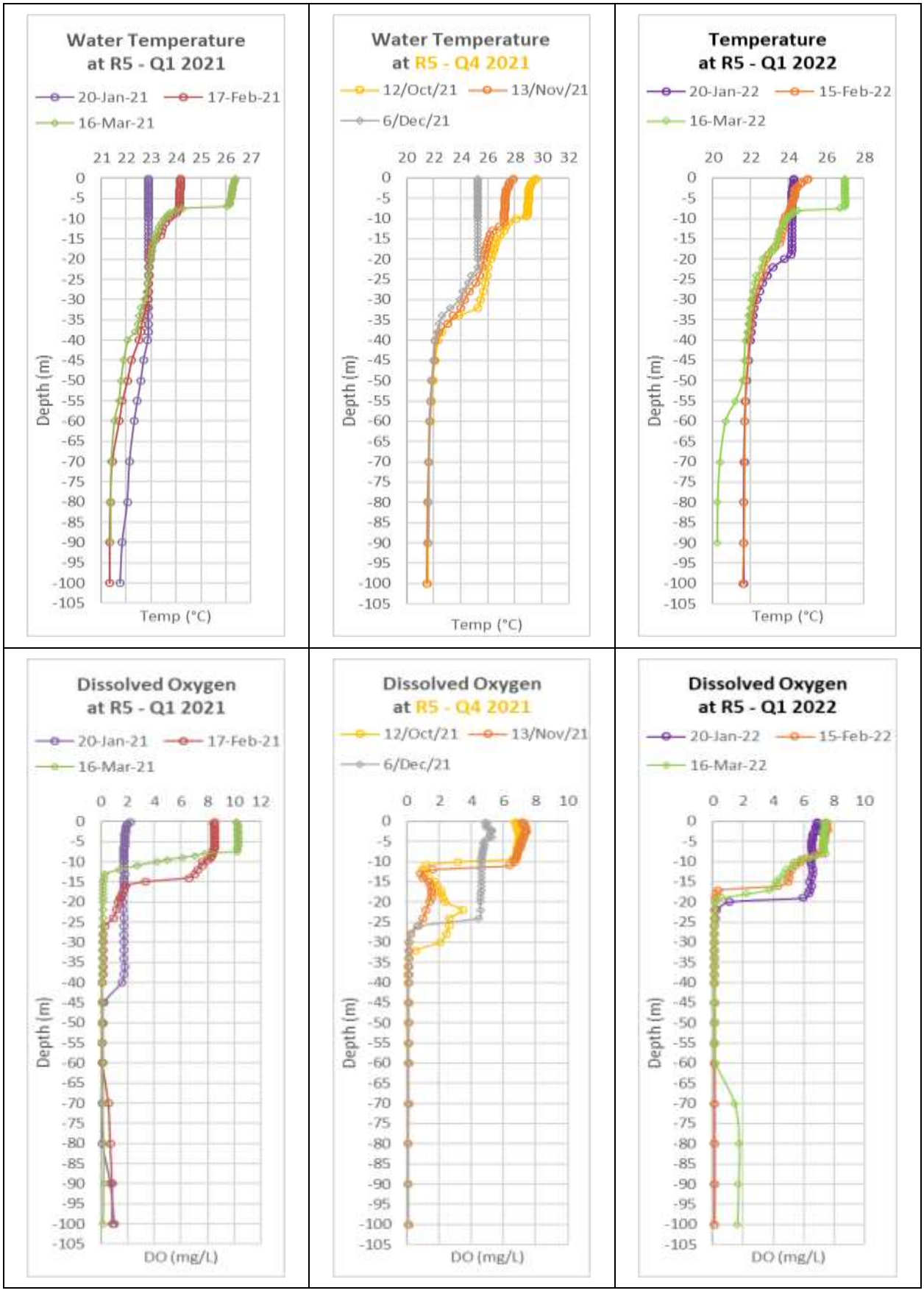


FIGURE 3-16: ***WATER TEMPERATURE AND DO DEPTH PROFILES IN THE MAIN RESERVOIR (R04 - R05), WITH POSITION OF INTAKE AT THE ACTUAL WATER LEVEL DURING SEPTEMBER 2018 – MARCH 2022***

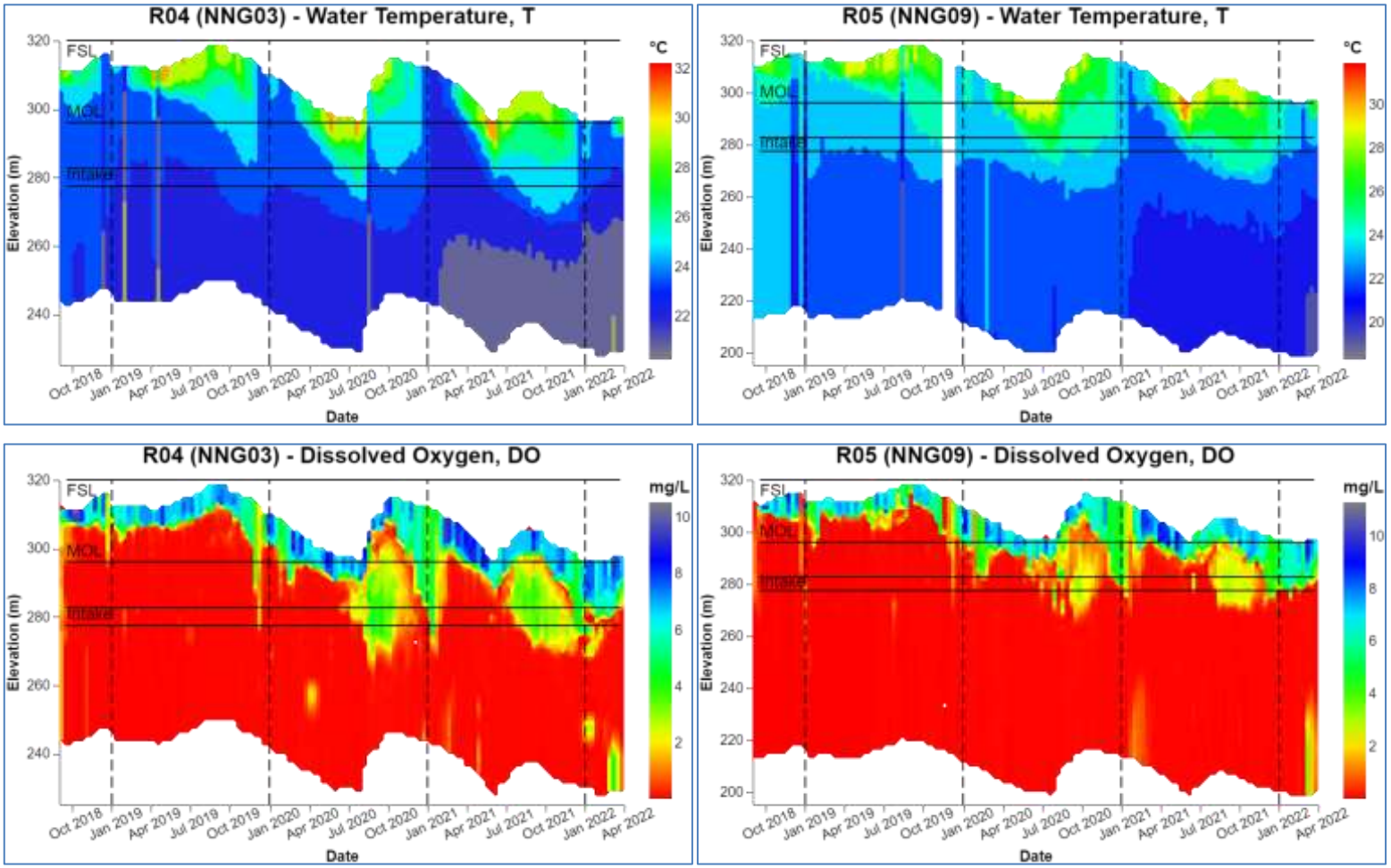


TABLE 3-9: *DO (MG/L) RESULTS OF SURFACE WATER IN MAIN RESERVOIR, RE-REGULATION RESERVOIR, NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 2022 (NATIONAL SURFACE WATER QUALITY STANDARD FOR DISSOLVED OXYGEN: ≥6 MG/L)*

Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
20-Jan-22				7.52	7.39	6.87	4.82	5.38								
24-Jan-22		7.9	6.55	6.57										9.1		
25-Jan-22					6.36	6.59	5.54	6.36								
26-Jan-22									7.68	7.06	7.31	7.18			7.07	6.41
1-Feb-22		8.02	7.19	8.49										9.21		
2-Feb-22					6.84	6.57	5.37	6.18								
3-Feb-22									8.32	7.7	7.85	8.37			6.84	7.08
7-Feb-22	11.93												11.83			
8-Feb-22		10.23	7.44	8.87										10.86		
9-Feb-22					7.64	7.65	5.03	5.34								
10-Feb-22									7.0	5.52	6.83	7.18			7.73	6.43
14-Feb-22		7.81	7.84	8.36										8.48		
15-Feb-22					7.68	7.48	5.3	5.37								
16-Feb-22									7.57	7.12	7.07	7.21			6.32	6.78
21-Feb-22	9.39												9.95			
23-Feb-22		9.05	6.72	6.74										9.64		
24-Feb-22					7.01	6.46	5.8	6.48								
25-Feb-22									9.7	8.76	9.01	9.06			8.61	9.86
2-Mar-22		9.49	8.89	9.11												
3-Mar-22					9.48	9.61	7.06	6.8								
4-Mar-22									8.7	7.76	7.81	8.05			8.3	7.54
7-Mar-22	8.79												8.66			
8-Mar-22		8.05	7.92	8.33										8.62		
9-Mar-22					8.73	8.85	5.45	5.32								
10-Mar-22									7.71	7.66	7.28	7.07			6.63	6.5
15-Mar-22		8.24	8.32	8.35										8.68		
16-Mar-22					7.34	7.42	4.85	5.63								
17-Mar-22									7.71	7.24	7.41	7.46			7.27	7.23

Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
21-Mar-22	6.78												8.54			
22-Mar-22		9.19	8.94	9.31										9.05		
23-Mar-22					6.8	6.8	6.45	5.57								
24-Mar-22									6.62		6.36	6.25			6.14	

Ammonia Nitrogen

In Q1 2022, Ammonia Nitrogen complied with the National Surface Water Quality Standard (<0.2 mg/L) in all monitored stations.

TABLE 3-10: ***AMMONIA NITROGEN (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 2022***

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

Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
24-Jan-22		<0.2		0.2										<0.2		
25-Jan-22					<0.2	<0.2										
7-Feb-22	<0.2												<0.2			
8-Feb-22		<0.2		<0.2										<0.2		
9-Feb-22					<0.2	<0.2										
7-Mar-22	<0.2												<0.2			
8-Mar-22		0.11		0.11										<0.2		
9-Mar-22					<0.2	<0.2										

Biochemical Oxygen Demand (BOD_5)

Since 2014, the Biochemical Oxygen Demand (BOD_5) values in the Nam Ngiep River and its tributaries have generally been below the detection limit (< 1 mg/L) with some measurements exceeding the National Surface Water Quality Standard (< 1.5 mg/L). The results for Q1 2022 indicate that the BOD_5 levels are in compliance with the standard. 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 3-11: ***BOD_5 (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 2022***

(NATIONAL SURFACE WATER QUALITY STANDARD FOR BOD_5: <1.5 MG/L)

Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
24-Jan-22		<1		<1										<1		
24-Jan-22 Bottom				<1												
25-Jan-22					<1	<1	<1	<1								
25-Jan-22 Bottom					<1	6.5										
26-Jan-22									<1	<1	<1	<1			<1	<1
7-Feb-22	<1												<1			
8-Feb-22		<1		<1												
8-Feb-22 Bottom				<1												
9-Feb-22					<1	<1	<1	<1						<1		
9-Feb-22 Bottom					<1	7.2										
10-Feb-22									<1	<1	<1	<1			<1	1.2
7-Mar-22	<1												<1			
8-Mar-22		<1		<1										<1		
8-Mar-22 Bottom				<1												
9-Mar-22					<1	<1	1.84	1.36								
9-Mar-22 Bottom					<1	<1										

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
10-Mar-22									<1	<1	<1	<1			<1	<1

Chemical Oxygen Demand (COD)

The COD measurements in Q1 2022 are presented in ***Table 3-12***.

TABLE 3-12: ***COD (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q1 2022 (NATIONAL SURFACE WATER QUALITY STANDARD FOR COD: < 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
24-Jan-22														<5		
25-Jan-22							<5	<5								
26-Jan-22									<5	<5	<5	<5			<5	<5
7-Feb-22	<5												<5			
8-Feb-22														<5		
9-Feb-22							6.4	<5								
10-Feb-22									<5	<5	<5	<5			<5	<5
7-Mar-22	<5												<5			
8-Mar-22														12.8		
9-Mar-22							<5	<5								
10-Mar-22									<5		<5	6.4			<5	6.4

Faecal Coliform Bacteria

The results of the faecal coliform analyses in Q1 2022 are presented in **Table 3-13**.

Faecal coliform complied with the standard in all stations during Q1 2022.

TABLE 3-13: ***FAECAL COLIFORMS (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q1 2022 (NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: <1,000 MPN/100 ML)***

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
24-Jan-22														130		
25-Jan-22							14	49								
26-Jan-22									5	2	8	17			33	27
7-Feb-22	540												79			
8-Feb-22														17		
9-Feb-22							8	11								
10-Feb-22									49	240	79	350			350	240
7-Mar-22	26												49			
8-Mar-22														27		
9-Mar-22							8	17								
10-Mar-22									22	33	130	170			170	130

Total Coliform Bacteria

The results of measurements for total coliform bacteria are presented in **Table 3-14.** 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 3-14: ***TOTAL COLIFORM (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q1 2022 (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	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
24-Jan-22														920		
25-Jan-22							49	70								
26-Jan-22									49	79	49	350			240	920
7-Feb-22	1,600												540			
8-Feb-22														140		
9-Feb-22							13	33								
10-Feb-22									70	240	170	920			1,600	540
7-Mar-22	70												79			
8-Mar-22														140		
9-Mar-22							13	33								
10-Mar-22									49	170	240	220			920	240

3.7.2 Compliance Monitoring of Effluents from Camps

A total of 03 sites discharged effluents in Q1 2022, 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 3-17.**

The results are described in **Table 3-15** and the full data set is in **Appendix 5.2**.

The status of compliance as of 31 March 2022 can be summarized as follows:

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

FIGURE 3-17: ***LOCATION OF EFFLUENT MONITORING POINTS***

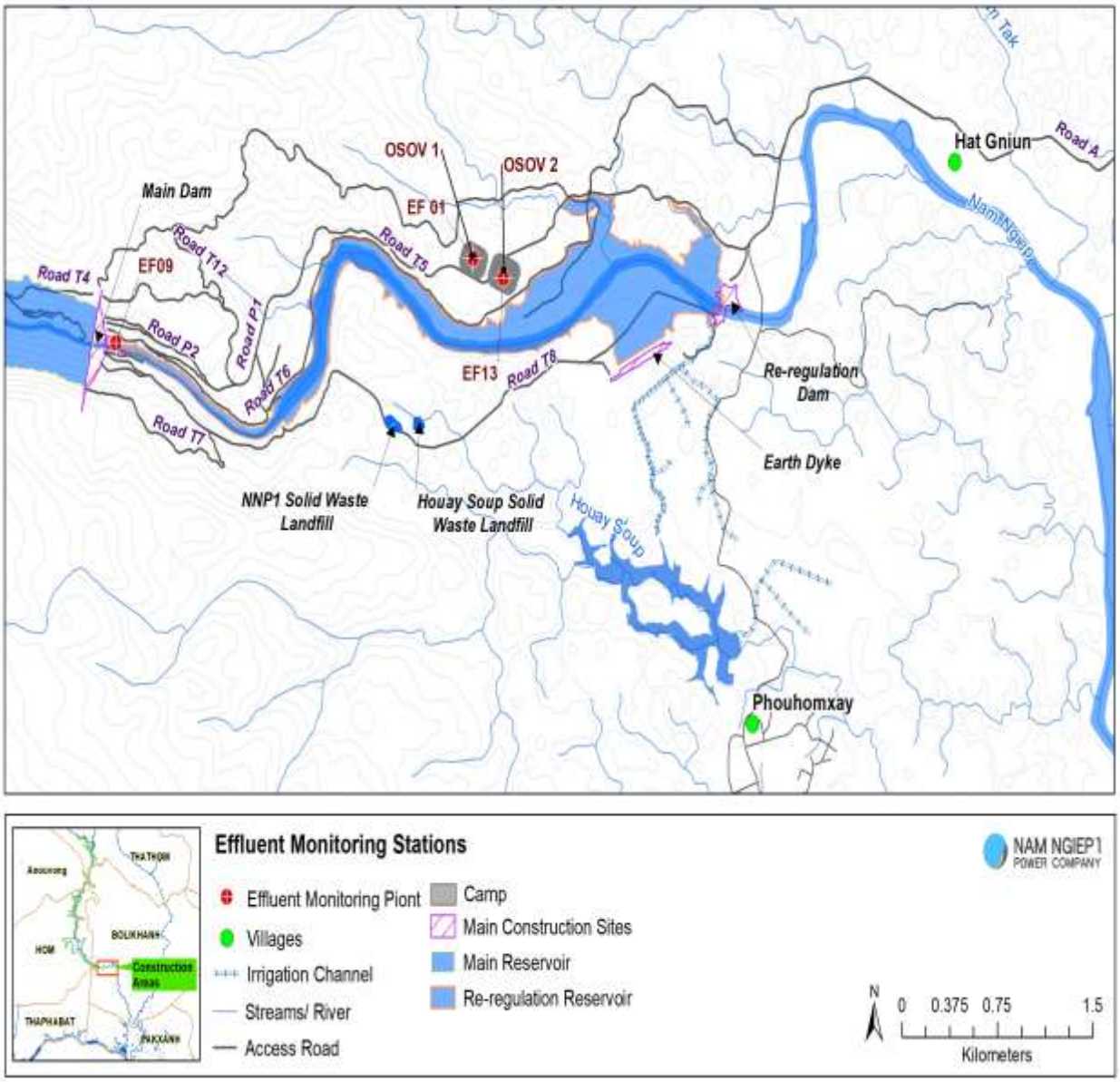


TABLE 3-15*: RESULTS OF THE EFFLUENT WATER QUALITY MONITORING OF THE CAMPS IN Q1 2022 (NON-COMPLIANCE PARAMETERS ONLY)*

		Site Name	OSOV1 (Owner's Site Office and Village)	OSOV2 (ESD Camp)	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameters (Unit)	Guideline			
27-Jan-22	NH_3-N (mg/L)	<10.0	6.2	30	8.1
4-Feb-22	NH_3-N (mg/L)	<10.0	7.1	34	11.5
11-Feb-22	NH_3-N (mg/L)	<10.0	6.6	28	7.8
18-Feb-22	NH_3-N (mg/L)	<10.0	4.7	28	9.5
22-Feb-22	NH_3-N (mg/L)	<10.0	2.9	17	4.9
1-Mar-22	NH_3-N (mg/L)	<10.0	3.7	24	7.1
11-Mar-22	NH_3-N (mg/L)	<10.0	2.8	26	27.8
18-Mar-22	NH_3-N (mg/L)	<10.0	4.1	22	12.6
27-Jan-22	Total Nitrogen (mg/L)	<10.0	7.11	41	9.2
4-Feb-22	Total Nitrogen (mg/L)	<10.0	8.18	36	12.0
11-Feb-22	Total Nitrogen (mg/L)	<10.0	8.73	30	8.5
18-Feb-22	Total Nitrogen (mg/L)	<10.0	5.41	28	10.9
22-Feb-22	Total Nitrogen (mg/L)	<10.0	3.76	19	5.2
1-Mar-22	Total Nitrogen (mg/L)	<10.0	6.3	31	17.5
11-Mar-22	Total Nitrogen (mg/L)	<10.0	4.36	34	28.5
18-Mar-22	Total Nitrogen (mg/L)	<10.0	5.11	23	13.9
27-Jan-22	Total Phosphorus (mg/L)	<2	1.5	2.0	6.8
4-Feb-22	Total Phosphorus (mg/L)	<2	1.6	2.5	8.1
11-Feb-22	Total Phosphorus (mg/L)	<2	1.6	2.1	3.3
18-Feb-22	Total Phosphorus (mg/L)	<2	1.6	2.9	8.4
22-Feb-22	Total Phosphorus (mg/L)	<2	1.0	1.5	3.2
1-Mar-22	Total Phosphorus (mg/L)	<2	1.2	2.3	7.3
11-Mar-22	Total Phosphorus (mg/L)	<2	1.5	2.4	7.7
18-Mar-22	Total Phosphorus (mg/L)	<2	1.5	1.9	7.6
27-Jan-22	Total coliform (MPN/100 mL)	<400	1,600	1,600	2
4-Feb-22	Total coliform (MPN/100 mL)	<400	1,600	1,600	3,500
11-Feb-22	Total coliform (MPN/100 mL)	<400	5,400	23	2
18-Feb-22	Total coliform (MPN/100 mL)	<400	3,500	1,600	16,000
22-Feb-22	Total coliform (MPN/100 mL)	<400	1,600	240	1,600
1-Mar-22	Total coliform (MPN/100 mL)	<400	920	1,600	1,600
11-Mar-22	Total coliform (MPN/100 mL)	<400	920	1,600	1,600
18-Mar-22	Total coliform (MPN/100 mL)	<400	1,600	23	23
25-Mar-22	Total coliform (MPN/100 mL)	<400	1,600	0	
27-Jan-22	Faecal Coliform (MPN/100 mL)	<400	1,600	1,600	0
4-Feb-22	Faecal Coliform (MPN/100 mL)	<400	1,600	540	3,500
11-Feb-22	Faecal Coliform (MPN/100 mL)	<400	3,500	0	2

		Site Name	OSOV1 (Owner's Site Office and Village)	OSOV2 (ESD Camp)	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameters (Unit)	Guideline			
18-Feb-22	Faecal Coliform (MPN/100 mL)	<400	3,500	170	16,000
22-Feb-22	Faecal Coliform (MPN/100 mL)	<400	1,600	0	1,600
1-Mar-22	Faecal Coliform (MPN/100 mL)	<400	920	920	1,600
11-Mar-22	Faecal Coliform (MPN/100 mL)	<400	540	920	1,600
18-Mar-22	Faecal Coliform (MPN/100 mL)	<400	1,600	8	13
25-Mar-22	Faecal Coliform (MPN/100 mL)	<400	1,600	0	

TABLE 3-16: *COMPLIANCE STATUS OF EFFLUENT DISCHARGE FROM THE CAMPS IN Q1-2022*

Site	ID	WWTS	Key Non-Compliance Issues[1] in Q1-2022	Corrective Actions
OSOV 1 (Owner's Site Office and Village)	EF01	Septic tanks (kitchen and black water) and wetland (grey water), discharge: 70 m^3/day	- Faecal coliform (<400 MPN/100 mL): Non-compliance in all 9 samplings. Q1 mean 1,829 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in all 9 samplings. Q1 mean 2,082 MPN/100 mL.	The construction of the improved Wastewater Treatment System was completed at the end of August 2021 and the operation of the system is undergoing adjustments.
OSOV 2 (ESD Camp)	EF13	Septic tanks (kitchen and black water) and SBR with chlorination system.	- Ammonia-nitrogen (<10 mg/L): Non-compliance in all 8 samplings. Q1 mean 26 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in all 8 samplings. Q1 mean 30 mg/L. - Total Phosphorus (<2 mg/L): Non-compliance in 5 out of 8 samplings. Q1 mean 2.2 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-	As above.

[1] The values in brackets indicate the applicable standard

			compliance in 4 out of 9 samplings. Q1 mean 462 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 5 out of 9 samplings. Q1 mean 921 MPN/100 mL.	
Main Powerhouse	EF19	Septic tanks (grey and black water), biofilm tank and chlorination tank.	- Ammonia-nitrogen (<10 mg/L): Non-compliance in 3 out of 8 samplings. Q1 mean 11.2 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 5 out of 8 samplings. Q1 mean 13.2 mg/L. - Total Phosphorus (<2 mg/L): Non-compliance in all 8 samplings. Q1 mean 6.6 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 5 out of 8 samplings. Q1 mean 3,039 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 5 out of 8 samplings. Q1 mean 3,041 MPN/100 mL. -	As above

3.7.3 Groundwater Quality Monitoring

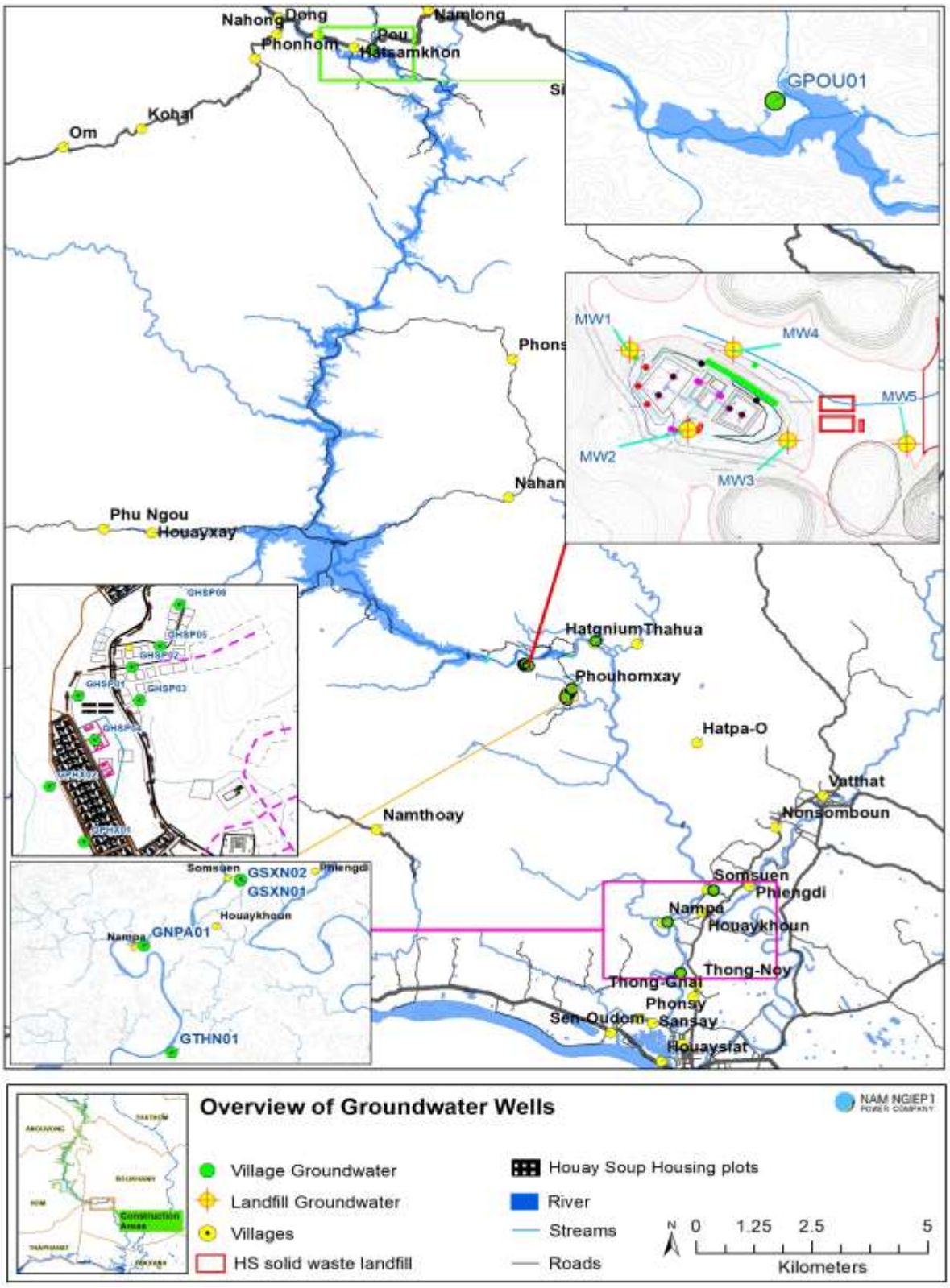
During Q1 2022, a total of seven boreholes at Somseun, Nam Pa, Thong Noy, (one borehole in each village), Pou Villages (two boreholes) and Phouhomxay Village (two boreholes) have been monitored for the following parameters:

a. *Monthly:* pH, DO (%), DO (mg/L), Conductivity (µs/cm), Temperature (°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 3-18*** and the groundwater monitoring data is presented in ***Appendix 5.3.***

FIGURE 3-18*: GROUNDWATER SAMPLING LOCATIONS*



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

Thong Noy Village: all monitored parameters complied with the standard, except faecal coliform and *E. coli* bacteria (March 2022).

Somsuen Village: all monitored parameters complied with the standard, except faecal coliform (March 2022).

NamPa Village: all monitored parameters complied with the standard.

Pou Village: One out of two boreholes (GPOU02 – the new borehole) did not comply with the standard for faecal coliform and *E.coli* parameters.

Phouhomxay Village: All parameters complied with the standard.

The villagers were advised to boil water before drinking. This advice is in accordance with the Law on Hygiene, Disease Prevention and Health Promotion No 01/NA of 10 April 2001, which states that domestic water supply for daily use is not required to be readily drinkable but would normally have to be boiled or otherwise treated before it would be suitable for drinking.

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

(A) Nam Papa systems (water supply) – water from natural water sources that has gone through a treatment process to become clean and safe water in compliance with the drinking water quality standards. These systems are managed by the Department of Water Supply, Ministry of Public Works and Transport; and

(B) Nam Saat Systems (domestic water supply) – provide water to rural areas that are not connected to Nam Papa systems. Nam Saat systems include gravity fed systems and boreholes with motorised pumps or hand pumps. These systems are managed by the Centre for Environmental Health and Water Supply (Nam Saat) under the Department of Hygiene and Health Promotion, Ministry of Health.

The community water supply systems related to the NNP1 hydropower project are under Nam Saat systems 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 potential 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.

During the Q1 2022, the landfill groundwater monitoring results were similar to the previous monitoring results, where the concentration of Lead (Pb) in the monitoring wells MW1, MW3, MW4 and MW5 exceeded the relevant groundwater quality standard. This is most likely the

background (natural) level and is not attributed to the landfill. Lead has been detected in all wells from time to time both upstream and downstream the landfill. Furthermore, lead has not been detected in the leachate from the landfill treatment ponds and the waste pits. All ponds of both landfills are lined with a HDPE liner protecting the groundwater against infiltration of leachate; therefore, it is most likely that the presence of Lead is due to the geology of the area. Note also that these boreholes are more than 50 m deep and are not used by staff or villagers.

TABLE 3-17: *LANDFILL GROUNDWATER QUALITY MONITORING RESULTS IN NNP1 AND HOUAY SOUP LANDFILLS*

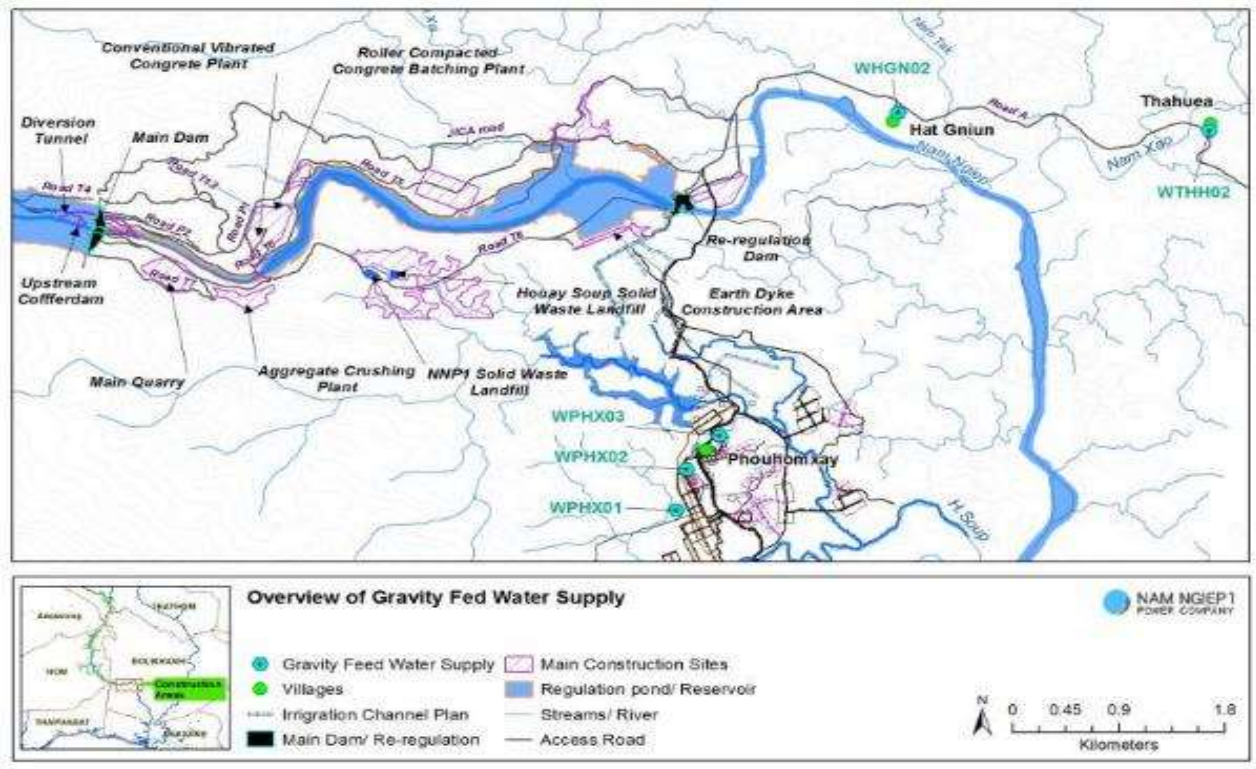
		Site Name	NNP1 Landfill				Houay Soup Landfill
		Station	MW1	MW2	MW3	MW4	MW5
Date	Parameter (Unit)	Guideline					
22/02/2020	pH		6.75	-	6.28	6.1	6.17
22/02/2020	Sat. DO (%)		39.6	-	28.8	21.6	36.7
22/02/2020	DO (mg/L)		3.31	-	2.41	1.82	3
22/02/2020	Conductivity (µS/cm)		186	-	131	56	107
22/02/2020	Temperature (°C)		24.22	-	24.71	24.7	27.7
22/02/2020	Turbidity		23	-	2.23	2.77	13.3
22/02/2020	Total Nitrogen (mg/L)		2.23	-	1.25	1.04	2.10
22/02/2020	Lead (mg/L)	<0.01	0.407	-	2.20	0.491	0.518
22/02/2020	Faecal Coliform (MPN/100ml)		4.5	-	2	0	0
22/02/2020	E. coli (MPN/100ml)		4.5	-	2	0	0
22/02/2020	NH_3-N (mg/L)		0.09	-	0.07	0.10	0.22
22/02/2020	Copper (mg/L)	<1	<0.003	-	0.007	0.003	<0.003
22/02/2020	Total Petroleum (mg/L)		<3	-	<3	<3	<3
22/02/2020	Water level (m)		29.5	-	26.7	25.1	14.9

3.7.4 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. Commencing in

October 2020, two new boreholes in Phouhomxay Village were put in use as a source of water supply instead of the previous gravity fed water supply system.

FIGURE 3-19: *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 3-18***. The full set of data is presented in ***Appendix 5.4.***

TABLE 3-18*: THE GFWS MONITORING RESULT IN Q1 2022*

Date	Parameter (Unit)	Site Name	Tha Heua Village	Hat Gnuin Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
		Guideline				
17-Feb-22	E. Coli (MPN/100 mL)	0	13	49	130	240
14-Mar-22		0	49	17	70	22
17-Feb-22	Faecal coliform (MPN/100 mL)	0	13	79	220	540
14-Mar-22		0	70	33	70	49

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

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

Phouhomxay Village (WPHX02-tap water at primary school; and **WPHX03**-tap water at the villager's house**):** all parameters complied with the standard, except faecal coliform and *E.coli* in

all Q1 2022 samples. Note here that during sampling of tap water in Phouhomxay Village, surface water from Houay Soup Stream was still supplied into the system and the samples likely represent a mixture of surface water and groundwater from the boreholes *(GPHX01 and GPHX02),* which may explain the bacteria contamination in the tap-water at Phouhomxay.

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. The villagers generally use tap water for washing and cleaning. They were informed about the monitoring results and 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.

As mentioned in section **3.7.3**, the gravity fed system is a domestic water supply under Nam Saat System 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 aims, to continue using water from the gravity fed system, are to get a safe drinking water by boiling and use the non-boiled water for other purposes such as feed 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.

3.7.5 Landfill Leachate Monitoring

Sampling of landfill leachate at NNP1 Project landfill and Houay Soup landfill was not carried out due to the ponds dried out during the quarter.

3.7.6 Water Quality Compliance Monitoring

The water quality non-compliance issues in Q1 2022are summarized in **Table 3-19**.

TABLE 3-19*: NON-COMPLIANCES RELATING TO WATER QUALITY MONITORING IN Q1 2022*

No	Non-compliance Issues	Corrective Actions	Status
1	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 compiled and analysed the water quality data and also evaluated if additional aeration to improve the DO level at downstream would be warranted. - Preliminary studies have been conducted on the feasibility and costs (including implications for electricity generation) of various aeration systems.	- NNP1PC has proposed to ADB and LTA to keep monitoring the water quality in the Reservoir, Re-regulation Reservoir, and the Nam Ngiep downstream the Re-regulation Dam to study the changes and take actions where necessary. - A trial to operate the labyrinth spillway at the Re-regulation Dam was implemented in November 2021 to see the improvement of DO values downstream and the report was prepared by TD and shared to LTA and ADB during the mission in Q4 2021. - It is also worth noting that over the course of the last three years, no fish kill has been observed or reported
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	The systems were studied and NNP1PC management agreed on improvement and modification as follows: - **OSOV1** – new construction of the 2nd wetland pond to be a concrete type for a longer-term service and full maintenance by replacing the filtering system of 2 wetland ponds and their piping; - **OSOV2** – new construction of the Sequencing Batch Reactor (SBR) system to replace the under-designed wetland pond; - **The Main Dam** – modifying the piping system to extend the treatment time of wastewater including the automatic Chlorine dosing system installation.	- The WWTS improvement work was completed by the end of August 2021 and the treatment system is under adjustment to ensure compliance with the effluent standards. - In Q1 2022, the monitoring frequency was increased from fortnightly to weekly to obtain more data to support the system adjustments. - Expect to complete the adjustments in Q2 2022.

No	Non-compliance Issues	Corrective Actions	Status
3	Groundwater quality monitored for the communities (Thong Noy, Som Seun, Nam Pa, and Pou Villages) were not complied with the National Groundwater Quality Standard for drinking purpose on Faecal Coliform and E.*coli* 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 Gniun, and Phouhomxay Village) were not complied with the National Drinking Water Quality Standard on Faecal Coliform and E.*coli* parameters	- 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. The villagers were informed about the monitoring results and were advised to boil water before drinking.	- The villagers generally use tap water for washing and cleaning, and were encouraged to boil water before drinking. - Continue monitoring.
5	Non-compliance with the groundwater quality standard for	- Lead has been detected in all wells from time to time both upstream and downstream the landfill.	- Lead concentrations still exceed the groundwater quality standard.

No	Non-compliance Issues	Corrective Actions	Status
	lead in the landfill groundwater monitoring wells	- Lead has not been detected in the leachate from the landfill treatment ponds and the waste pits. - The presence of Lead is most likely due to the geology of the area. These boreholes are used for landfill groundwater monitoring and they are not used by staff or villagers	- Continue monitoring.

4 WATERSHED AND BIODIVERSITY MANAGEMENT

4.1 WATERSHED MANAGEMENT

4.1.1 Implementation of Watershed Management Plan

4.1.1.1 Xaysomboun Watershed and Reservoir Protection Office (WRPO)

Xaysomboun WRPO conducted reservoir patrols during 11-18 February 2022 and 22-31 March 2022. The report will be communicated with the Biodiversity Service Provider (BSP) - Wildlife Conservation Society (WCS) for SMART data analysis and future planning. Xaysomboun WRPO also scheduled the Participatory Land Use Plan (PLUP) training and PLUP improvement for Phonhom Village in April 2022.

Xaysomboun WRPO informed EMO Team in March 2022 that a new Head of Xaysomboun Provincial Agriculture and Forestry Office (PAFO) has been appointed and the internal meeting will be organized to discuss the AIP implementation including the pending progress such as the appointment of staffs for WRPO sub-office operation and patrolling program, the establishment of two land-based ranger stations in the Totally Protected Zone (TPZ) and two reservoir checkpoints, as well as actions related with reservoir and fishery management. They also informed that a meeting on improving institutional arrangements of the Watershed and Reservoir Protection Committee (WRPC) and WRPO is scheduled for April 2022.

4.1.1.2 Bolikhamxay Watershed and Reservoir Protection Office (WRPO)

Bolikhamxay WRPO organized the annual meeting on 3 February 2022 at Bolikhan Administration Office using the remaining budget from AIP2021. There were 34 attendees comprising representatives from Department of Forestry (DOF) of Ministry of Agriculture and Forestry (MAF), Xaysomboun PAFO, Provincial Forestry Section, District Agriculture and Forestry Office (DAFO), village authorities, and NNP1PC EMO. The meeting presented and discussed the lessons learned from implementing activities in 2021 and the status of the AIP2022. The key points summarized from the meeting:

- The land use, forest encroachment and illegal wildlife trading are not in line with existing laws and regulations and these pending issues need to be solved as soon as possible through coordination among parties.
- The pending issue on the law enforcement should be solved by the relevant sectors soon.
- NNP1PC to finalize the fishery co-management plan in line with relevant regulations on wildlife management within the NNP1 watershed soon.
- The budget to be timely provided to GOL on a quarterly basis to solve the issues within the NNP1 watershed.
- Livelihood improvement programs for the external watershed villages should be considered to solve the forest encroachment issue in the NNP1 watershed.

Bolikhamxay WRPO also conducted internal monthly meeting on 14 February 2022 with the participation of EMO. It was noted that they will focus on forest patrolling in February 2022 to deal with the threats around Phonsong Village with encroachment nearby the NNP1 watershed totally protection zone (TPZ). They conducted forest patrolling between 15-24 February 2022. The report will be shared with EMO and BSP-WCS for SMART data analysis and future planning.

Bolikhamxay WRPO with the participation of BSP-WCS also organized awareness raising on the importance of biodiversity for villagers and students in the nine villages adjacent to NNP1 watershed at Bolikhan District during 22 February - 6 March 2022.

4.1.1.3 NNP1PC EMO

EMO team organized the consultation meetings with village authorities and representatives of village producers on 18 January 2022 at Phou Ngou and Houayxai Villages. The consultation meeting was also attended by the Hom District Focal Point for Livelihood Activities under the NNP1 Watershed Management Plan (WMP). The topics that were discussed included the establishment of village producer groups particularly for cattle and orange production, group regulations particularly for cattle, pineapple and orange production, strengthening pineapple and orange production, and other capacity building activities for the 5-year action plan. The village authorities and representatives of village producers of the two villages acknowledged and confirmed their support and cooperation on the implementation of the activities. DAFO of Hom District organized a consultation meeting on the establishment of a Production Group at PhouNgou and Houayxai village on 22-23 March 2022.

EMO organized a meeting with the Head of Lao Woman Union of Hom District on the possibility of collaboration for providing training on pineapple and orange processing for producers at PhouNgou and Houayxai Villages at Lao Woman Union Office on 01 February 2022. A summary of the discussion is as follow:

- Hom District Lao Woman Union confirmed their full support to NNP1PC and local producers in building capacity for producing local products and distribution to the market.
- Producers from PhouNgou and Houayxai Villages can participate in any exhibition where Hom Lao Woman Union is invited.
- Lao Woman Union and NNP1PC will work together on improving processed pineapple products in terms of quality and packaging.

- Lao Woman Union will assist pineapple and orange production groups in obtaining approval of Food and Drug Authority (FDA) for their processed products.

EMO team organized a working session on the 5-year action plan with Thathom District Agriculture and Forestry Office (DAFO) on 20 January 2022 at Thathom DAFO. The meeting was attended by the Head of DAFO and three staffs from the Agriculture Unit. The summary of discussion and agreement include the following:

- Thathom DAFO confirmed their support and cooperation for the implementation of activities under the 5-year action plan.
- Thathom DAFO will organize consultation meetings on the activities under the 5-year action plan at Phonhom and Nahong Villages.
- Thathom DAFO will review existing relevant documents about production group establishment and will organize meetings on production group establishment at Phonhom and Nahong Villages.
- Thathom DAFO will appoint District Focal Point for coordination and implementation of the activities.
- EMO Team will share the detailed 5-year action plan for strengthening the capacity of local producers and market linkages for Ban Phonhom and Nahong.

EMO team also had a follow-up meeting to discuss and finalize the extension service plan of Thathom DAFO on 20 January 2022 at Thathom DAFO. It was agreed that the extension service plan 2022 will focus on the improvement of home garden production at Phonhom Village and Kai Noi rice production at Phonhom and Nahong Villages. EMO is coordinating with District Agriculture and Forestry Office (DAFO) of Thathom District for the implementation of agriculture extension service plan in March 2022.

EMO had a meeting with Dr. Viengsakoun, a Professor at Faculty of Agriculture, National University of Laos on 18 February 2022 to discuss the collaboration on providing capacity building for cattle fattening to the farmers at PhouNgou, Houayxai, Phonhom and Nahong Villages. A field visit for trainers from Faculty of Agriculture to collect necessary information for planning and designing training course was scheduled in April 2022.

EMO received confirmation from Department of Forestry (DOF)-Ministry of Agriculture and Forestry (MAF) through an official letter No. 022/PAFO-Xaysomboun dated on 20 January 2022 that the Head of Xaysomboun PAFO and the Head of Xaysomboun WRPO accepted and have no objections on the NNP1 proposed allowances for field-office-based staffs for local villagers who participate in field activity in the forest, and also for the pending issue on the patrolling works as discussed and agreed during the meeting on the Financial Management Manual (FMM) on 27 December 2021. The camera trap installation was completed on 14 March 2022 and the Lao Newt and Gecko survey was completed on 25 March 2022.

A meeting with NNP1 Provincial Resettlement and Livelihood Restoration Committee (PRLRC) and Watershed and Reservoir Protection Committee (WRPC) took place on 7 February 2022 at 01.30 p.m. at the Provincial Administration Office of Xaysomboun Province. The meeting was chaired by H.E. Mr. Phoikham Houngboungnuang, Provincial Governor and Leader of the Provincial Revolutionary Party and was attended by 23 participants (included 3 women)

comprising of Deputy Head from relevant provincial departments, Vice District Governors of Hom and Thathom, Head of District Agriculture and Forestry of Hom and Thathom, Head of Xaysomboun Provincial Resettlement Management Unit (RMU), Head of Xaysomboun WRPO, Mr. Masahiko Umesaki (Managing Director of NNP1PC), Deputy Managing Director of NNP1PC (ESD), and staffs of NNP1PC.

Two presentations on the overall implementation progress of NNP1 watershed management and social development were presented by representatives from NNP1PC. A summary of the discussion and agreement related with NNP1 watershed and reservoir management:

- The Maj. Gen. Vongsone Inpanphim, Provincial Vice Governor is appointed as new Chairperson of Xaysomboun PRLRC and WRPC replacing Mr. Bounphanh Phommachanh, Former Chairperson of Xaysomboun PRLRC and WRPC. The Provincial Home Affairs Department in coordination with PAFO is assigned to review and improve the existing Agreement for the appointment of the new Chairperson of Xaysomboun PRLRC and WRPC for the Provincial Governor review and approval.
- The proposed two ranger stations and two reservoir checkpoints should be compatible to the patrolling strategies on protecting the conservation areas. Xaysomboun WRPO (Watershed and Reservoir Protection Office) is advised to continue preparing documents for building the two ranger stations and two reservoir checkpoints as well as reviewing the plan if one additional ranger station in TPZ is needed.
- WRPO to draft an Agreement on the appointment of staff to be stationed at the new sub-office, patrolling programs and reservoir checkpoints for the Provincial Governor review and approval.
- WRPO to draft an Instruction Letter to be signed by the Provincial Governor on the prohibition/restriction of land occupation and utilization inside the forest land, TPZs and compensated land by clearly mentioning the deadline for moving out from these areas for his prior review and approval.
- Draft an Agreement on the establishment of a Government Special Task Force to inform villagers who illegally encroached and occupied forest land, TPZs and compensated land to move out from these areas. (The Task Force should consist of staff from relevant GoL agencies at provincial and district levels)
- The NNP1 reservoir fishery management should focus on the benefits and engagement of the Project Affected People. NNP1PC in collaboration with Xaysomboun PAFO to organize another consultation meeting on roles and responsibilities of reservoir fishery management with relevant parties and start implementing the fishery management plan as soon as possible.
- The clearance of compensated rubber plantation must be carried out in accordance with the recommendations during the last PRLRC meeting held on 07 August 2019 in Bolikhamxay Province. Xaysomboun PAFO in collaboration with NNP1PC to develop a plan for removal of compensated rubber plantations.
- Allowance for field work shall be paid in accordance with the Ministry of Finance's Agreement No.4000/MoF.

The progress of actions to deal with the pending issues could be summarized in **Table 4-1**.

TABLE 4-1*: THE APPROACHES TO SOLVE THE PENDING ISSUES WITH THE GOL PARTIES ON THE NNP1 WATERSHED AND BIODIVERSITY PROGRAM*

No	Actions	Expected date to be conducted/completed	Remarks	Status as of 31 March 2022
1	Drafting the Financial Management Manual (FMM) for NNP1 Project to share with the GOL parties (DOF-MAF, WRPOs and BOMU) for their review and comments	22 November 2021	The draft was circulated to DOF-MAF, WRPOs, and BOMU on 22 November 2021	Completed
2	The comments from GOL for the draft FMM to be provided to NNP1PC	30 November 2021		Completed: NNP1 received the comments from DOF-MAF and Bolikhamxay Nam Chouane-Nam Xang (NC-NX) Biodiversity Offset Management Unit (BOMU), as well as from Bolikhamxay WRPO on 30 November and 21 December 2021 respectively. The comments from Xaysomboun WRPO were discussed during the workshop on 27 December 2021.
3	Organize a meeting with the central level and provincial level (DOF-MAF, WRPOs, BOMU) to clarify the provided comments from GOL and finalize the FMM for further approval.	During 13-17 November 2021	It is expected that the pending issues of allowance for the field works and the sub-office operation could be agreed and finalized.	Completed: • The meeting was held online via 'meet.google' on 27 December 2021 with representatives from all relevant parties. • The two issues of the allowances for the field works and the sub-office operation still pending and could not be finalized, but the meeting agreed that the FMM will be finalized and approved by DOF with the technical support from NNP1PC and its consultant. • The improved FMM (final draft) was shared with DOF on 11 Feb 2022 for their final review and approval. • A face-to-face meeting on the final FMM among GOL committees (DOF-MAF, Xaysomboun WRPO, Bolikhamxay WRPO, and Bolikhamxay NC-NX BOMU) and NNP1 at DoF-MAF will be organized in April 2022. If there is still disagreement, then the implementing unit should discuss internally with their respective provincial management or chairman of the committee.

No	Actions	Expected date to be conducted/completed	Remarks	Status as of 31 March 2022
4	Organize meetings with implementing units (BOMU and WPROs) and BSP-WCS to discuss the way forward to put effort to implement the planned activities if the GOL COVID19 lockdown measures are still extended in December 2021.	7 December 2021		Completed: • The meeting was held on 8 Dec 2021 between NNP1PC and BSP-WCS. • Xaysomboun Province issued an official notification on 3 Dec 2021 to allow the vaccinated persons travelling to the province (except to the red villages). • Xaysomboun WRPO provided confirmation to BSP-WCS team on 20 Dec 2021 that they accepted to participate the biological surveys that are scheduled in Jan 2022 with the existing allowance rate. However, the head of XSB WRPO re-confirmed again on 30 Dec 2021 after further internal discussion with Xaysomboun WRPO/PAFO team that they cannot accept the proposed activity without additional accommodation allowance and so the survey in NNP1 watershed will be postponed until the meeting with XSB provincial governor was organized. • EMO received confirmation from Department of Forestry (DOF)-Ministry of Agriculture and Forestry (MAF) through an official letter No. 022/PAFO-Xaysomboun dated on 20 January 2022 that the Head of Xaysomboun PAFO and the Head of Xaysomboun WRPO accepted and have no objections on the NNP1 proposed allowances for field-office-based staffs, for local villagers who participate in field activity in the forest, and also for the pending issue on the patrolling works as discussed and agreed during the meeting on the Financial Management Manual (FMM) on 27 December 2021.
5	Organize a meeting with the Bolikhamxay Vice Provincial Governor (Chairman of Bolikhamxay Watershed and Reservoir Protection Committee (WRPC) and NC-NX Biodiversity Offset Management Committee	Within 14 January 2022	May not be necessary if the FMM can be agreed and finalized within action 3.	The meeting in this step 5 is not needed at this time.

No	Actions	Expected date to be conducted/completed	Remarks	Status as of 31 March 2022
	(BOMC)) for his guidance on the pending allowance issues.			
6	Organize a meeting with the Xaysomboun Provincial Governor (PG) for his guidance on the pending allowance issues, Fishery Management Plan (FMP), the threats in the watershed TPZs related with NNL objectives, and the AIP2022 preparation.	Within 14 January 2022	This would be the follow up on the PG recommendation from the meeting in March 2021. The discussion on the allowance might not be necessary if the FMM can be agreed and finalized within action 3.	Completed: The Meeting of NNP1 Resettlement, Livelihood Restoration Committee (PRLRC) and Watershed and Reservoir Protection Committee (WPRC) in Xaysomboun Province was done successfully on 7 Feb 2022 at the Provincial Administration Office of Xaysomboun Province. The MOM is shared on google drive.
7	Organize a meeting with the DOF-MAF and the Ministry level for their guidance on the pending allowance issues.	Within end of January 2022	May not be necessary if the issues can be agreed and finalized within action 5 and 6.	It is confirmed that this meeting is not needed at this time.
8	Organize the Annual Meeting relating to AIP2020 and 2022 including the way forward with Xaysomboun WRPO to be chaired by Xaysomboun PG.	Within end of January 2022	After the approval of AIP2022	Xaysomboun WRPO informed EMO Team in March 2022 that a new Head of Xaysomboun Provincial Agriculture and Forestry Office (PAFO) has been appointed and the internal meeting will be organized to discuss the AIP implementation including the pending progress of particular the appointment of staffs for WRPO sub-office operation and patrolling program, the establishment of two land-based ranger stations in the Totally Protected Zone (TPZ) and two reservoir checkpoints, as well as actions related with reservoir and fishery management. They also informed that a meeting on improvement of institutional arrangement of Watershed and Reservoir Protection Committee (WRPC) and WRPO is scheduled for April 2022. Xaysomboun WRPO submitted the budget plan of their AIP2022 to EMO on 30 March 2022. The plan is being reviewed by EMO team and is expected to be further discussed and finalized after a meeting on improving the institutional arrangements of the Watershed and Reservoir

No	Actions	Expected date to be conducted/completed	Remarks	Status as of 31 March 2022
				Protection Committee (WRPC) and WRPO and a meeting on the final FMM have been held in April 2022.
9	Organize the Annual Meeting relating to AIP2021 and 2022 including the way forward with Bolikhamxay WRPO to be chaired by Bolikhamxay Vice Governor.	Within end of January 2022	After the approval of AIP2022	Completed: The Meeting was organized on 3 Feb 2022. The MOM is shared on google drive.
10	Organize the annual meeting relating to AIP2021 and 2022 including the way forward with Bolikhamxay NC-NX BOMU to be chaired by Bolikhamxay Vice Governor.	Within end of January 2022	After the approval of AIP2022 Note: Action 8 and 9 could be organized at the same day for time efficiency because the Bolikhamxay Vice Governor is the chairman for both Bolikhamxay WRPC and NC-NX BOMC	BOM AIP2022 of NC-NX BOMU is still under review and finalizing by the BOMU. EMO and BOMU organized an online meeting on 9 Feb 2022 to discuss and agree on the key issues for the draft AIP2022 such as field allowance, subsistence allowance, phone cards and etc. The activity schedule was further detailed and communicated with BSP-WCS on 16 Feb 2022 for their inputs. BSP also recommended to include additional training budget for the patrolling and snare removal team and so the plan was further updated accordingly. The draft was submitted to ADB and IAP on 23 Feb 2022 for their review and approval. IAP and ADB provided comments with no objection on 7 and 18 March 2022 respectively. However, BOMU confirmed that the FMM should be finalized first before concluding their AIP2022.

4.1.2 Preparation of Annual Implementation Plan (AIP) 2022

4.1.2.1 Xaysomboun WRPO

Xaysomboun WRPO confirmed that they could not submit the draft AIP2022 in January 2022 because the Head of Xaysomboun WRPO is fully occupied with other assignments between the middle to end of January 2022.

Xaysomboun WRPO organized another round of discussions with EMO and the BSP-WCS between 1-3 February 2022. They further worked on the detailed budget plan after that and proposed for the draft to be submitted on 25 February 2022. However, the Head of Xaysomboun PAFO informed that the draft plan need to be further discussed with Xaysomboun PAFO management prior to submission to NNP1PC and DOF-MAF. Therefore, the planned submission was further delayed because the Head of Xaysomboun PAFO has been out of the office since the first week of February 2022 and returned to the office in March 2022. Xaysomboun WRPO submitted the budget plan of their AIP2022 to EMO on 30 March 2022. The plan is being reviewed by EMO team and is expected to be further discussed after a meeting on improvement of institutional arrangement of Watershed and Reservoir Protection Committee (WRPC) and WRPO has been held in April 2022.

4.1.2.2 Bolikhamxay WRPO and DOF-MAF

EMO submitted the draft AIP2022 of DOF-MAF and Bolikhamxay WRPO to ADB, Independent Advisory Panel (IAP) and Lender's Technical Advisor (LTA) on 21 December 2021 for their review and approval. EMO received the first comments from ADB and IAP for clarification on 10 and 24 January 2022 respectively. EMO has responded and provided additional supporting documents as requested.

The IAP and ADB confirmed acceptance on the plan of DOF-MAF and Bolikhamxay WRPO on 7 and 10 February 2022 respectively. The team has refined the Lao version of the plan and shared the plans to DOF-MAF and Bolikhamxay WRPO on 11 February 2022. DOF-MAF submitted the fund disbursement request on 25 February 2022. The funds to cover the implementation of activities during Q1 and Q2 2022 under the approved Bolikhamxay WRPO and DOF-MAF AIP2022 were transferred by NNP1PC to DOF-MAF account at central level on 15 March 2022. Bolikhamxay WRPO is preparing the document for further fund transfer from DOF-MAF account to Bolikhamxay WRPO account at provincial level during end of March 2022.

4.2 BIODIVERSITY OFFSET MANAGEMENT

4.2.1 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 Biodiversity Offset Management Unit (BOMU) continued working with the district authorities of Viengthong and Xaychampone for the official approval of Nam Chouane-Nam Xang (NC-NX) Totally Protected Zone (TPZ) boundary. The discussion among EMO, BOMU, and BSP-WCS for updating village land use plans could not be organized before the end of March 2022 because the responsible staffs were infected by COVID-19.

b. Component 2 – Enforcement

The results of patrolling in January to March of 2022 are as follow:

Team	Patrolling Area/distance	Observations/Actions Taken
1	**3-22 January 2022** TPZ highest priority area including Nam Sone, Nam Chuan, Houay Xay Gnai, Houay Xay Noi, and Houay Poung. (14 days covering a distance of 81 km on forest patrolling) **8-27 February 2022** TPZ highest priority area including Nam Sone, Nam Chuan, Houay Kokhai and Houay Payang. (16 days covering a distance of 102.2 km on forest patrolling) **20 March – 4 April 2022** TPZ highest priority area including Houay Phai, Nam San and southern Nam San Mountain ridges. (16 days covering a distance of 66 km on forest patrolling)	**3-22 January 2022** The team found and destroyed one old fishing camp at Nam Chouan, one hunting camp close to Nam Chouan. The team also observed a small-scale of inactive forest fire close to Houay Poung suspected as the work of hunter and Non-Timber Forest Product (NTFP) collector. **8-27 February 2022** The team encountered and destroyed a small and fresh hunting camp at Houay Payang. **20 March – 4 April 2022** The team heard a gunshot at Nam San.
2	**3-22 January 2022** TPZ highest priority area including Houay Phalai, Nam San and southern Nam San tributaries (14 days covering a distance of 57 km on forest patrolling) **8-27 February 2022** TPZ highest priority area including Nam Sone, Nam Chang and Houay Poung. (16 days covering a distance of 85.7 km on forest patrolling) **12-27 March 2022** TPZ highest priority area including Nam Sone, Nam Chuan, Nam Xi, Houay Xai Noi and mountain ridges. (16 days covering a distance of 126.5 km on forest patrolling)	**3-22 January 2022** The team found and destroyed a small hunting camp which including 17 bird traps and some trashes at Houay Phalai. **8-27 February 2022** The team did not encounter any threats during the patrolling. **12-27 March 2022** The team did not encounter any threats during the patrolling.
3	**3-22 January 2022**	**3-22 January 2022**

Team	Patrolling Area/distance	Observations/Actions Taken
	TPZ highest priority area including Nam Sone, Houay Poung and mountain ridges. (14 days covering a distance of 73 km on forest patrolling) **8-27 February 2022** TPZ highest priority area including Nam Chouan, Houay Hree, Houay Phai, Houay Poung, Nam San and northern Nam San tributaries. (17 days covering a distance of 82.29 km of forest patrolling) **12-27 March 2022** Nam Houng TPZ high priority area including Nam Tan, Nam Sik, Houay Vangmoun, Houay Kanang, Houay San, Houay Pahok, Houay Nongsaen and Houay Kaengkouang. (16 days covering a distance of 85.29 km distance on forest patrolling)	The team found and destroyed a hunting camp upstream of Nam Sone. They also collected some litter potentially from hunters upstream of Houay Poung. **8-27 February 2022** The team did not encounter any threats during the patrolling. **12-27 March 2022** The team found and destroyed one hunting camp at Nam Sik, one hunting camp at Houay Vangmoun, and one hunting camp at Houay Kanang. The team also detected and destroyed 120 active large spring snares at the upstream of Houay Kaengkouang.
4	**3-22 January 2022** Nam Ma TPZ high priority area including Nam Sa Nga, and mountain ridges. (14 days covering a distance of 77 km on forest patrolling) **8-27 February 2022** Nam Ma TPZ high priority area including Nam Ma, Nam Mong, Nam Pang and mountain ridges. (16 days covering a distance of 61.39 km of forest patrolling) **13-28 March 2022** Nam Ma TPZ high priority area including Nam Ma, Nam Sa Nga and mountain ridges. (16 days covering a distance of 95 km on forest patrolling)	**3-22 January 2022** The team found and destroyed a recent fishing camp with some garbage at Nam Ma and a recent hunting camp with a used cartridge located close to Nam Sa Nga. **8-27 February 2022** The team encountered and destroyed a fresh hunting camp and collected a used cartridge located at the upstream of Nam Mong. **13-28 March 2022** The team encountered and destroyed a fresh fishing camp at Nam Ma (outside TPZ or TPZ high priority area) and two old fishing camps at Nam Ma (inside TPZ high priority area).

Notes: During the January 2022 patrolling, each patrol team spent two working days (5-6 January 2022) to help with road and bridge maintenance from Vangphieng Village to Nam San sub-station and so the forest patrolling only included 14 working days (7-20 January 2022).

FIGURE 4-1: ***MAP OF PATROLLING TRACK FROM JANUARY TO MARCH 2022***

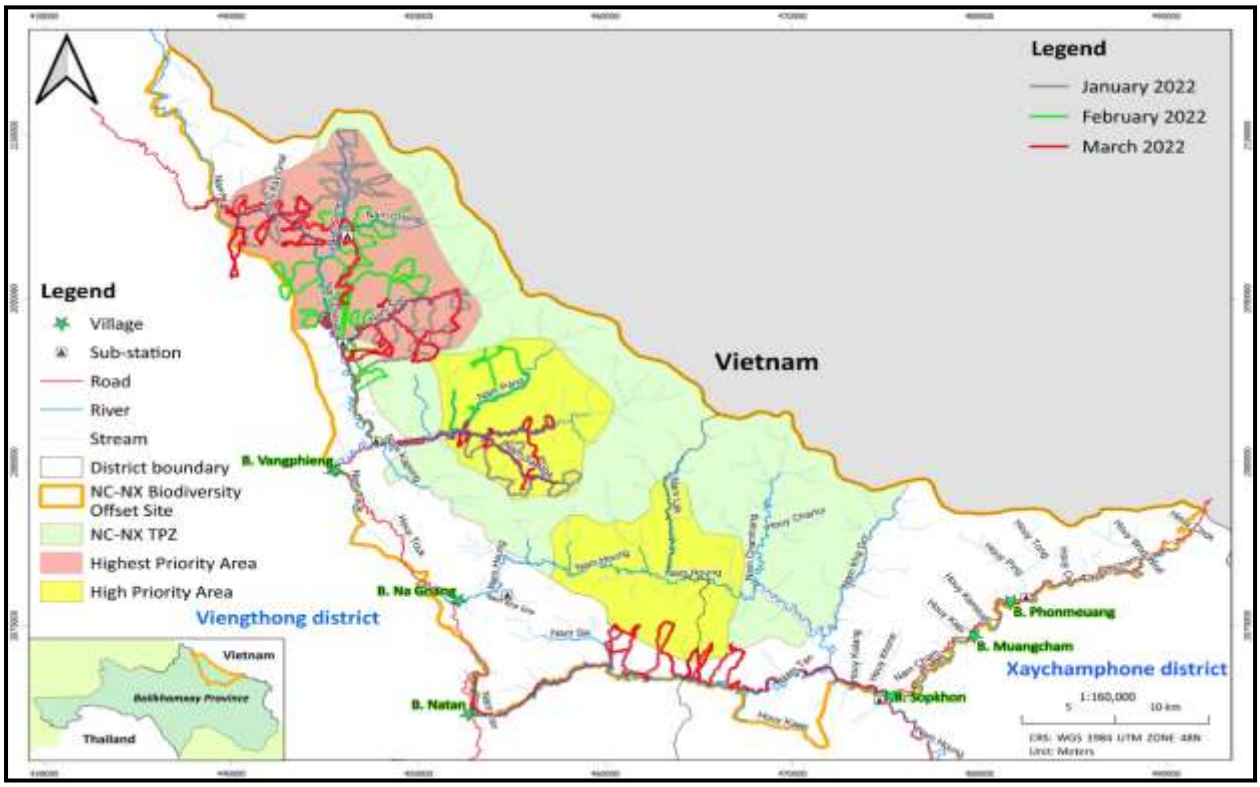


FIGURE 4-2: ***MAP OF THREATS FROM JANUARY TO MARCH 2022***

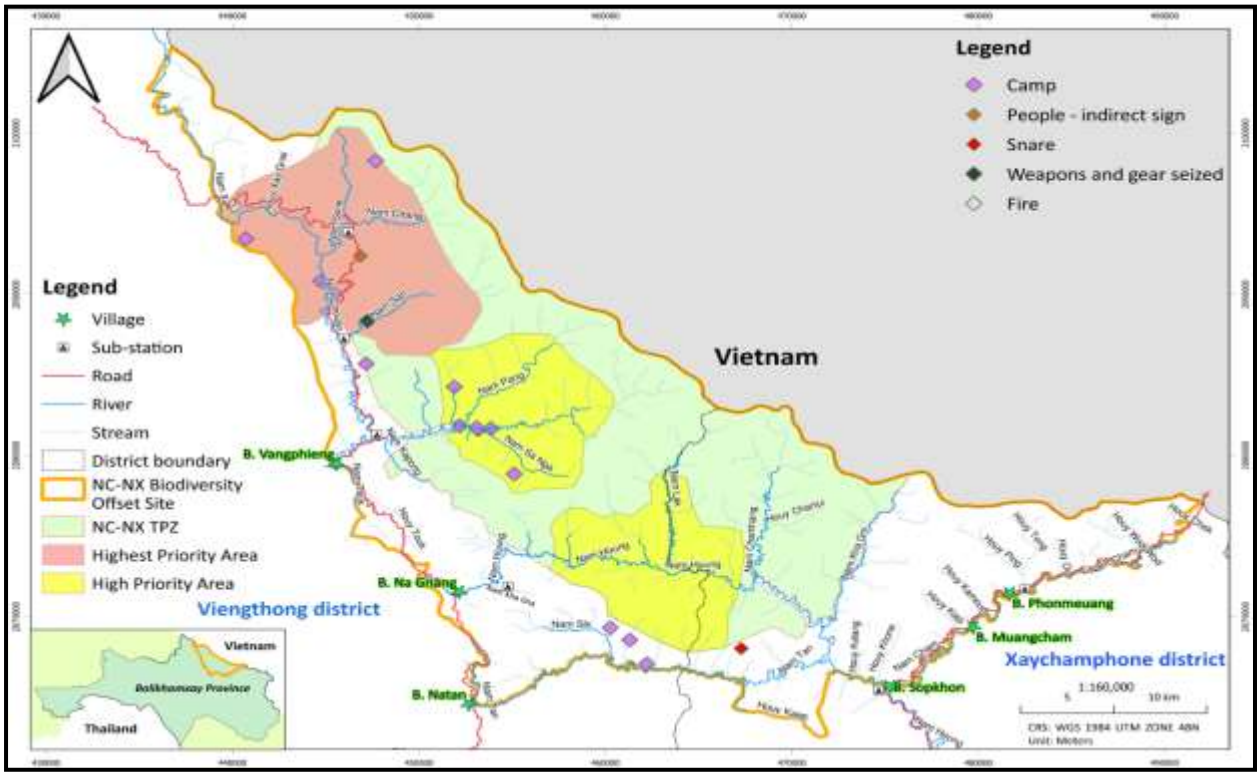


FIGURE 4-3: ***EVIDENCE OF SMALL-SCALE FOREST FIRE OBSERVED BY TEAM 1 CLOSE TO HOUAY POUNG DURING JANUARY 2022 PATROLLING***

FIGURE 4-4: ***FISHING CAMP FOUND AND DESTROYED BY TEAM 1 AT NAM CHOUAN DURING JANUARY 2022 PATROLLING***

FIGURE 4-5: ***HUNTING CAMP FOUND AND DESTROYED BY TEAM 1 CLOSE TO NAM CHOUAN DURING JANUARY 2022 PATROLLING***

FIGURE 4-6: ***BIRD TRAPS FOUND AND COLLECTED BY TEAM 2 AT HOUAY PHALAI DURING JANUARY 2022 PATROLLING***

FIGURE 4-7: ***HUNTING CAMP FOUND AND DESTROYED BY TEAM 3 AT THE MOUNTAIN RIDGE OF NAM SONE DURING JANUARY 2022 PATROLLING***

FIGURE 4-8: ***DRYING RACK FOUND AND DESTROYED BY TEAM 4 AT MOUNTAIN RIDGE OF NAM SA NGA DURING JANUARY 2022 PATROLLING***

FIGURE 4-9: ***USED CARTRIDGE FOUND AND COLLECTED BY TEAM 4 AT MOUNTAIN RIDGE OF NAM SA NGA DURING JANUARY 2022 PATROLLING***

FIGURE 4-10: ***A FRESH HUNTING CAMP FOUND AND DESTROYED BY TEAM 1 AT HOUAY PAYANG DURING FEBRUARY 2022 PATROLLING***

FIGURE 4-11: ***USED CARTRIDGE COLLECTED BY TEAM 4 AT THE UPSTREAM OF NAM MONG DURING FEBRUARY 2022 PATROLLING***

FIGURE 4-12: ***HUNTING CAMP FOUND AND DESTROYED BY TEAM 3 CLOSE TO NAM SIK DURING MARCH 2022 PATROLLING***

FIGURE 4-13: ***FISHING CAMP WITH DRYING RACK DETECTED AND DESTROYED BY TEAM 4 AT NAM MA (OUTSIDE TPZ) DURING MARCH 2022 PATROLLING***

FIGURE 4-14: ***FISHING CAMP DETECTED AND DESTROYED BY TEAM 4 AT NAM MA (INSIDE TPZ HIGH PRIORITY AREA) DURING MARCH 2022 PATROLLING***

c. Component 3 – Conservation Outreach

BSP-WCS shared the second draft of outreach strategy on 28 December 2021 and EMO provided comments for further improvement on 05 January 2022. BSP-WCS shared the third draft of outreach strategy on 04 February 2022. EMO provided comments on the draft particularly to elaborate on the budget estimation for the proposed activities. BSP-WCS is working to further improve the draft. BSP-WCS continues to further improve the draft Nam Chouane-Nam Xang (NC-NX) outreach strategy.

NNP1 EMO, NC-NX BOMU, and BSP-WCS agreed to conduct radio-based outreach campaigns. Three different scripts for the radio-based broadcasting at district and village level in two languages (Lao and Hmong) were finalized in the last week of November 2021 in collaboration with the district Information, Culture and Tourism Office. The scripts were distributed to the six NC-NX villages on 3 February 2022. The broadcasting is being implemented from February to July 2022.

d. Component 4 – Conservation linked livelihood

The activity under the approved Community Development Plan (CDP) that was scheduled in January 2022 could not be commenced yet due to the responsible staffs of BOMU and DAFO were infected by COVID-19.

BSP-WCS continues to improve the final draft Community Conservation Agreement (CCA). They shared the draft English version of CCA to EMO on 15 February 2022. They were also improving the Lao version of the draft in March 2022.

The snare removal of January 2022 was implemented between 3-16 January 2022 focusing on the TPZ highest priority area including upstream of Nam San and its mountain ridges. The team did not observe any snares, but they heard the gun shot and found ammunition cartridges around the area. The February 2022 snare removal was implemented between 10 to 24 February 2022 focussing on the TPZ highest priority area including Nam Xi, Houay Poung and Houay Xay Gnai. The results of January and February 2022 monthly snare removal were encoded into SMART database. The March 2022 snare removal was scheduled on 14 - 28 March 2022. However, EMO, BOMU, and BSP-agreed that snare removal assessment should be carried out before continuing the activity. BSP-WCS finalized the assessment forms elaborating the review and comments from BOMU and EMO on 17 March 2022. The budget plan for the assessment was prepared by BOMU at the end of March 2022. The assessment will be carried out in April 2022 because of the responsible staffs from DAFO were infected by COVID-19.

4.2.2 Preparation of Annual Implementation Plan (AIP) 2022

NC-NX BOMU submitted the draft Biodiversity Offset Management (BOM) AIP2022 to EMO on 24 December 2021. EMO provided comments back to NC-NX BOMU on 29 December 2021. Due to unavailability of Head of NC-NX BOMU related with COVID-19 case, EMO and representatives of BOMU admin and finance sections organized an online discussion on 11 January 2022. EMO received the updated draft on 20 January 2022.

EMO and BOMU organized an online meeting on 9 February 2022 to discuss and agree on the key issues for the draft AIP2022 such as field allowance, subsistence allowance, phone cards and etc. The activity schedule was further detailed and communicated with BSP-WCS on 16 February 2022 for their inputs. BSP also recommended to include additional training budget for the

patrolling and snare removal team and so the plan was further updated accordingly. The draft was submitted to ADB and IAP on 23 February 2022 for their review and approval.

The draft AIP 2022 was submitted to ADB and IAP on 23 February 2022. IAP and ADB provided comments with no objection on 7 and 18 March 2022 respectively. However, BOMU confirmed that the Financial Management Manual (FMM) should be finalized first before concluding the AIP2022. The discussion on final draft FMM was scheduled in April 2022.

5 FISHERY MONITORING

Four species groups and one species dominated the fish catch by weight in Q1 2022 as listed in ***Table 5-1.*** All species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species[2], except *Sikukia gudgeri* is classified as Data Deficient species (DD) and *Oreochromis niloticus* is an exotic species.

TABLE 5-1: *FISH SPECIES DOMINATING THE FISH CATCH IN Q1 2022*

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Hampala dispar, Hampala macrolepidota	ปาสูด	347.2	LC
Sikukia gudgeri, Amblyrhynchichthys truncatus	ปาขาวซาย	262.3	DD, LC
Barbonymus gonionotus, Hypsibarbus malcomi, Hypsibarbus vernayi, Hypsibarbus wetmorei	ปาปามา	223.4	LC
Oreochromis niloticus	ปานิน	205.2	LC
Poropuntius normani, Poropuntius laoensis, Poropuntius carinatus	ปาจาด	213.4	LC

The recorded catch of Threatened species (IUCN Red List classification) in Q1 2022 are presented in ***Table 5-2.*** The list includes three species that are classified as Vulnerable species (VU).

Table 5-2*: Threatened Species of Q1 2022 Fish Catch*

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
Cirrhinus cirrhosus	ปาแกง/ปามอมจัม	1.2	VU
Scaphognathops bandanensis	ปาอวมไฝ/ปาป่วม	28.4	VU
Tor sinensis	ปาแดง	41.1	VU

[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.

The occurrence of Threatened species in the fish catch by quarter since the start of species identification in Q3 2015 is displayed in **Table 5-3**. Based on the 7-day reported catch from the Daily Catch Logbook (DCL) survey, no specimens of *Lucio Cyprinus striolatus (*endangered species) have been reported since Q4 2018.

TABLE 5-3: *OCCURRENCE OF THREATENED SPECIES IN THE FISH CATCH*

Species	Q3 2015	Q4 2015	Q1 2016	Q2 2016	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021	Q4 2021	Q1 2022
Bangana behri (VU)	+	+	+	+	+	+	+	+	+			+	+	+		+											
Cirrhinus cirrhosus (VU)	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+		+	+	+		+		+	+	+
*Datnioides undecimradiatus **																+											
Epalzeorhynchos munense (VU)												+															
Luciocyprinus striolatus (EN)	+	+	+	+			+	+	+	+			+	+													
Pangasianodon hypophthalmus (EN)	+																										
Probarbus jullieni (EN)	+	+	+			+		+	+	+		+		+			+	+			+	+				+	
Probarbus labeamajor (EN)				+	+			+																			
Scaphognathops bandanensis (VU	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Tor sinensis (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 Q1 2022. The catch is divided in 3 areas including above the main dam, below the main dam and Mekong area. Main biodiversity indicators in Q1 2022 for above dam, below dam and Mekong area are presented in ***Table 5-4*** to explain the diversity of fish. This diversity index (Shannon) explains that the high value means high diversity.

TABLE 5-4*: MAIN BIODIVERSITY INDICATORS FOR Q1 2022*

Biodiversity Indicators	Mekong	Below dam	Above dam
Total number of species and groups recorded	46	49	37
Single species	37	32	24
Species groups	9	17	13
Top 15 species (% total catch weight)	84.72%	79.70%	95.43%
Proportion for species groups	24.01%	63.01%	51.56%
Diversity index (Shannon)	2.8494	2.9012	2.5050

The mean daily fish catch per household from July 2015 to March 2022 is displayed in ***Figure 5-1*** and the mean fish catch per household per fishing day for Q1 from 2016 to 2022 are shown in ***Table 5-5.***

FIGURE 5-1*: MEAN DAILY FISH CATCH PER HOUSEHOLD FROM JULY 2015 TO MARCH 2022*

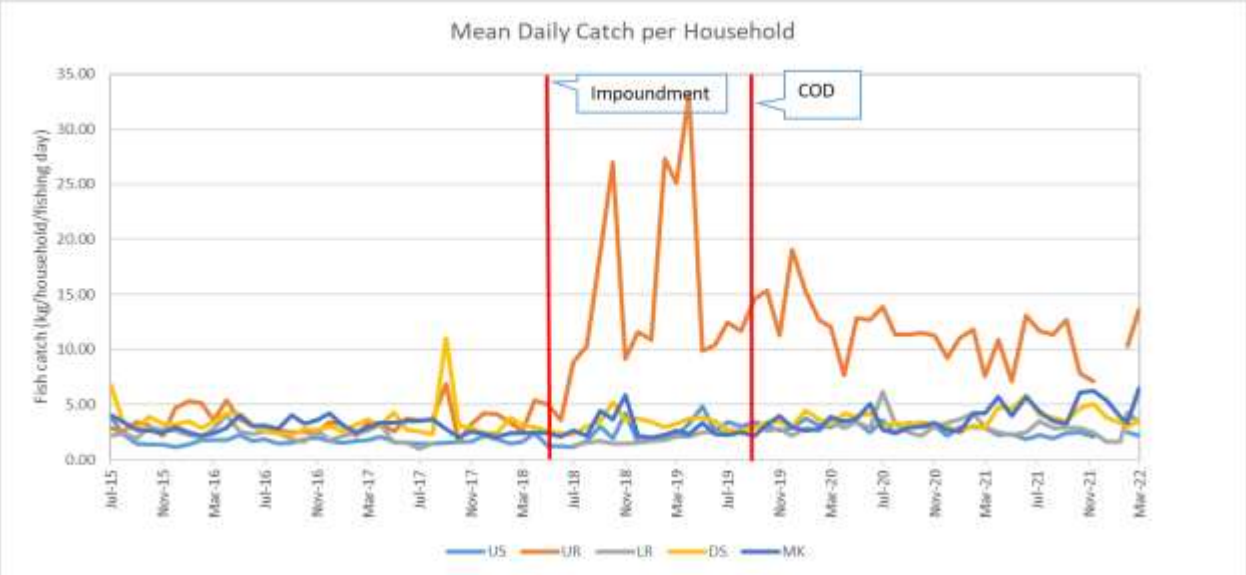


TABLE 5-5*: MEAN DAILY FISH CATCH PER HOUSEHOLD FOR Q1 FROM 2016 TO 2022*

Fishing Zone	Q1 2016 (kg)	Q1 2017 (kg)	Q1 2018 (kg)	Q1 2019 (kg)	Q1 2020 (kg)	Q1 2021 (kg)	Q1 2022 (kg)
Upstream	1.62	1.64	1.62	1.95	3.27	2.92	2.32
Upper reservoir	4.70	2.90	3.36	21.08	13.35	10.15	11.99

Fishing Zone	Q1 2016 (kg)	Q1 2017 (kg)	Q1 2018 (kg)	Q1 2019 (kg)	Q1 2020 (kg)	Q1 2021 (kg)	Q1 2022 (kg)
Lower reservoir	2.37	2.40	NA	1.85	3.01	3.58	3.11
Downstream	3.26	3.16	3.08	3.19	3.75	2.83	3.29
Mekong	2.36	2.86	2.32	2.30	3.11	3.63	4.57

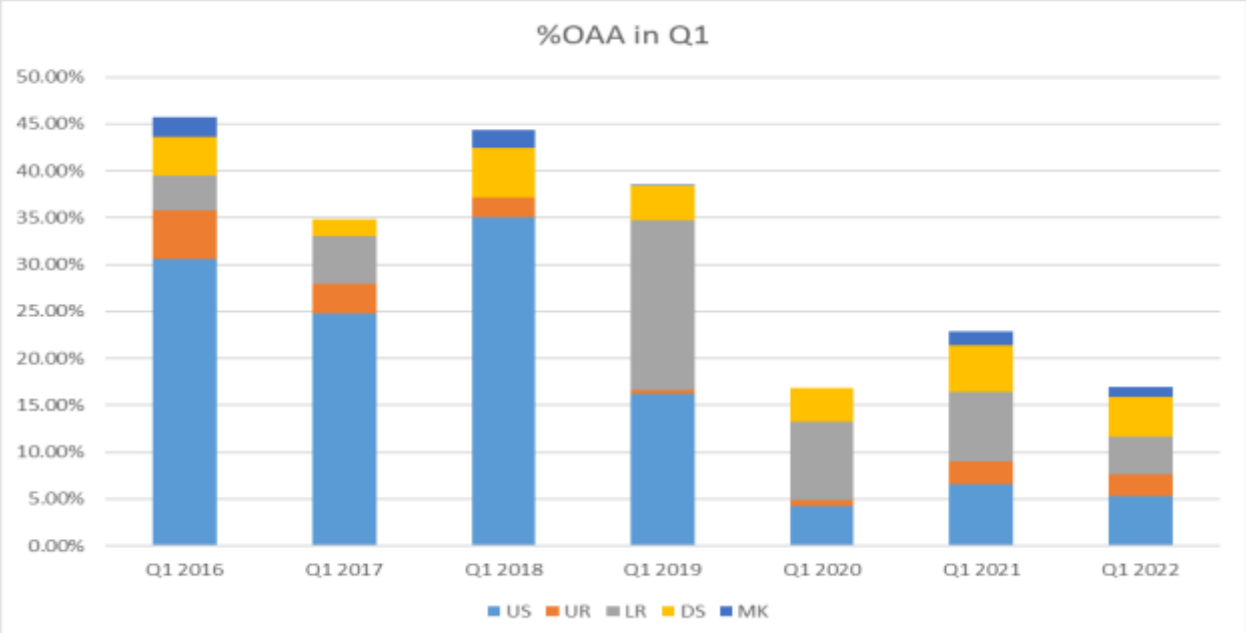
The survey results in Q1 2022 indicate that Nam Ngiep is the main fishing habitat for the upstream and downstream zones, while the main fishing habitat for the upper reservoir, lower reservoir and Mekong zones are the reservoir, tributaries and streams and Mekong respectively. The proportion of fishing habitats in Q1 2022 are displayed in ***Table 5-6***.

TABLE 5-6*: PROPORTION OF THE CATCH REPORTED BY MAIN HABITATS (%) IN Q1 2022*

Habitats	US	UR	LR	DS	MK
Mekong	0.0%	0.0%	0.00%	18.22%	88.71%
Nam Ngiep	69.8%	8.9%	0.00%	47.50%	1.82%
Nam Xan	0.0%	0.0%	0.00%	0.38%	0.00%
Reservoir	0.0%	88.7%	28.22%	0.00%	0.00%
Tributary and stream	30.2%	2.4%	70.65%	30.14%	0.08%
Wetland	0.0%	0.0%	1.14%	3.58%	9.39%
Others	0.0%	0.0%	0.00%	0.18%	0.00%

Total reported fish and other aquatic animal (OAA) catch (proportion of OAA) for the same 7-day period in Q1 from 2016 to 2022 are shown in ***Figure 5-2.***

FIGURE 5-2*: PROPORTION OF OAA TO THE TOTAL REPORTED KILOGRAM (KG) OF FISH AND OAA FOR A 7-DAY PERIOD BY FISHING ZONE IN Q1 FROM 2016 TO 2022*



6 Health and Safety

6.1 Related to NNP1PC Health and Safety

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

A summary of the safety incidents reported during the Operation Phase (September 2019 to March 2022) are provided in ***Table 6-1*.**

Table 6-1*: Safety Incidents Reported during the Operation Phase (September 2019 to March 2022)*

Type of Incidents	LTI	RI	NM	PD	FI	MVI	Total
No. of Incidents in Q1 2022	0	0	0	0	0	0	0
Cumulative Total Incidents to 31 March 2022	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

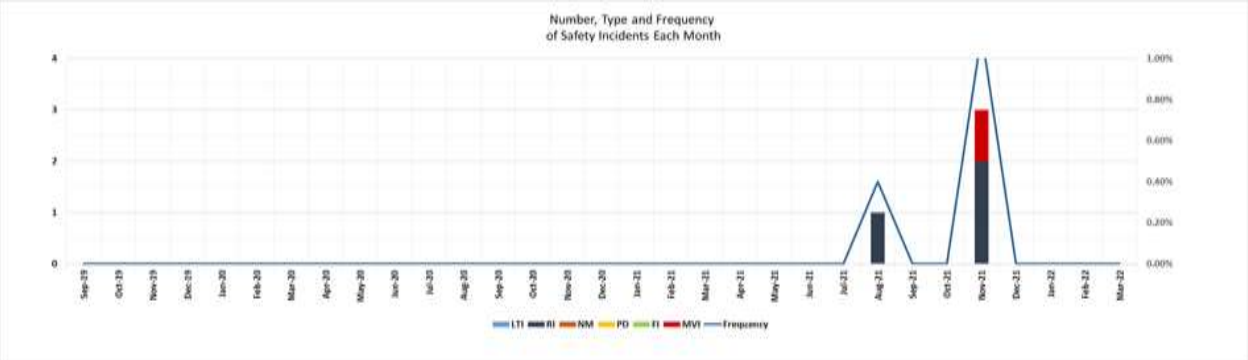
There was no incident or accident reported in Q1 2022.

The histogram below in ***Figure 6-1*** shows the number of reported incidents occurring in each month since the start of the Civil Works Contract with the colour indicating the type of incident including near misses. Up to the end of December 2015, all incidents related to the Civil Contractor and from 01 January 2016, those of the other three principal Contractors have been included. 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.

[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

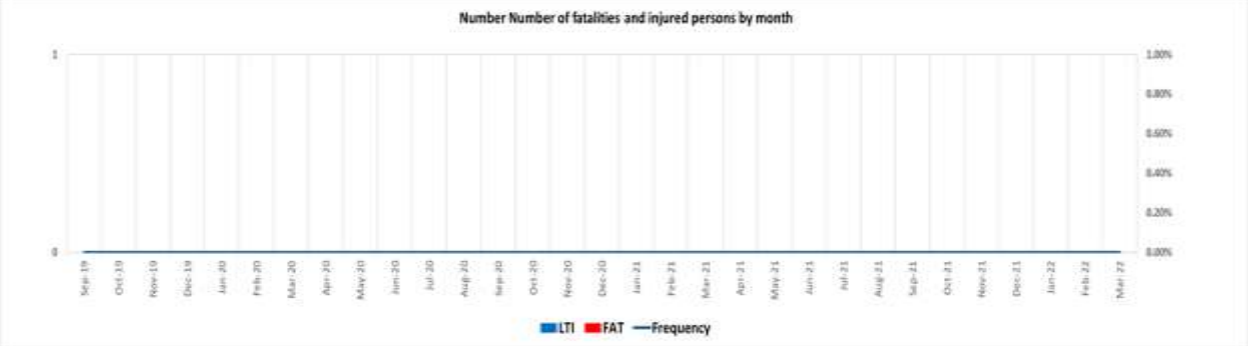
All reported incidents that have involved the Owner and its Contractors and Subcontractors are included in the histogram and shown graphically below. At the end of March 2022, the total number of people employed on Site was 304.

FIGURE 6-1*: Number, Type and Frequency of Safety Incidents during September 2019 to 31 March 2022*



The second histogram in ***FIGURE 6-2*** shows none of persons who were injured, or lost their lives in the reported Lost Time Incidents during September 2019 to 31 March 2022.

FIGURE 6-2*: Number of Fatalities and Injured Persons to 31 March 2022*



Incidents = Accidents (with injury) + Near Misses + Other Incidents (with damage, no injury)

6.2 RELATED TO COVID-19

Due to confirmed internal cases of COVID-19 in April in Laos and following Government of Laos' countermeasure, NNP1PC locked down the site offices. The OSOV1 and OSOV2 have been closed off to outsiders and no external site visit was allowed. COVID-19 countermeasures such as physical distancing, practicing personal hygiene by frequent washing hands with alcohol-based gel, mask wearing in the work place as well as avoiding mass gathering, and limiting physical meeting are encouraged. This lockdown of OSOV1 and OSOV2 - with some relax restriction such as subject to prior approval staff are allowed to return home but need to be self-quarantined when they return to work - has still in place to ensure safe operation of the Project.

In early January 2022, the first COVID-19 cases were confirmed at NNP1 Project site and by the end of month, there were 12 confirmed cases which included NNP1PC staffs and contractors

(Kenber and LPS). In February 2022, there were two confirmed COVID-19 cases in NNP1 Project and by the end of the month, there was no COVID-19 case in NNP1PC.

6.2.1 NNP1PC COVID-19 Measures

Based on the latest Government of Lao PDR announcement No. 130/PMO dated 3 February 2022 on COVID-19 preventive, control, and containment measures during the new phase of the pandemic, (the "Latest PM Order"), the isolation of OSOV1 and OSOV2 has been extended from 23 February 2022 until further notice.

General Instructions:

- All staff are requested 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 don't 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.
- 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;
- ***NNP1PC Site Access Form*** needs to be filled by all staff who are going out/coming into the camp for approval by each relevant DMD or his/her delegation. The 14 days' timeline submission as part of the Site Access Form before entering the site will no longer needed. However, the prior approval of the Site Access Form for the outgoing trip is still needed and to attach as part of a Vehicle Request each time;
- NNP1PC's essential activities such as operation and maintenance of power facilities, social and environmental activities and others can be conducted where permissible by GOL and communities by following GOL's preventative measures strictly;
- Subject to respective DMD's approval, staff and camp residents are allowed to travel to Pakxan or Bolikhan Districts for a day trip for personal and business-related matters and they are not required to be in self-quarantine when they return. However, they need to comply with COVID-19 measures strictly and avoid crowded areas. After return, staff will be tested using authorized ATK by NNP1PC paramedic if it is a business related 72 hours after the trip and own ATK if personal related trip is made;
- Staff have to be kept in self-quarantine for three days (72 hours) from the hour of arrival to the site and then take AKT test before discharging. If a staff is found to have any symptoms of COVID-19 (i.e., dry cough, high fever of more than 37.5 C, difficult breathing, sweats at night time while sleeping, chills, headaches, high temperature or flulike symptoms), the staff must contact his/her immediate supervisor for immediately placed in an isolation room provided (site-based staff) and referred to instruction by a relevant authority;
- Staff have to continuously check their own body temperature using a thermometer provided at the entrance of OSOV1 and OSOV2 at least once a day; and
- Paramedics stationed at the site clinic have to provide a thermometer and body temperature record sheet for self-quarantine and/or self-isolated personnel.

Specific Instructions:

(A) Self-quarantine for NNP1PC personnel:

- Staff who come from home leave or field trip activities of more than one day will be self-quarantined in OSOV1/OSOV2 for three days (72 hours);
- During the three days self-quarantine, staff are required to measure their own body temperature and record in the provided sheets by the paramedic two times a day (morning and evening). If the body temperature is more than 37.5 ^{o}C and staff has any symptom of COVID-19, they should report to their supervisor and/or paramedic immediately;
- the staff will notify their supervisor, DMD and paramedic to request for an ATK at least 3 hours before due. Based on the DMD approval, the site paramedic will conduct ATK test for group of more than 5 staff prior to the discharge. If less than that, staff is recommended to conduct their own test using instruction provided or consult the paramedic. If the result is negative, they will be released and resume normal work with preventive measure;
- If the result is positive, a report will be made to Bolikhan District COVID-19 Committee and the case will be treated at OSOV1 or at home if requested by staff who meet the GOL's conditions for home treatment and approved by the DMD in consultation with the NNP1 COVID-19 Committee and local village authorities for the nearby Villages.

(B) One-day tripper:

- One day trippers on both personal or business purposes to Vientiane Capital, Bolikhamxay and 2UR (Xaysomboun) Provinces do not need self-quarantine. However, preventive measures shall be observed during the trip and upon returning to the site;
    - The trippers are not allowed to dine in the canteen for three days upon returning from the trip,
    - The trippers shall be encouraged to work from their room for three days. If working in the office is unavoidable, prior permission from the management is needed;
    - The trippers must not join social activities e.g., group dinner or sports during the seven day period;
    - DMD will approve the use of NNP1 provided ATK for the business tripper 72 hours after the trip and if the test is negative, normal work with preventive measures shall follow;
    - Day trippers who take a trip for personal purpose shall use their own ATK to conduct ATK test. The trippers also need to provide another ATK to the driver for testing after returning 72 hours to ensure that they both are safe;
    - A staff who takes a trip for business purpose, ATK will be provided by the company;
    - Only authorized ATK by the Lao Government will be used by the paramedic for both personal and business purposes to avoid errors;
    - The authorized ATK can be purchased from the office in case of emergency with the same price as procured by NNP1 which have fluctuated from the currency exchange rate;
    - In order to ensure that only authorized ATK are used, the company will procure sufficiently for necessary use. The paramedic is responsible for making good record of the ATK used for personal if borrowed and approved by DMD for business purposes and report results immediately if found positive to the NNP1 COVID-19 Working Group for further advices and actions.

(C) Neighboring communities e.g., Hat Gniun, Thaheua and Phouhomxay villages:

- Staff can buy food and consumables in Hat Gniun village once a week but with strict implementation of GOL measures as well as the minimal number of staff going there;

- Staff from these communities will be allowed to return home and commute daily to their work at OSOV1 and OSOV2. Since they are not required to do self-quarantine as other staff, they will be tested with ATK on Monday every week before starting work during the week of Lao New Year holiday to the end of April. They are to socialize in their community as per government announcements;
- Staff living and working in Phouhomxay Village can commute to the Project site office by following strict COVID-19 measures and will be following the same rule as staff in Hat Gniun and Thaheua Villages.

(D) Travel from Overseas:

- Staff are encouraged to complete their self-quarantine per GOL measures which include 2 days quarantine with negative PCR test result prior to travelling to the site and 5 days self-quarantine at home or a designated area. They need to travel straight and take COVID-19 preventive measures without stopping for dining or shopping along the roads and complete all required quarantine with approved GOL documentation in order to not completing the self-quarantine again on site.
- Per GOL guideline, investors who obtain negative PCR test after being self-quarantined in a designated hotel for 48 hours can go to conduct their works based on their schedule, however, they must take COVID-19 preventive and control measure e.g., by keeping social distances, wearing face masks etc.

(E) Community safety:

- Staff who reside in Phouhomxay, Hat Gniun and Thaheua villages must limit their participation and organization of social functions or parties with villagers;
- Work coordination with local authorities in the three villages has to be conducted in line preventive measures against COVID-19 as described above; and
- New arrival of workers or employees especially foreigners to the three villages or the NNP1 Project site has to be notified promptly to the local Village authorities and to Social Development team of ESD for the case of temporary workers by relevant Division.

(F) Guests or visitors:

- Except emergency cases by Government Agencies, all external visit will not be allowed until further notice.

(G) Others:

- Subject to prior approval by a respective Deputy Managing Director (DMD), staff will be considered to return home for annual leave or to work from home;
- Food and essential items to be delivered to the site for camp residents using LPS truck or NNP1PC vehicles must be loaded at the Main Entrance to OSOV and these will be collected and sterilized by the respective team before distribution. Materials for construction activities can be transported into site directly as long as there is no direct contact with any camp residents;
- Alcohol consumption is prohibited at all times in the main and re-regulation powerhouses as well as by general staff and contractors during or outside working hours. Consumption of alcohol outside these areas after work is allowed;
- The residents of OSOV1 and OSOV2 can interact with one another and dining in the canteen are allowed but precautionary measures such as social distance at least one meter and personal hygiene have to be practiced. Different dining time between OSOV1, OSOV2 and contractors such as EGAT O&M and Kenber will be organized to reduce congestion in the canteen;
- Selling beer and other alcoholic beverages inside the camp is allowed;

- Drinking beer and other alcoholic beverages in the residence area is allowed subject to: (1) within four people; (2) within one hour; and (3) with social distance; and
- Sport events onsite are allowed but all players need to wear masks. The number of players is limited to six (6) people who have been onsite for more than seven days only in case of group sport event. Gathering and discussing in groups or more than six in sport areas is not allowed.

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 don't 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) Contractors' personnel living outside the camps can commute from the host villages directly to their work areas without contacting with NNP1PC staff. These include Kenber, PKCC, Lao Security Service Enterprise, CV General Construction and Nilun.

(C) Contractors from overseas are encouraged to complete their self-quarantine per GOL measures with negative PCR test result and GOL approved documentation for discharging prior to travelling to the site. They need to travel straight and take COVID-19 preventive measures without stopping for dining or shopping along the roads in order to not completing the self-quarantine again on site.

(D) Domestic Contractors' personnel travelling into the Project site for work have to complete at least 2 doses of vaccines and take ATK test to obtain negative results and approval by relevant DMD before start working following GOL's basic measures. But it may change subject to the working arrangement related risks, pandemic situation and further announcements from Governments.

(E) 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.

(F) 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.

(G) If a contractors' personnel are 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.

6.2.2 Overview of NNP1PC COVID-19 Measures related to NNP1PC project implementation and monitoring program

Workplace risk assessment	
• The exposure risk for NNP1PC entities (employee, consultant, contractor, sub-contractor) during the increased COVID-19 cases which was started in April 2021 is defined based on the WHO Guideline (2020)[4] that is "medium exposure risk". • The medium exposure risk means that jobs or work tasks with close, frequent contact with the general public, or other co-workers, visitors, clients or customers, or contractors, but that do not require contact with people known to be or suspected of being infected with COVID-19. In areas where COVID-19 cases continue to be reported, this risk level may be applicable to workers who have work-related frequent and close contact with the general public, visitors, or customers in high-population-density work environments (e.g., food markets, bus stations, public transport, and other work activities where physical distancing of at least 1 m may be difficult to observe), or work tasks that require close and frequent contact between co-workers. In areas without community transmission of COVID-19, this scenario may include frequent contact with persons returning from areas with community transmission.	
Risk	**Preventive measures**
Job or work tasks with close or frequent contact in the area where COVID-19 continue to be reported or contact with persons returning from area with community transmission	• Based on the latest Government of Lao PDR announcement No. 130/PMO dated 3 February 2022 on COVID-19 preventive, control, and containment measures during the new phase of the pandemic, (the "Latest PM Order"), the isolation of OSOV1 and OSOV2 has been extended from 23 February 2022 until further notice. • Staff who come from home leave or field trip activities of more than one day will be self-quarantined in OSOV1/OSOV2 for three days (72 hours). • During the self-quarantine, staff are required to measure their own body temperature and record in the provided sheets by the paramedic two times a day (morning and evening). If the body temperature is more than 37.5 C and staff has any symptom of COVID-19, they should report to their supervisor and/or paramedic immediately.

[4] Annex to Considerations for public health and social measures in the workplace in the context of COVID-19. WHO (10 May 2020)

	• In case of infection, a report will be made to Bolikhan District COVID-19 Committee and the case will be treated at OSOV1 or at home if requested by staff who meet the GOL's conditions for home treatment and approved by the DMD in consultation with the NNP1 COVID-19 Committee and local village authorities for the nearby Villages.
Impact on NNP1 project and OHS	**Mitigation**
• The country wide lockdown measures following PM Order No. 15/PM dated 21 April 2021 is being implemented since 21 April 2021 as well as PM Order No. 130/PMO dated 3 February 2022 on COVID-19 preventive, control, and containment measures during the new phase of the pandemic might impacting the continuation some project implementation activities.	• The project activities within the project area with COVID-19 low-risk of community transmission continues to progress such as Dam operation and maintenance work; EMO environmental monitoring work within the NNP1 reservoir; or SMO livelihood centre operation. • Close coordination with relevant GOL committees related with COVID-19 measures for the implementation and monitoring activities. • Any continuation of project implementation and monitoring activities especially for the field work must comply NNP1PC COVID-19 measures and any with applicable guidelines.
• The site lockdown between April 2021 to February 2022 might impact psychological state of site residents	• NNP1PC COVID-19 measures during this lockdown allow the site residents to leave their respective site in case of emergency such as accidents, health and family related issues and other requests as found reasonable by respective management. • NNP1PC COVID-19 measures during this lockdown period allow for social events/gathering but for less than 20 people with mask-wearing and social distancing of at least one meter must be ensured.

Lockdown schedule	**Impact on NNP1PC project implementation and monitoring activities**		
	TD	**SMO**	**EMO**
01 October – until further notice (Ref: PM Order No.1036/PMO dated 19 August 2021, PM Order No. 1094/PMO dated 31 August 2021, and PM Order No.	No impact on the overall power generation and maintenance work.	To be reported in the SMO Quarterly Progress Report (Q4 2021).	• No monthly and quarterly visit by EMU. • No impact on EMO environmental monitoring program. • Relevant GOL committees in Xaysomboun and Bolikhamxay confirmed

Lockdown schedule	Impact on NNP1PC project implementation and monitoring activities		
	TD	SMO	EMO
1177/PMO dated 15 September 2021; PM Order No. 1330/PMO dated 15 October 2021, and PM Order No. 1494/PMO dated 14 November 2021) PM Order No. 130/PMO dated 3 February 2022			that the implementation activities under watershed and biodiversity monitoring could resume except for further instruction in case of COVID-19 infections.

6.2.3 General situation of COVID-19 in NNP1PC

- Vaccination rate as of October 2021

No	Work location	Target Group (person)	Vaccination received (1st dose)	Vaccination received (2nd dose or full dose)
1	Staff in Vientiane office	33	33 (100.0%)	33 (100.0%)
2	Staff on site office	110	110 (100.0%)	110 (100.0%)
Total		**143**	**143 (100.0%)**	**143 (100.0%)**

- Number of positive tests on site during Q1 of 2022 – 18 NNP1 staff

7 EXTERNAL MISSIONS AND VISITS

There was no external missions and visits by ADB, IAP, and LTA carried out during January-March 2022.

The action priorities recommended by ADB, IAP, and LTA during the mission in November 2021 are listed for further follow-up as shown in the **Table 7-1**.

Table 7-1: *NNP1 CORRECTIVE ACTION PLAN (CAP)*

No	Requested/Recommended Actions	Status as of early January 2022
1	**E&S Capacity** i) NNP1PC to provide Job Descriptions of Key EMO and SMO staff. ii) NNP1PC to provide also job descriptions for H&S staff. iii) NNP1PC to include the updated chart in the ESMS and next Q monitoring report iv)The Job Descriptions of key SMO staff will be assessed by ADB to ensure that their deliverables are aligned with the deliverables in the REDP, SDP, CDP and Masterplan for Livelihood Development	i) Three TORs of EMO key positions and H&S staff were already provided since the November 2021 mission. The remaining job descriptions of EMO &SMO key staff positions was completed by Q4, 2021. iii) The organization chart of E&S is added in the Env Q4 2021 Report.
2	**Emergency Preparedness** • The revised EAP and EEP have to be completed and tested • Revise and consider response times • Integration of the EAP and EEP into the internal documents • The plans need to consider the comments from the mission of December 2020. Plans should be developed in consultation with relevant emergency authorities. o Drills to be performed prior to the wet season, and a concrete timebound plan for field testing, and evidence of consultants hired and their CVs are required to achieve project completion. o The LTA and ADB needs to review the revised EAP and EEP version for clearance.	• Stage1: NNP1PC is addressing comments of ADB from Dec 2020 mission and this was shared by 31 December 2021. The timeline for EEP drills conducted by ESD in September-October 2021 was already shared with the mission in November 2021 and will be updated for providing by mid-January 2022. • Stage 2: The national consultant hired by NNP1PC was revising the EEP for GOL review by Q1 2022 and drills will be done before the 2022 wet season. The format for EEP will follow the GOL format adjusted to include key practical information. Draft EEP and drills report will be provided by 30 June 2022.
3	**Impacts caused by water level variations** • EAP & EAP Socialisation: Prior to the onset of the wet season each year, annual emergency evacuation drills are to be undertaken with each downstream village • Compensation Upstream: Confirm whether there have been any flooding impacts upstream above 320masl due to backwater effects or the wet season/abnormal flooding. Also confirm if compensation has been provided for the new suspension bridge design which is to be built at 323.2 MASL. Provide evidence that National Road 1D (which is to be raised to 322 MASL) used to get flooded prior to filling the reservoir the level of	• NNP1PC already responded during the mission and provided photos to document the flooding related to the upstream flooding and road 1 D improvements. The relevant info and materials (including the compensation maps both upstream and downstream area) were shared with ADB during and after the latest virtual mission. • The EEP schedule is being updated and will share with ADB/LTA by end of June 2022.

No	Requested/Recommended Actions	Status as of early January 2022
	the road. Clarify NNP1PC funding contribution to Road 1D. CDF funds should not be used.	
4	**Operation manual** • NNPC1 to address comments by the LTA, and update manuals as necessary • LTA to indicate whether the operational manual requires updating with the finalization of the EAP and EEP. • LTA to review and endorse the Operational Manual (updated in July 2021 as indicated by NNPC1) to verify that previous comments on maximum operating levels considering PMF, backwater effects and water availability for the irrigation system have been incorporated. • LTA to verify that the operations manual complies with CA requirements on eflows and water level fluctuation.	• The comments made by LTA has been addressed in the Operation Manual (OM) by TD team by the end of December 2021. • NNP1PC provided an OM management plan and document list and its coverage by 31 December 2021.
5	**Eflows** NN1PC to continue monitoring compliance with the eflows and fluctuation thresholds set in the ESIA and CA.	Noted. No further response is required.
6	**Water Quality (Reservoir)** i) NN1PC to provide the results of the trial to operate the labyrinth Spillway at the Re-regulation Dam (scheduled in September 2021) to see the improvement of DO values downstream and possibility to operate the spillway routinely. ii) LTA to review the information provided and the ESMMP-OP. iii) Share results of the 3-D simulation of predicting DO will be done in Q4 2021 to understand the changes. Share results with ADB and LTA	i) the results were shared during the latest virtual mission; iii) NNP1PC already confirmed during the mission that there will be no 3D simulation in Q4-2021.
7	**Water Quality (Reservoir)** LTA/ADB to confirm whether monitoring can stop. Continue monitoring in the meantime.	A report requesting stopping monitoring hydrogen sulphide (H2S) and Phytoplankton Biomass was shared with ADB and LTA on 14 January 2022.
8	**Water Quality (communities)** The Plan of action will be followed up	The potential root cause and the plan of action was reported in the Env Q4 2021 Report and explained in the Env Q1 2022 Report.
9	**Wastewater Treatment** • Review the design and as built plans of all WWTPs to be retained during the operations phase to ensure adequate volume and discharge quality.	i) the maps with the requested details were provided by the end of December 2021. ii) the root cause of contamination and the updated results of system adjustment will be reported in the Env Q2 2022 Report.

No	Requested/Recommended Actions	Status as of early January 2022
	• Find root cause of contamination and possible solutions.	iii) The SOPs for waste management were provided to ADB and LTA on 3 December 2021.
10	**Watershed Management Plan - Budget** • Finalise AIP while ensuring that allocated resources are not diverted from conservation • NN1PC to provide evidence of the following: i) Resolution of the allowance issue with WRPOs considering how this has been addressed in other similar programs in the provinces and Lao; ii) Provide an efficient and rapid way of generating the AIP or suggest improvements to the current process; iii) Budget (AIP) for 2021 agreed asap. iv) AIP for 2022 agreed by December 2021 with GoL.	i) The approach was provided and discussed during the mission on Thursday 25 November 2021 and updates were provided on 07 December 2021. ADB confirmed its acceptance on 07 December 2021. ii) The IAP and ADB confirmed acceptance on the plan of DOF-MAF and Bolikhamxay WRPO on 7 and 10 February 2022 respectively. The team has refined the Lao version of the plan and shared the plans to DOF-MAF and Bolikhamxay WRPO on 11 February 2022. DOF-MAF submitted the fund disbursement request on 25 February 2022. The funds to cover the implementation of activities during Q1 and Q2 2022 under the approved Bolikhamxay WRPO and DOF-MAF AIP2022 were transferred by NNP1PC to DOF-MAF account at central level on 15 March 2022. Bolikhamxay WRPO is preparing the document for further fund transfer from DOF-MAF account to Bolikhamxay WRPO account at provincial level during end of March 2022. iii) Xaysomboun WRPO submitted the budget plan of their AIP2022 to EMO on 30 March 2022. The plan is being reviewed by EMO team and is expected to be further discussed after a meeting on improvement of institutional arrangement of Watershed and Reservoir Protection Committee (WRPC) and WRPO has been held in April 2022.
11	**Watershed Management Plan - Law Enforcement** i) A law enforcement strategy approved by all relevant bodies for the sub-catchment (BSP is taking the lead role on this). The Strategy should clarify what those entails, and who should lead on it (at least, a final draft submitted for review to the relevant bodies). ii) Details of finalization and operation of Xaysomboun (Hom District) sub office and 2 reservoir checkpoints iii) rubber plantation clearing issues to be resolved	• The Law Enforcement Strategy for the NNP1 sub-catchment will be ready by the end of Q2 2022. • 'Hom sub-office' - the construction was completed in September and the evidence was shared on 31 December 2021. • The other actions (operation of Hom District sub-office and rubber plantation clearance) cannot be achieved by the end of December 2021. These are GOL responsibilities outside the WMP/REDP and PCD conditions of NNP1PC. NNP1PC will indicate a timeline which GOL commits after discussing with the Xaysomboun PRLRC at the end of January 2022.
12	**Watershed Management Plan - Health and Safety** i) update EPRP accordingly	EPRP was updated and shared with ADB/LTA on 01 March 2022.

No	Requested/Recommended Actions	Status as of early January 2022
	ii)Implement updated H&S and EPRP - to be verified by ADB/LTA	
13	**Downstream Impacts** • Follow up on the plan of action • Update relevant plans • Provide warnings to PAP and Consultations - see Social CAP	The compensation downstream was confirmed by pegging line and RMU to be up to 160 m^3/s plus 1 m up from this discharge level in the dry season (therefore an equivalent of 230 m^3/s max. discharge can be obtained). The map of compensated riverbank garden was provided in Google Drive. The Action Plan for downstream water discharge warning is part of the OM for re-regulation dam.
14	**Reservoir & Watershed Management - Fisheries and Livelihood Development** • Confirm that Final Fisheries Co-Management Plan was approved by the GoL and disclosed to communities and is being successfully implemented • PAPs are still returning to lands and fishing concession is being extended in the absence of dissemination of WMP regulations. • In addition to the AIP finalisation, NN1PC should: v) provide a final FMP addressing comments vi) Submit Livelihood Program for 12 Reservoir Villages vii) Provide details of plans and the process to address the issue of people returning to the sub-catchment TPZ for agriculture, both at the reservoir and in other areas.	The final draft of the Fisheries Co-Management Plan is still on hold by the Xaysomboun PAFO due to pending workshop to decide on the role and responsibilities including budget division between the Province and District levels. Xaysomboun Provincial Governor already advised in March 2021 for them to organise workshops and discuss but this was not done. NNP1PC already reported to the Provincial Governor and requested for a meeting with PRLRC to resolve the pending issues of watershed management, encroachment by PAP to the watershed area and compensated land, etc. A meeting with NNP1 Provincial Resettlement and Livelihood Restoration Committee (PRLRC) and Watershed and Reservoir Protection Committee (WRPC) took place on 7 February 2022 at 01.30 p.m. at the Provincial Administration Office of Xaysomboun Province. Xaysomboun WRPO informed EMO Team in March 2022 that a new Head of Xaysomboun Provincial Agriculture and Forestry Office (PAFO) has been appointed and the internal meeting will be organized to discuss the AIP implementation including the pending progress such as the appointment of staffs for WRPO sub-office operation and patrolling program, the establishment of two land-based ranger stations in the Totally Protected Zone (TPZ) and two reservoir checkpoints, as well as actions related with reservoir and fishery management. They also informed that a meeting on improvement of institutional arrangement of Watershed and Reservoir Protection Committee (WRPC) and WRPO is scheduled in April 2022.

No	Requested/Recommended Actions	Status as of early January 2022
15	**Implementation of the biodiversity mitigation and offset framework** i) finalize the AIP for 2021 asap ii) Resolve the allowance issue with WRPOs considering how this has been addressed for other similar NNL programs in the provinces and Lao; iii) Provide an efficient and rapid way of generating the AIP or suggest improvements to the current process; iv) provide an agreement on the TPZ demarcation and checkpoints by all relevant parties; v) Budget (AIP) for 2022 agreed by December 2021 with GoL. vi) Commence biological monitoring survey as planned for 2021 vii) procurement and engagement of the NNL audit consultant in 2021	i) The draft AIP 2022 was submitted to ADB and IAP on 23 February 2022. IAP and ADB provided comments with no objection on 7 and 18 March 2022 respectively. However, BOMU confirmed that the Financial Management Manual (FMM) should be finalized first before concluding the AIP2022. The discussion on final draft FMM was scheduled in April 2022. ii) The field works for the biological monitoring survey as planned for 2022 started in February 2022.
16	**BOMP – Law enforcement** Provide a strategy agreed with GoL and monitor compliance i) Continue TPZ patrolling according to the BOMP and Law Enforcement Strategy ii) Provide an update and demonstrate that law enforcement targets for 2021 are on track as indicated in table 5 of the NC-NX LE strategy v6 (August 2021).	The results of patrolling were reported by BSP-WCS and discussed during the last virtual mission in November 2021.
17	**BOMP – Community Development Plan** CDP monitoring and implementation	The approved CDP was shared with ADB and IAP, the CDP implementation activities are included in the AIP2021 and will also be included in the AIP2022.
18	**Occupational Health and Safety** Update ERP with the navigation/emergency situations near water	EPRP led by NNP1PC-ADM was updated and shared with ADB/LTA on 01 March 2022.
19	**Dam safety** NNP1PC to provide evidence of completion of grouting and slope stabilization works of the main dam and an update on the dam safety recommendations. LTA to review and clear	• The work plans were provided to ADB and LTA on 3 December 2021. • The updated recommendation from the Dam Safety Review Panel (DSRP meeting 20 Report) was provided on 8 December 2021. • The evidence of work completion will be provided when the work has been done.
20	**Site disposal areas/ Site rehabilitation/ quarry site** • Submit a handover plan for ADB/LTA review that includes responsibilities and	• The restoration work has been completed by the Contractor for each site and checked/inspected by GOL (EMU). Only two areas are pending to be monitored and confirmed by EMU including the former

No	Requested/Recommended Actions	Status as of early January 2022
	how the GoL will check the conditions of the site or KPIs, and agreed future uses • Agree on the handover plan with GoL	LILAMA10 camp and the spoil disposal area of the irrigation canal contractor. The need for any additional counter measures suggested by GOL will be discussed and considered by NNP1PC using operational budget. • handover plan shared with ADB and LTA at the end of March 2022.
21	**Paragraph (b) of the definition of Project Completion Date** All Project Costs have been paid in full or provided for other than: (i) any amounts which the Company is disputing in good faith and in respect of which a reserve (to an amount satisfactory to the Intercreditor Agent) has been established in a segregated account or sub-account of the Project Accounts and has been fully funded; (ii) the withholding of retention amounts pursuant to the Construction Contracts; and (iii) any other amounts in respect of which, in the opinion of the Intercreditor Agent (acting on the instructions of the Required Lenders who shall consult with the Technical Adviser in providing such instructions), an adequate reserve has been established in a segregated account or sub-account in the Accounts and has been fully funded.	This was done by Q1 2022. The main budget source will be from the operation budget only.
22	**Paragraph (k) of the definition of Project Completion Date** The Shareholders have complied with their obligations under clauses 2 (Base Equity Commitment) and 3 (Contingent Equity Commitment) of the Shareholder Support and Subordination Deed to make Contributions to the Company in the amount of the Remaining Construction Period Safeguard Costs for credit to the Safeguards Costs Reserve Account	NNP1PC already submitted the items and amount of the Remaining Construction Period Safeguard Costs in 2019. The list of the remaining item and budget was also presented in the joint ADB-IAP-LTA mission's meeting on 26 November 2021.
23	**Section 29,a,ii of Annex C of CA, and clauses related to permits** Compliance with the CA	This was determined and provided in Q1 of 2022 according to the CA requirements.
24	**Clauses 51-82 in Annex C of the CA** Compliance with the CA	This was determined and provided in Q1 of 2022 according to the CA requirements.

The status of the requested/recommended actions will be followed up and updated in the next quarterly report.

APPENDICES

APPENDIX 1: STATUS OF DOCUMENTS REVIEW AND APPROVAL DURING Q1 2022

No	Site name	Document Name	Contractor / Subcontractor	Approval Status by EMO/NNP1 (date)	Detailed Site Information	Monthly Construction & Operation Status as of 31 December 2021
1	Phouhomxay village's Irrigation Canal	DWP & SS-ESMMP for improvement of damaged irrigation canal and leveling access roads	CV General Construction Sole Co., Ltd.	2nd submission on 10 February 2022. No objection with comments on 21 February 2022	Repairing of damaged irrigation canal	In progress
2	Main Dam Right Bank	DWP SS-ESMMP for Remedial Right Bank Abatement of Main Dam	CV General Construction Co., Ltd.	1st submission on 07 January 2022. No objection with comments on 10 January 2022	Remedial the right bank abutment erosion	In progress
3	NNP1PC's Operation Sites	DWP SS-ESMMP for Monitoring Work	PK Construction sole Co., Ltd	1st submission on 08 January 2022. No objection with no comments on 10 January 2022	Dam safety and operation facilities monitoring	In progress
4	NNP1PC's Operation Sites	DWP SS-ESMMP for Maintenance Works 2022	PK Construction sole Co., Ltd	1st submission on 20 January 2022. No objection with no comments on 20 January 2022	NNP1PC's operation site's facilities maintenance	In progress

APPENDIX 2: ENVIRONMENTAL MONITORING CORRECTIVE ACTIONS Q4 2021

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
1	ONC_KENBER-0007	28.12.2021	Main Dam	The contractor has a lack of spill response and control on site: - Black oil and hydrocarbon spills from the generator and water pump to the ground and open ditch without provision of appropriate countermeasures; - No cleaning up of absorbent sand/contaminated sand for a proper disposal/elimination.	- Move the water pump for 2-3 meters far away from the open ditch and provide spillage control measures to stop the oil leakage to the water. - Collect the oil on the water and store properly for further elimination and disposal environmentally. - Regular clean-up of contaminated soil/sand under the generators and store properly for further disposal/elimination. ***Note*:** The Contractor needs to pay more attention for spillage response on site. Otherwise, NCR will be issued immediately.	05.01.2022	15.03.2022	Resolved
2	ONC_KENBER-0008	28.12.2021	KENBER's Temporary Camp	Refer to the previous NCR (NC No.03/2021) pursuant the poor waste management at the temporary camp (rental houses). The scattered waste was collected and burnt at the	- Stop burning of solid waste on site. The solid waste shall be sorting/separated: (i) General waste to be disposed of at NNP1 landfill; (ii) Recycle waste to be sold to the	05.01.2022	15.03.2022	Resolved

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			(Rental houses)	surrounding areas of the rental houses. Whilst NNP1PC-EMO has regular instructed that no burning of solid waste is allowed.	local trader. - Collect the burnt waste/ash to bag and deliver to dispose of at the Spoil Disposal no.6, where currently uses for disposing of chemical waste and cement bags.			
3	NC04/2021	28.12.2021	KENBER's Temporary Camp (Rental houses)	With reference to the NC No. 02/2021 (in item no. 8), pursuant the lack of spill control at the KENBER's temporary camp and workshop (rental house) at Hat Gniun Village. NNP1PC-EMO had issued the NC No. 02/2021 with six (06) instructions to the Contractor's Site Manager for taking the corrective actions. During a joint site inspection and following up on 28 December 2021, only one of six instructions has been undertaken. No corrective actions have been taken for the rest of five instructions, in addition, new addition spillages were also observed. This indicates that the Contractor	- The Contractor's Site Manager/Project Manager needs to undertake his role and responsibility to ensure the site operation and management are followed the proposed and approved SS-ESMMP. - Proper housekeeping and move the scattered fuel drums and used oil drums including oily dirt hose, equipment and machinery to designated hazardous material storage areas. - Clean-up of spillage and contaminated soil/sand and store properly for proper disposal and elimination when the work completed. - Provide a hazardous material management and spill response training to relevant workers.	07.01.2022	24.03.2022	**Resolved**

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				lacks of attention to follow up and resolve the non-compliance issue. During this joint site inspection, it was found that: - No cleaning up of contaminated soil/sand on the ground that NNP1PC-EMO previously instructed on NC No. 02/2021. - Contaminated sand and spilt oil inside of the bunding area of fuel station was cleaned up and disposed/dumped to the ground outside of bunding area directly without contain and store properly. - New additional spillages on the ground is observed.	- Precaution signages and work instruction need to be displayed at hazardous material storage areas. - The evidences of the hazardous material management and spill response (photos, training material/topics and list of trainees record) shall be presented during the next joint site inspection and verification.			
4	NCR01/2022	13.02.2022	OSOV1 & OSOV2	The Waste Water Treatment Systems at three main operation sites (OSOV1, OSOV2 and Main Powerhouse) are fully operated for almost three months since a significant improvement and	'- Proper fencing installation to prevent the cattle's encroachment in the OSOV1 wetlands' ponds. - Additional planting of reeds in the OSOV1 wetlands' ponds.	30.04.2022	30.03.2022 (Newly opened in Q1, planned to	**In progress**

No	Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				modification completed in September 2021. After closely monitoring on their effluents, it is observed some monitoring parameters are sometimes exceeded the effluent guidelines.	- Adding the proper sludges/seeds into the Aeration Tank at OSOV2 WWTS and the Biofilm Septic Tank at the Main Powerhouse System. - Replacing the detergent materials in the Main Powerhouse by using lower Phosphate detergent. - Closely monitor the Residual Chlorine content in the effluents of OSOV2 and the Main Powerhouse WWTS and adjust as necessary. - Closely monitor the Influent to compare with the Effluent for the specific parameters to check their treatment effectiveness.		be resolved by Q2)	

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

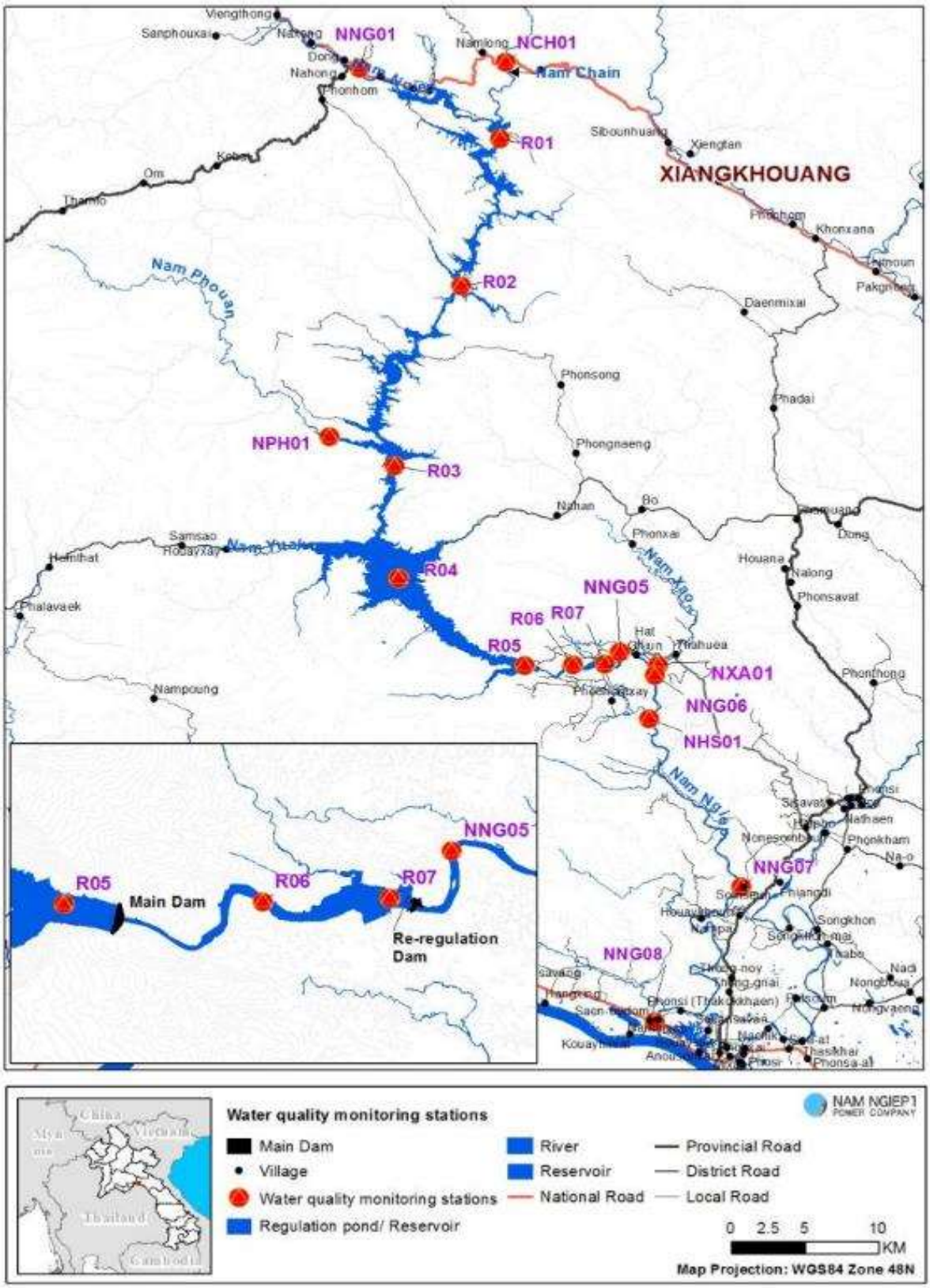
SITE CODES AND LOCATION STATION FOR SURFACE WATER QUALITY MONITORING

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

MONITORING FREQUENCY FOR SURFACE WATER QUALITY PARAMETERS

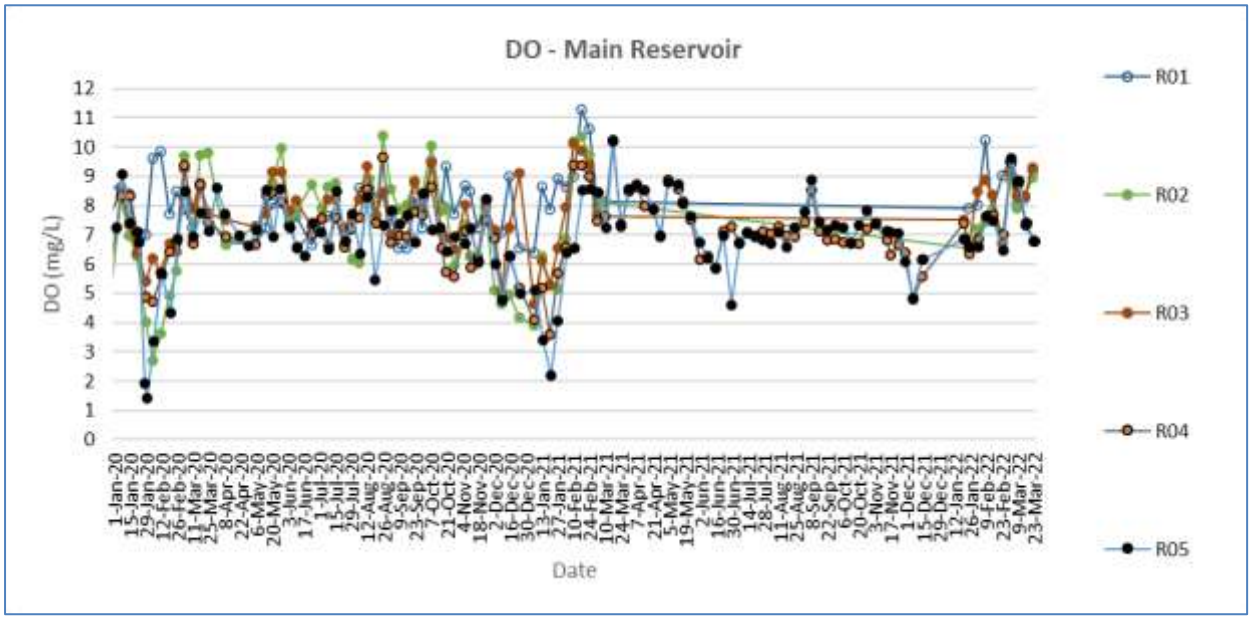
Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/L), Conductivity (µs/cm), Temperature (°C), Turbidity (NTU).	- Main Reservoir: R01, R02, R03, R04, R05; - Nam Ngiep downstream: NNG05, NNG06, NNG07 and NNG08; - Tributaries: Nam Phouan [NPH01], Nam Xao [NXA01] and Nam Houay Soup [NHS01].
Fortnightly	pH, DO (%), DO (mg/L), Conductivity (µs/cm), Temperature (°C), Turbidity (NTU)	All stations
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), Hydrogen sulphide (mg/L), Phytoplankton biomass, TOC and TKN.	As per ESMMP-OP.

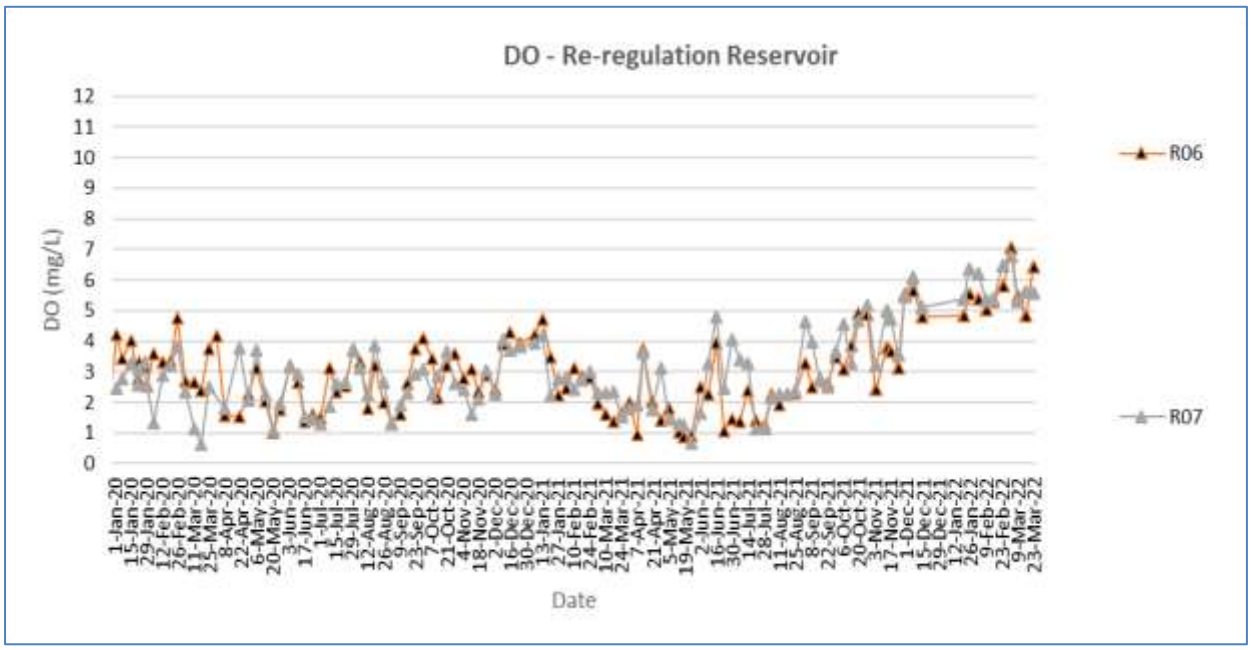
SURFACE WATER QUALITY MONITORING LOCATIONS

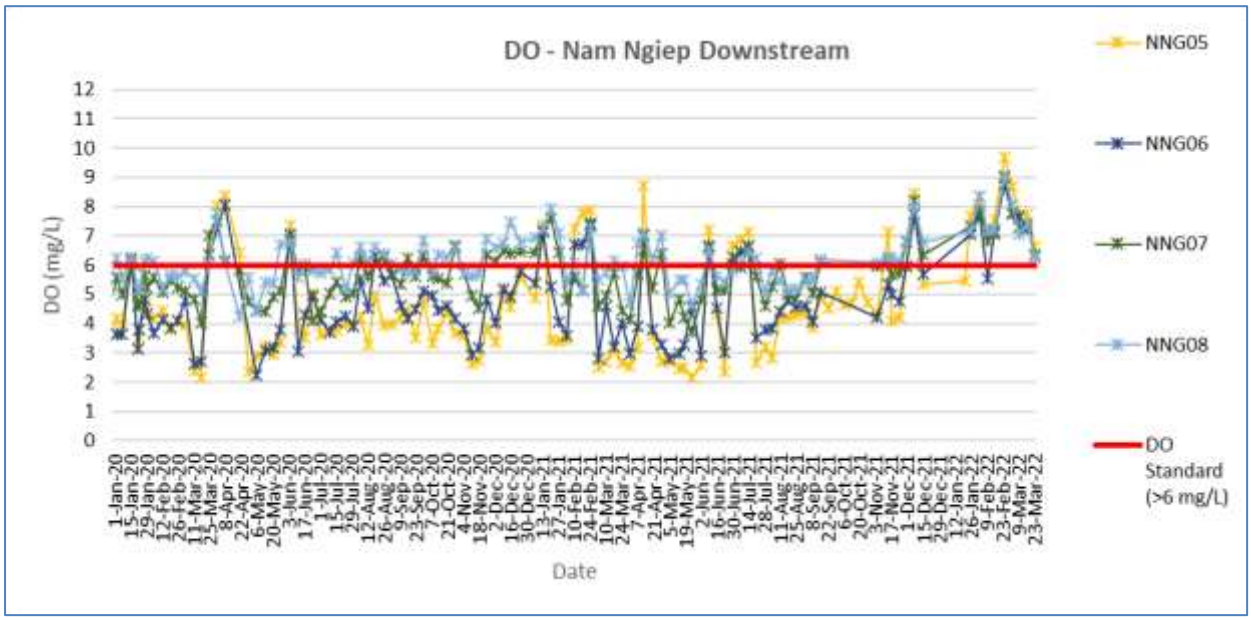


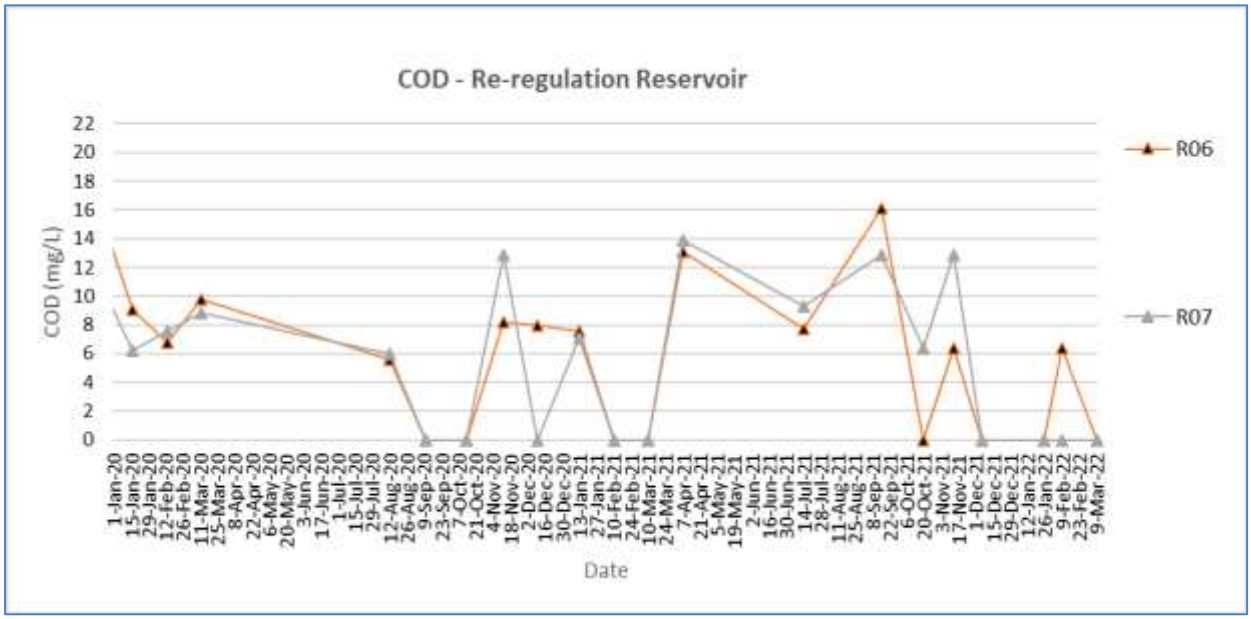
APPENDIX 4: KEY TRENDS OF WATER QUALITY MONITORING FROM JANUARY 2020 TO END OF MARCH 2022 (ONLY PARAMETERS THAT EXCEEDED THE STANDARDS)

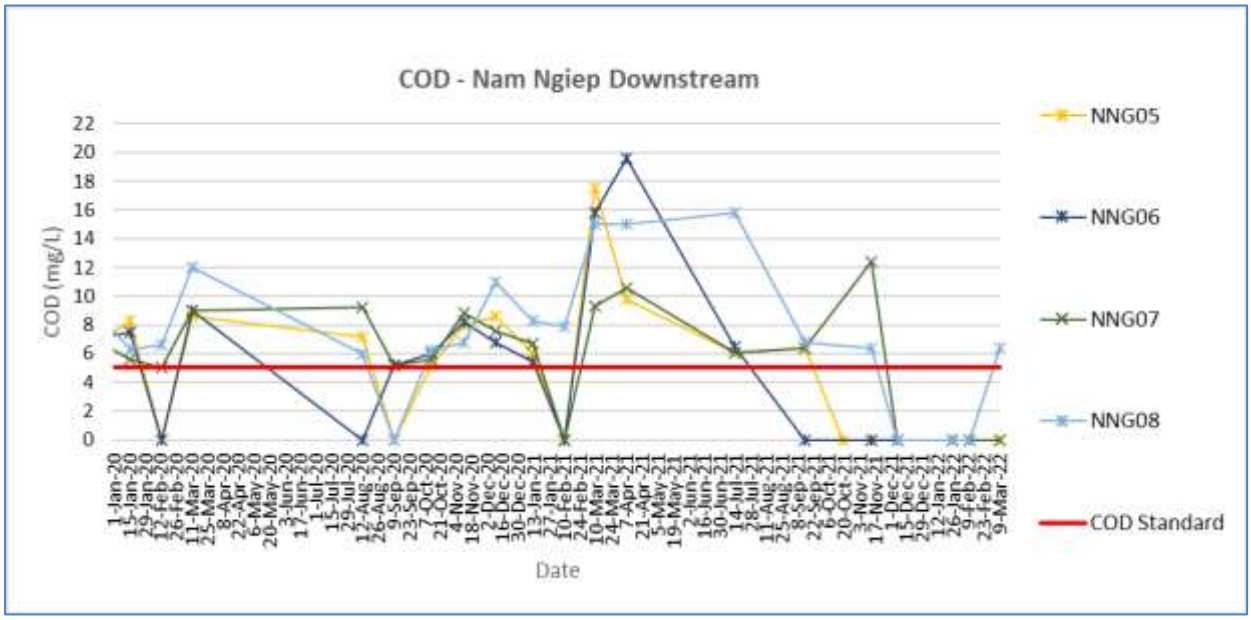
Nam Ngiep Surface Water



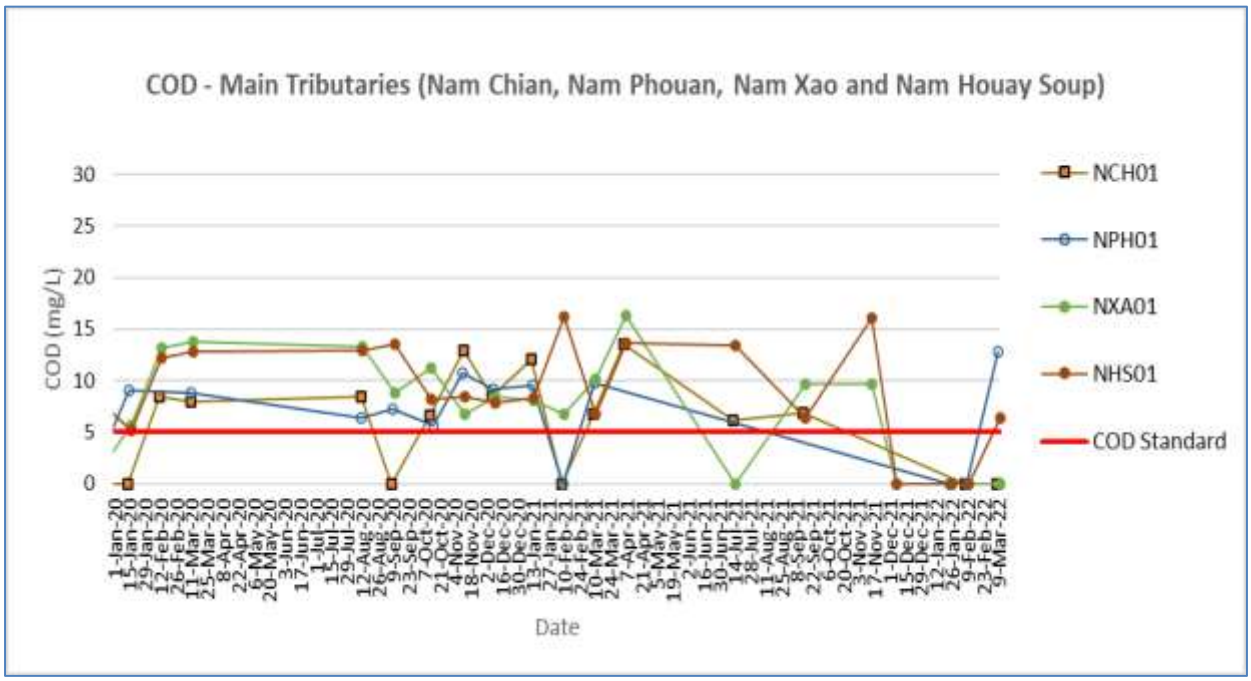



DO - Nam Ngiep Downstream
DO (mg/L)
Date
NNG05
NNG06
NNG07
NNG08
DO Standard (>6 mg/L)

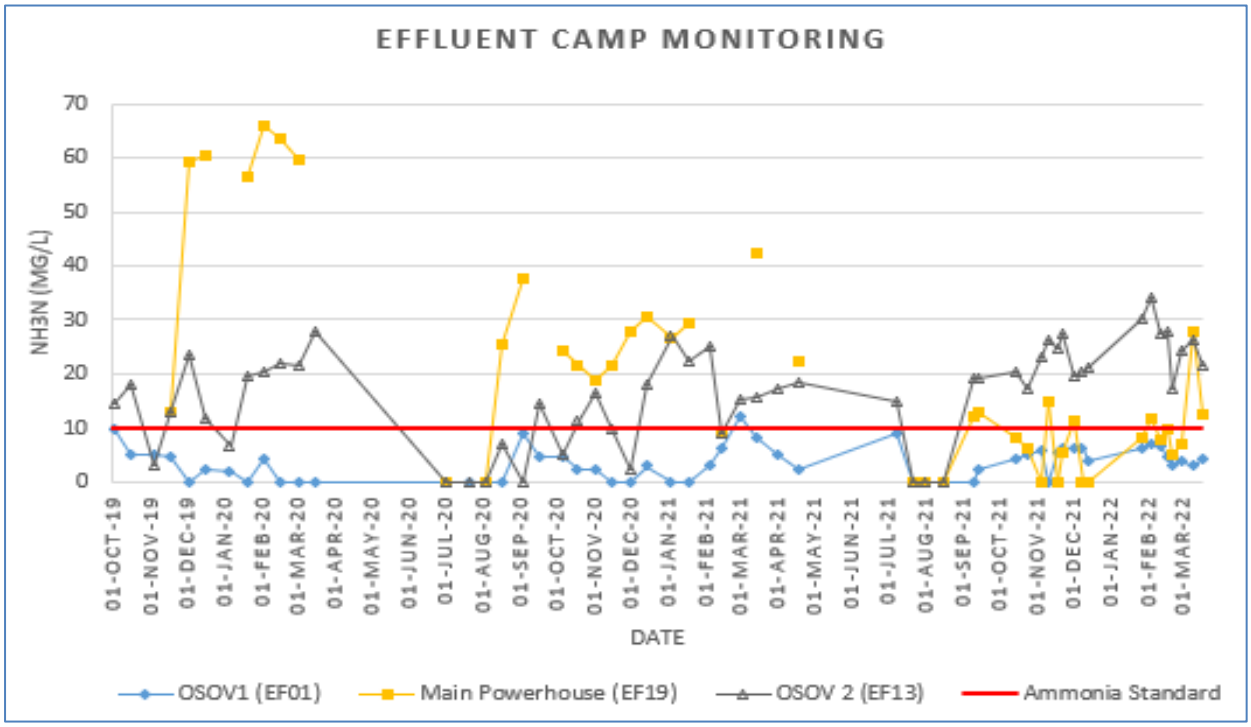

COD - Re-regulation Reservoir
COD (mg/L)
Date
R06
R07

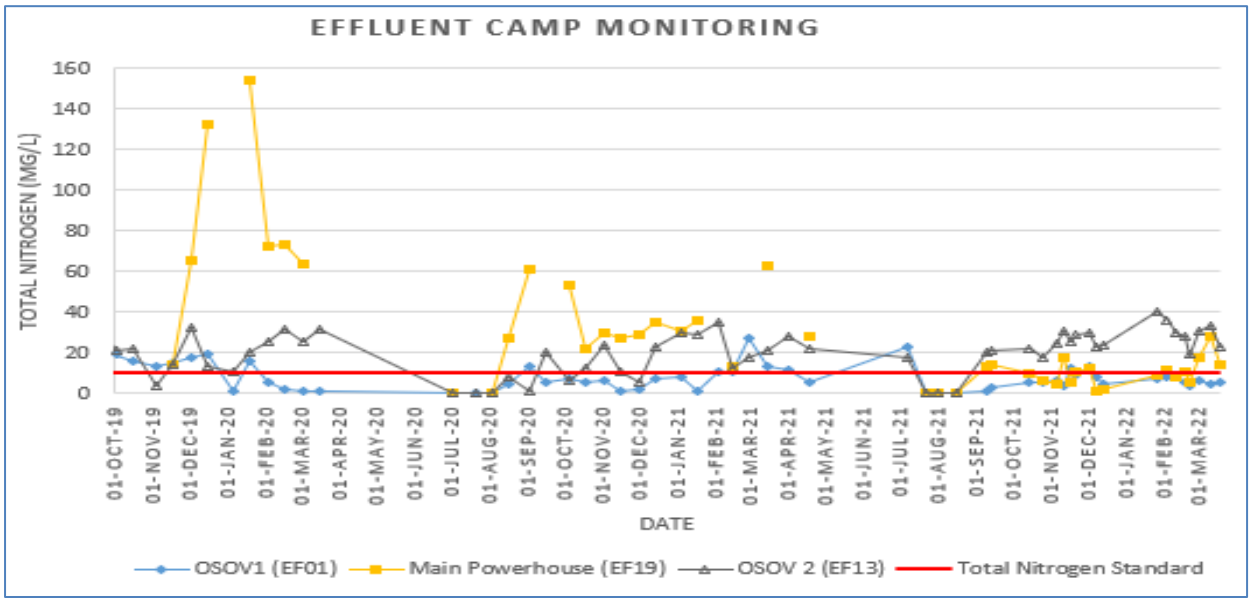

COD - Nam Ngiep Downstream
COD (mg/L)
Date
NNG05
NNG06
NNG07
NNG08
COD Standard

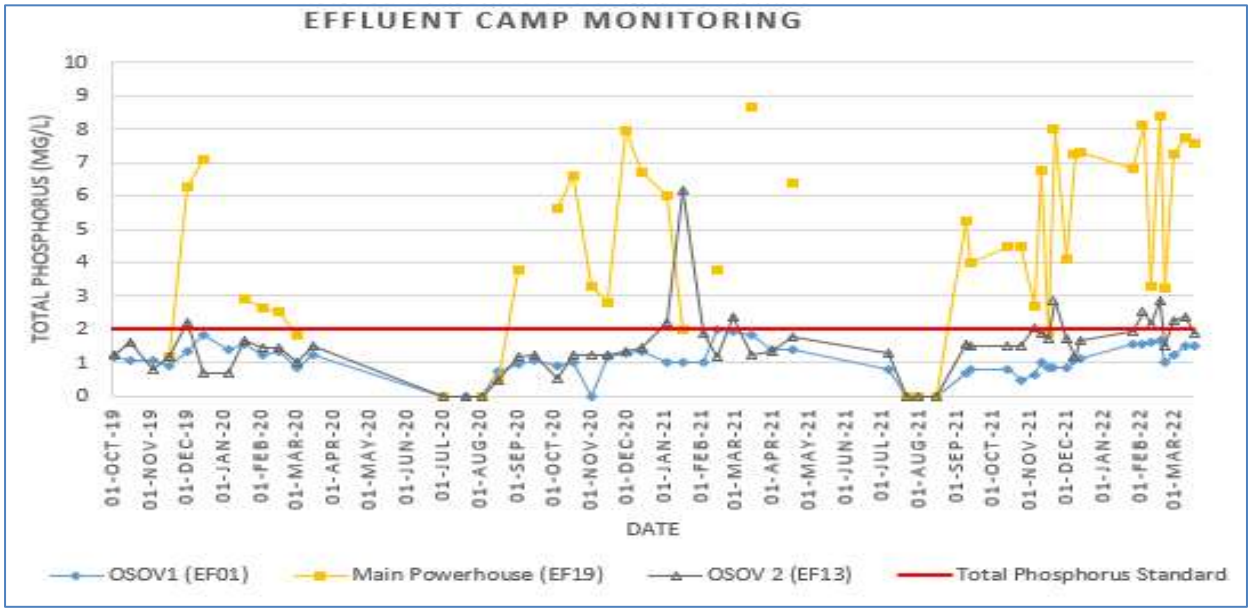
Key Water Quality Parameters for the Nam Ngiep Tributaries: Nam Chian, Nam Phouan, Nam Xao, Nam Houay Soup

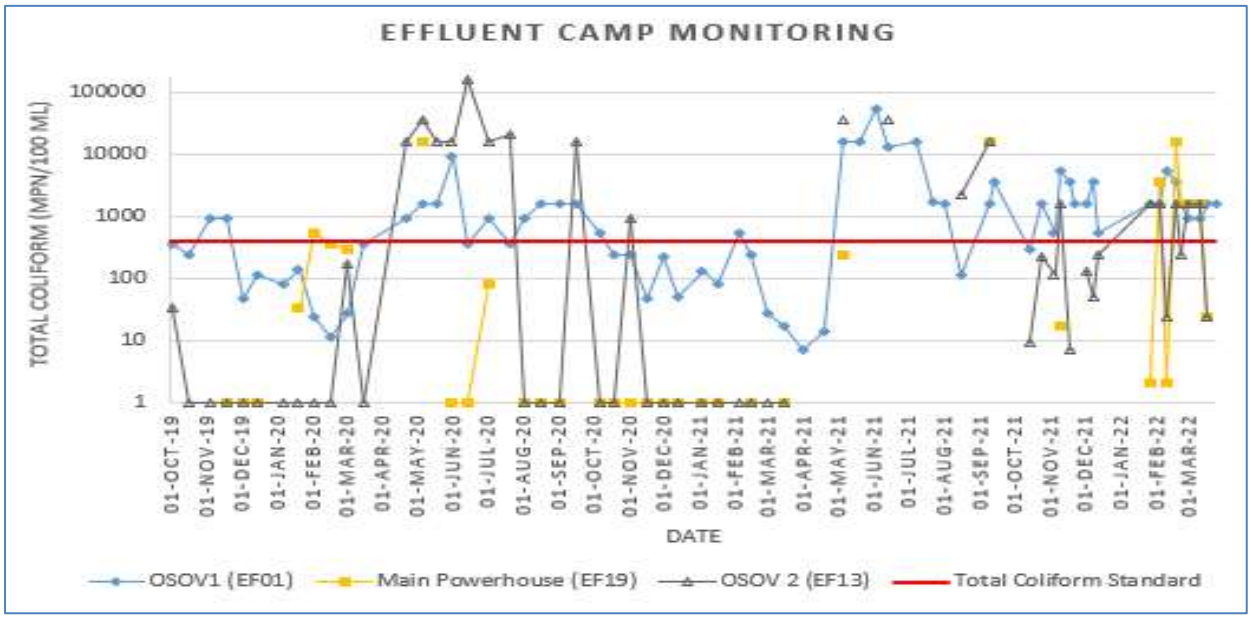


Camps' Effluent Water Quality Trends (Since October 2019 – March 2022)




EFFLUENT CAMP MONITORING
TOTAL NITROGEN (MG/L)
DATE
OSOV1 (EF01)
Main Powerhouse (EF19)
OSOV 2 (EF13)
Total Nitrogen Standard


EFFLUENT CAMP MONITORING
TOTAL PHOSPHORUS (MG/L)
DATE
OSOV1 (EF01)
Main Powerhouse (EF19)
OSOV 2 (EF13)
Total Phosphorus Standard


EFFLUENT CAMP MONITORING
TOTAL COLIFORM (MPN/100 ML)
DATE
OSOV1 (EF01)
Main Powerhouse (EF19)
OSOV 2 (EF13)
Total Coliform Standard

APPENDIX 5: WATER QUALITY MONITORING DATA
APPENDIX 5-1: SURFACE WATER QUALITY MONITORING – Q1 2022

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream				
											Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
20-Jan-22	pH	5.0 - 9.0				6.88	7.13	6.97	6.79	6.89								
21-Jan-22	pH	5.0 - 9.0									6.84							
24-Jan-22	pH	5.0 - 9.0		6.82	7.24	7										7.03		
25-Jan-22	pH	5.0 - 9.0					7.05	7	6.62	6.68								
26-Jan-22	pH	5.0 - 9.0									6.9	7.07	6.74	6.62			6.98	6.82
1-Feb-22	pH	5.0 - 9.0		7.18	7.35	7.19										7.4		
2-Feb-22	pH	5.0 - 9.0					7.26	6.97	6.85	6.78								
3-Feb-22	pH	5.0 - 9.0									6.95	6.95	7.22	7.24			6.94	6.96
7-Feb-22	pH	5.0 - 9.0	7.25												7.85			
8-Feb-22	pH	5.0 - 9.0		7.06	7.06	7.41										7.12		
9-Feb-22	pH	5.0 - 9.0					7.59	6.99	6.8	6.9								
10-Feb-22	pH	5.0 - 9.0									7.22	7.04	7.01	7.14			7.11	6.88
14-Feb-22	pH	5.0 - 9.0		7.13	7.82	7.43										7.82		
15-Feb-22	pH	5.0 - 9.0					7.26	7.08	7.83	7.66								
16-Feb-22	pH	5.0 - 9.0									7.01	7.11	7.47	7.28			7.38	7.03
21-Feb-22	pH	5.0 - 9.0	7.89												8.06			
23-Feb-22	pH	5.0 - 9.0		8.32	8.27	8.21										8.09		
24-Feb-22	pH	5.0 - 9.0					7.4	7.1	6.88	6.92								
25-Feb-22	pH	5.0 - 9.0									7.62	7.48	7.61	7.49			7.58	7.47
2-Mar-22	pH	5.0 - 9.0		8.34	8.67	9.03												
3-Mar-22	pH	5.0 - 9.0					7.54	7.04	8.38	7.93								
4-Mar-22	pH	5.0 - 9.0									7.66	8.02	7.71	7.76			7.96	7.89
7-Mar-22	pH	5.0 - 9.0	7.92												7.61			

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream			Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
8-Mar-22	pH	5.0 - 9.0		8.18	7.4	7.28										8.12		
9-Mar-22	pH	5.0 - 9.0					7.02	7.18	7.42	7.38								
10-Mar-22	pH	5.0 - 9.0									6.87	7	6.79	6.88			7.03	6.98
15-Mar-22	pH	5.0 - 9.0		7.33	7.8	7.84										7.68		
16-Mar-22	pH	5.0 - 9.0					7.93	7.68	6.97	7.22								
17-Mar-22	pH	5.0 - 9.0									7.08	7.25	7.26	7.26			7.31	7.27
21-Mar-22	pH	5.0 - 9.0	6.78												6.71			
22-Mar-22	pH	5.0 - 9.0		6.78	7.33	7.61										6.93		
23-Mar-22	pH	5.0 - 9.0					7.18	7.06	6.89	6.94								
24-Mar-22	pH	5.0 - 9.0									7.07		7.12	7.16			7.32	
20-Jan-22	Sat. DO (%)					90.3	88.7	82.2	59.3	66.8								
21-Jan-22	Sat. DO (%)										64.1							
24-Jan-22	Sat. DO (%)			92.9	79.2	78.4										97.7		
25-Jan-22	Sat. DO (%)						75.6	78.4	66.2	80.4								
26-Jan-22	Sat. DO (%)										90.3	81.1	86.2	85.5			81.3	72.6
1-Feb-22	Sat. DO (%)			92.3	86.4	102.3										101.3		
2-Feb-22	Sat. DO (%)						81.4	77.8	62.9	73.7								
3-Feb-22	Sat. DO (%)										97.8	89.2	91.4	97.9			78.9	79.8
7-Feb-22	Sat. DO (%)		135												130.4			
8-Feb-22	Sat. DO (%)			118.6	89.4	105.5										121.5		
9-Feb-22	Sat. DO (%)						91	92.4	59.5	63.8								
10-Feb-22	Sat. DO (%)										83.1	65.7	80.9	86.1			92.6	72.7
14-Feb-22	Sat. DO (%)			91.7	94.7	101.2										95.9		
15-Feb-22	Sat. DO (%)						92.9	90.7	64.6	67.1								
16-Feb-22	Sat. DO (%)										90.2	84.2	84.5	85.9			76	77.1
21-Feb-22	Sat. DO (%)		96.8												101.1			

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream			Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
23-Feb-22	Sat. DO (%)			101.5	81.3	79.4										103.9		
24-Feb-22	Sat. DO (%)						82.6	75.6	68.7	79.6								
25-Feb-22	Sat. DO (%)										113.5	101.1	104.5	105.2			97.2	107.2
2-Mar-22	Sat. DO (%)			110.5	110.6	111.3												
3-Mar-22	Sat. DO (%)						115.1	115.9	91.3	84.3								
4-Mar-22	Sat. DO (%)										103.5	92.5	95.2	99.8			98.8	88.4
7-Mar-22	Sat. DO (%)		103.4												99.2			
8-Mar-22	Sat. DO (%)			95.3	99.1	103										99.5		
9-Mar-22	Sat. DO (%)						107.5	108.3	68.1	68.4								
10-Mar-22	Sat. DO (%)										90.6	90.2	88.2	87.3			82.4	77
15-Mar-22	Sat. DO (%)			95.8	106.8	107.4										102.6		
16-Mar-22	Sat. DO (%)						92.8	93.1	57.2	71.7								
17-Mar-22	Sat. DO (%)										91.2	86.1	89.2	89.6			88.9	86.3
21-Mar-22	Sat. DO (%)		79.2												97.4			
22-Mar-22	Sat. DO (%)			109.1	116.1	121										107.7		
23-Mar-22	Sat. DO (%)						87.6	86.5	83.6	71.4								
24-Mar-22	Sat. DO (%)										76.5		73.3	76.1			75.2	
20-Jan-22	DO (mg/L)	>6.0				7.52	7.39	6.87	4.82	5.38								
21-Jan-22	DO (mg/L)	>6.0						6.87	4.82	5.38	5.45							
24-Jan-22	DO (mg/L)	>6.0		7.9	6.55	6.57										9.1		
25-Jan-22	DO (mg/L)	>6.0					6.36	6.59	5.54	6.36								
26-Jan-22	DO (mg/L)	>6.0						6.59	5.54	6.36	7.68	7.06	7.31	7.18			7.07	6.41
1-Feb-22	DO (mg/L)	>6.0		8.02	7.19	8.49										9.21		

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream			Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
2-Feb-22	DO (mg/L)	>6.0					6.84	6.57	5.37	6.18								
3-Feb-22	DO (mg/L)	>6.0							5.37	6.18	8.32	7.7	7.85	8.37			6.84	7.08
7-Feb-22	DO (mg/L)	>6.0	11.93												11.83			
8-Feb-22	DO (mg/L)	>6.0		10.23	7.44	8.87										10.86		
9-Feb-22	DO (mg/L)	>6.0					7.64	7.65	5.03	5.34								
10-Feb-22	DO (mg/L)	>6.0							5.03	5.34	7	5.52	6.83	7.18			7.73	6.43
14-Feb-22	DO (mg/L)	>6.0		7.81	7.84	8.36										8.48		
15-Feb-22	DO (mg/L)	>6.0					7.68	7.48	5.3	5.37								
16-Feb-22	DO (mg/L)	>6.0							5.3	5.37	7.57	7.12	7.07	7.21			6.32	6.78
21-Feb-22	DO (mg/L)	>6.0	9.39												9.95			
23-Feb-22	DO (mg/L)	>6.0		9.05	6.72	6.74										9.64		
24-Feb-22	DO (mg/L)	>6.0					7.01	6.46	5.8	6.48								
25-Feb-22	DO (mg/L)	>6.0							5.8	6.48	9.7	8.76	9.01	9.06			8.61	9.86
2-Mar-22	DO (mg/L)	>6.0		9.49	8.89	9.11												
3-Mar-22	DO (mg/L)	>6.0					9.48	9.61	7.06	6.8								
4-Mar-22	DO (mg/L)	>6.0							7.06	6.8	8.7	7.76	7.81	8.05			8.3	7.54
7-Mar-22	DO (mg/L)	>6.0	8.79												8.66			
8-Mar-22	DO (mg/L)	>6.0		8.05	7.92	8.33										8.62		
9-Mar-22	DO (mg/L)	>6.0					8.73	8.85	5.45	5.32								
10-Mar-22	DO (mg/L)	>6.0						8.85	5.45	5.32	7.71	7.66	7.28	7.07			6.63	6.5
15-Mar-22	DO (mg/L)	>6.0		8.24	8.32	8.35										8.68		
16-Mar-22	DO (mg/L)	>6.0					7.34	7.42	4.85	5.63								
17-Mar-22	DO (mg/L)	>6.0						7.42	4.85	5.63	7.71	7.24	7.41	7.46			7.27	7.23
21-Mar-22	DO (mg/L)	>6.0	6.78												8.54			
22-Mar-22	DO (mg/L)	>6.0		9.19	8.94	9.31										9.05		
23-Mar-22	DO (mg/L)	>6.0					6.8	6.8	6.45	5.57								

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
24-Mar-22	DO (mg/L)	>6.0						6.8	6.45	5.57	6.62		6.36	6.25			6.14	
20-Jan-22	Conductivity (µs/cm)					74	72	73	78	80								
21-Jan-22	Conductivity (µs/cm)										79							
24-Jan-22	Conductivity (µs/cm)			84	80	74										75		
25-Jan-22	Conductivity (µs/cm)						73	73	82	77								
26-Jan-22	Conductivity (µs/cm)										75	78	77	80			162	59
1-Feb-22	Conductivity (µs/cm)			88	78	74										76		
2-Feb-22	Conductivity (µs/cm)						73	73	81	78								
3-Feb-22	Conductivity (µs/cm)										77	80	81	84			126	76
7-Feb-22	Conductivity (µs/cm)		116												36			
8-Feb-22	Conductivity (µs/cm)			69	80	73										76		
9-Feb-22	Conductivity (µs/cm)						73	73	79	77								
10-Feb-22	Conductivity (µs/cm)										76	84	78	78			163	95
14-Feb-22	Conductivity (µs/cm)			89	80	74										78		
15-Feb-22	Conductivity (µs/cm)						73	73	79	78								
16-Feb-22	Conductivity (µs/cm)										78	79	79	80			163	58
21-Feb-22	Conductivity (µs/cm)		82												33			
23-Feb-22	Conductivity (µs/cm)			76	82	73										96		
24-Feb-22	Conductivity (µs/cm)						72	73	80	77								
25-Feb-22	Conductivity (µs/cm)										79	83	78	79			128	41
2-Mar-22	Conductivity (µs/cm)			78	81	74												
3-Mar-22	Conductivity (µs/cm)						73	73	81	74								
4-Mar-22	Conductivity (µs/cm)										79	80	81	82			163	59
7-Mar-22	Conductivity (µs/cm)		97												37			
8-Mar-22	Conductivity (µs/cm)			88	83	73										65		
9-Mar-22	Conductivity (µs/cm)						73	72	82	76								

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
10-Mar-22	Conductivity (µs/cm)										80	84	84	85			169	60
15-Mar-22	Conductivity (µs/cm)			81	88	74										93		
16-Mar-22	Conductivity (µs/cm)						72	73	79	77								
17-Mar-22	Conductivity (µs/cm)										79	86	74	76			161	30
21-Mar-22	Conductivity (µs/cm)		94												37			
22-Mar-22	Conductivity (µs/cm)			79	86	71										89		
23-Mar-22	Conductivity (µs/cm)						71	71	73	66								
24-Mar-22	Conductivity (µs/cm)										72		143	66			101	
20-Jan-22	Temperature (°C)					24.6	24.52	24.28	26.08	26.53								
21-Jan-22	Temperature (°C)										23.47							
24-Jan-22	Temperature (°C)			23.41	24.89	24.24										18.61		
25-Jan-22	Temperature (°C)						23.97	23.91	24.47	24.6								
26-Jan-22	Temperature (°C)										23.26	23.02	23.53	24.18			22.33	21.77
1-Feb-22	Temperature (°C)			22.39	24.6	24.69										19.96		
2-Feb-22	Temperature (°C)						24.08	23.84	23.25	24.21								
3-Feb-22	Temperature (°C)										23.24	22.7	22.95	23.15			22.75	21.29
7-Feb-22	Temperature (°C)		21.35												19.97			
8-Feb-22	Temperature (°C)			22.65	24.65	24.35										20.97		
9-Feb-22	Temperature (°C)						24.06	24.86	23.76	24.43								
10-Feb-22	Temperature (°C)										23.9	23.74	23.76	24.52			24.37	21.34

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
14-Feb-22	Temperature (°C)			23.2	24.99	25.06										21.46		
15-Feb-22	Temperature (°C)						24.83	25.04	25.56	26.71								
16-Feb-22	Temperature (°C)										24.05	23.77	24.41	24.26			24.74	22.75
21-Feb-22	Temperature (°C)		16.82												16.11			
23-Feb-22	Temperature (°C)			21.06	24.84	23.74										18.68		
24-Feb-22	Temperature (°C)						23.63	23.32	23.78	25.9								
25-Feb-22	Temperature (°C)										23.05	22.37	22.83	23.41			21.44	19.43
2-Mar-22	Temperature (°C)			22.79	25.48	25.5												
3-Mar-22	Temperature (°C)						25.15	24.62	28.66	26.18								
4-Mar-22	Temperature (°C)										24.07	24.1	25.4	26.26			26.42	23.26
7-Mar-22	Temperature (°C)		23.37												22.03			
8-Mar-22	Temperature (°C)			23.79	26.87	26.14										22.45		
9-Mar-22	Temperature (°C)						25.9	25.65	26.87	28.05								
10-Mar-22	Temperature (°C)										23.37	23.39	25.23	26.13			26.53	23.81
15-Mar-22	Temperature (°C)			22.81	28.29	28.34										24.06		
16-Mar-22	Temperature (°C)						27.32	26.98	23.6	27.79								
17-Mar-22	Temperature (°C)										23.72	24.04	24.62	24.97			26.47	24.23

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
21-Mar-22	Temperature (°C)		23.74												22.19			
22-Mar-22	Temperature (°C)			23.96	28.73	29.01										23.95		
23-Mar-22	Temperature (°C)						28.7	27.84	28.94	28.1								
24-Mar-22	Temperature (°C)										23.89		24.89	25.35			26.09	
1-Feb-22	Turbidity (NTU)			42.4	3.3	1.22										15		
2-Feb-22	Turbidity (NTU)						1.8	1.23	4.21	10.4								
3-Feb-22	Turbidity (NTU)										2.77	2.51	3.69	8.35			2.89	2.38
7-Feb-22	Turbidity (NTU)		4.93												2.97			
8-Feb-22	Turbidity (NTU)			34.9	2.67	0.97										10.3		
9-Feb-22	Turbidity (NTU)						1.12	0.53	1.18	1.67								
10-Feb-22	Turbidity (NTU)										1.52	1.85	2.2	3.92			3.28	2.25
14-Feb-22	Turbidity (NTU)			47.8	3.76	1.07										14.2		
15-Feb-22	Turbidity (NTU)						0.64	0.43	2.14	2.15								
16-Feb-22	Turbidity (NTU)										1.72	1.73	2	4.34			3.43	2.68
21-Feb-22	Turbidity (NTU)		149												22.5			
23-Feb-22	Turbidity (NTU)			71.1	4.93	1.33										7.33		
24-Feb-22	Turbidity (NTU)						0.86	0.95	2.61	2.13								
25-Feb-22	Turbidity (NTU)										2.62	2.78	3.75	6.14			8.06	4.36
2-Mar-22	Turbidity (NTU)			29	2.1	0.86												
3-Mar-22	Turbidity (NTU)						0.7	0.58	4.1	9.22								
4-Mar-22	Turbidity (NTU)										2.94	2.96	2.52	5.51			3.42	3.04
7-Mar-22	Turbidity (NTU)		6.01												6.62			
8-Mar-22	Turbidity (NTU)			237	1.95	1.28										204		
9-Mar-22	Turbidity (NTU)						1.46	0.89	7.72	4.86								

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream			Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
10-Mar-22	Turbidity (NTU)										8.71	9.04	3.11	5.06			3.09	3.23
15-Mar-22	Turbidity (NTU)			12.9	2.75	0.95										5.27		
16-Mar-22	Turbidity (NTU)						1	1.32	4.21	3.92								
17-Mar-22	Turbidity (NTU)										3.27	4.19	5.97	12			8.22	6.46
21-Mar-22	Turbidity (NTU)		4.73												5.81			
22-Mar-22	Turbidity (NTU)			24.6	1.8	1.37										14.6		
23-Mar-22	Turbidity (NTU)						1.27	1.22	6.73	9.99								
24-Mar-22	Turbidity (NTU)										53.8		33	13.7			108	
24-Jan-22	TSS (mg/L)			159.33		<5										14.56		
25-Jan-22	TSS (mg/L)						<5	<5	<5	5.2								
26-Jan-22	TSS (mg/L)										<5	<5	<5	<5			<5	<5
7-Feb-22	TSS (mg/L)		<5												<1			
8-Feb-22	TSS (mg/L)			66.82		<5										14.22		
9-Feb-22	TSS (mg/L)						<5	<5										
10-Feb-22	TSS (mg/L)								<5	<5	<5	<5	5.45	<5			<5	<5
7-Mar-22	TSS (mg/L)		<5												<5			
8-Mar-22	TSS (mg/L)			181.06		<5										118.75		
9-Mar-22	TSS (mg/L)						<5	<5										
10-Mar-22	TSS (mg/L)								7.06	<5	5.46	5.36	<5	<5			<5	<5
24-Jan-22	BOD_5 (mg/L)	<1.5		<1		<1										<1		
25-Jan-22	BOD_5 (mg/L)	<1.5					<1	<1	<	<1								
26-Jan-22	BOD_5 (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
7-Feb-22	BOD_5 (mg/L)	<1.5	<1												<1			
8-Feb-22	BOD_5 (mg/L)	<1.5		<1		<1												
9-Feb-22	BOD_5 (mg/L)	<1.5					<1	<1	<1	<1						<1		

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream			Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
10-Feb-22	BOD_5 (mg/L)	<1.5									<1	<1	<1	<1			<1	1.2
7-Mar-22	BOD_5 (mg/L)	<1.5	<1												<1			
8-Mar-22	BOD_5 (mg/L)	<1.5		<1		<1										<1		
9-Mar-22	BOD_5 (mg/L)	<1.5					<1	<1	1.84	1.36								
10-Mar-22	BOD_5 (mg/L)	<1.5									<1	<1	<1	<1			<1	<1
24-Jan-22	COD (mg/L)	<5.0														<5		
25-Jan-22	COD (mg/L)	<5.0							<5	<5								
26-Jan-22	COD (mg/L)	<5.0									<5	<5	<5	<5			<5	<5
7-Feb-22	COD (mg/L)	<5.0	<5												<5			
8-Feb-22	COD (mg/L)	<5.0														<5		
9-Feb-22	COD (mg/L)	<5.0							6.4	<5								
10-Feb-22	COD (mg/L)	<5.0									<5	<5	<5	<5			<5	<5
7-Mar-22	COD (mg/L)	<5.0	<5												<5			
8-Mar-22	COD (mg/L)	<5.0														12.8		
9-Mar-22	COD (mg/L)	<5.0							<5	<5								
10-Mar-22	COD (mg/L)	<5.0									<5		<5	6.4			<5	6.4
24-Jan-22	NH_3-N (mg/L)	<0.2		<0.2		0.2										<0.2		
25-Jan-22	NH_3-N (mg/L)	<0.2					<0.2	<0.2										
7-Feb-22	NH_3-N (mg/L)	<0.2	<0.2												<0.2			
8-Feb-22	NH_3-N (mg/L)	<0.2		<0.2		<0.2										<0.2		
9-Feb-22	NH_3-N (mg/L)	<0.2					<0.2	<0.2										
7-Mar-22	NH_3-N (mg/L)	<0.2	<0.2												<0.2			
8-Mar-22	NH_3-N (mg/L)	<0.2		0.11		0.11										<0.2		
9-Mar-22	NH_3-N (mg/L)	<0.2					<0.2	<0.2										
24-Jan-22	NO_3-N (mg/L)	<5.0		0.14		0.08										0.09		
25-Jan-22	NO_3-N (mg/L)	<5.0					0.05	0.02										

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream			Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
7-Feb-22	NO_3-N (mg/L)	<5.0	0.13												0.1			
8-Feb-22	NO_3-N (mg/L)	<5.0		0.17		0.11										0.1		
9-Feb-22	NO_3-N (mg/L)	<5.0					0.09	0.09										
7-Mar-22	NO_3-N (mg/L)	<5.0	<0.02												0.08			
8-Mar-22	NO_3-N (mg/L)	<5.0		0.11		0.17										0.12		
9-Mar-22	NO_3-N (mg/L)	<5.0					0.07	0.07										
24-Jan-22	Faecal coliform (MPN/100 mL)	<1,000														130		
25-Jan-22	Faecal coliform (MPN/100 mL)	<1,000							14	49								
26-Jan-22	Faecal coliform (MPN/100 mL)	<1,000									5	2	8	17			33	27
7-Feb-22	Faecal coliform (MPN/100 mL)	<1,000	540												79			
8-Feb-22	Faecal coliform (MPN/100 mL)	<1,000														17		
9-Feb-22	Faecal coliform (MPN/100 mL)	<1,000							8	11								
10-Feb-22	Faecal coliform (MPN/100 mL)	<1,000									49	240	79	350			350	240
7-Mar-22	Faecal coliform (MPN/100 mL)	<1,000	26												49			
8-Mar-22	Faecal coliform (MPN/100 mL)	<1,000														27		
9-Mar-22	Faecal coliform (MPN/100 mL)	<1,000							8	17								
10-Mar-22	Faecal coliform (MPN/100 mL)	<1,000									22	33	130	170			170	130
24-Jan-22	Total Coliform (MPN/100 mL)	<5,000														920		
25-Jan-22	Total Coliform (MPN/100 mL)	<5,000							49	70								
26-Jan-22	Total Coliform (MPN/100 mL)	<5,000									49	79	49	350			240	920
7-Feb-22	Total Coliform (MPN/100 mL)	<5,000	1,600												540			
8-Feb-22	Total Coliform (MPN/100 mL)	<5,000														140		
9-Feb-22	Total Coliform (MPN/100 mL)	<5,000							13	33								
10-Feb-22	Total Coliform (MPN/100 mL)	<5,000									70	240	170	920			1,600	540
7-Mar-22	Total Coliform (MPN/100 mL)	<5,000	70												79			
8-Mar-22	Total Coliform (MPN/100 mL)	<5,000														140		

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream				
											Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
9-Mar-22	Total Coliform (MPN/100 mL)	<5,000							13	33								
10-Mar-22	Total Coliform (MPN/100 mL)	<5,000									49	170	240	220			920	240
24-Jan-22	TKN			<1.5		<1.5										<1.5		
25-Jan-22	TKN						<1.5	<1.5										
7-Feb-22	TKN		<1.5												<1.5			
8-Feb-22	TKN			<1.5		<1.5										<1.5		
9-Feb-22	TKN						<1.5	<1.5										
7-Mar-22	TKN		<1.5												<1.5			
8-Mar-22	TKN			<1.5		<1.5										<1.5		
9-Mar-22	TKN						<1.5	<1.5										
24-Jan-22	TOC (mg/L)															2.78		
25-Jan-22	TOC (mg/L)								2.02	2.41								
26-Jan-22	TOC (mg/L)										1.84	1.98	1.87	1.72			2.23	2.39
7-Feb-22	TOC (mg/L)		1.86												1.26			
8-Feb-22	TOC (mg/L)															1.87		
9-Feb-22	TOC (mg/L)								1.45	1.28								
10-Feb-22	TOC (mg/L)										1.12	1.28	1.13	1.18			1.93	1.86
7-Mar-22	TOC (mg/L)		0.65												0.84			
8-Mar-22	TOC (mg/L)															2.81		
9-Mar-22	TOC (mg/L)								1.05	1.04								
10-Mar-22	TOC (mg/L)										0.96	0.94	0.97	0.78			1.51	2.17
24-Jan-22	Phytoplankton Biomass (g dry wt/m^3)			167		3.6												
25-Jan-22	Phytoplankton Biomass (g dry wt/m^3)						1.6	1.2										
8-Feb-22	Phytoplankton Biomass (g dry wt/m^3)			60.2		1.6												
9-Feb-22	Phytoplankton Biomass (g dry wt/m^3)						0.6	0.6										
8-Mar-22	Phytoplankton Biomass (g dry wt/m^3)			174		0.8												

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
9-Mar-22	Phytoplankton Biomass (g dry wt/m³)						1	0.8										
24-Jan-22	Total Phosphorus (mg/L)			0.19		0.01										0.03		
25-Jan-22	Total Phosphorus (mg/L)						<0.01	0.03										
7-Feb-22	Total Phosphorus (mg/L)		0.02												0.01			
8-Feb-22	Total Phosphorus (mg/L)			0.09		0.01										0.04		
9-Feb-22	Total Phosphorus (mg/L)						0.01	0.01										
7-Mar-22	Total Phosphorus (mg/L)		0.03												0.03			
8-Mar-22	Total Phosphorus (mg/L)			0.16		0.03										0.12		
9-Mar-22	Total Phosphorus (mg/L)						0.03	0.03										
24-Jan-22	Total Dissolved Phosphorus (mg/L)			0.11		<0.01										0.01		
25-Jan-22	Total Dissolved Phosphorus (mg/L)						<0.01	0.01										
7-Feb-22	Total Dissolved Phosphorus (mg/L)		<0.01												<0.01			
8-Feb-22	Total Dissolved Phosphorus (mg/L)			0.05		<0.01										0.02		
9-Feb-22	Total Dissolved Phosphorus (mg/L)						<0.01	<0.01										
7-Mar-22	Total Dissolved Phosphorus (mg/L)		0.02												0.02			
8-Mar-22	Total Dissolved Phosphorus (mg/L)			0.07		0.02										0.06		
9-Mar-22	Total Dissolved Phosphorus (mg/L)						0.02	0.02										
24-Jan-22	Hydrogen Sulfide (mg/L)			<0.02		<0.02												
25-Jan-22	Hydrogen Sulfide (mg/L)						<0.02	<0.02										
8-Feb-22	Hydrogen Sulfide (mg/L)			<0.02		<0.02												
9-Feb-22	Hydrogen Sulfide (mg/L)						<0.02	<0.02										
8-Mar-22	Hydrogen Sulfide (mg/L)			0.02		<0.02												
9-Mar-22	Hydrogen Sulfide (mg/L)						<0.02	<0.02										
8-Feb-22	Turbidity (NTU)-bottom					4.63												
9-Feb-22	Turbidity (NTU)-bottom						7.34	0.79										

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream			Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
8-Mar-22	Turbidity (NTU)-bottom					4.78												
9-Mar-22	Turbidity (NTU)-bottom						8.7	12										
24-Jan-22	TSS (mg/L)-bottom					<5												
25-Jan-22	TSS (mg/L)-bottom							<5										
8-Feb-22	TSS (mg/L)-bottom					<5												
9-Feb-22	TSS (mg/L)-bottom						<5	<5										
8-Mar-22	TSS (mg/L)-bottom					<5												
9-Mar-22	TSS (mg/L)-bottom						<5	<5										
24-Jan-22	BOD_5 (mg/L)-bottom					<1												
25-Jan-22	BOD_5 (mg/L)-bottom						<1	6.54										
8-Feb-22	BOD_5 (mg/L)-bottom					<1												
9-Feb-22	BOD_5 (mg/L)-bottom						<1	7.22										
8-Mar-22	BOD_5 (mg/L)-bottom					<1												
9-Mar-22	BOD_5 (mg/L)-bottom						<1	<1										
24-Jan-22	NH_3-N (mg/L)-bottom					<0.2												
25-Jan-22	NH_3-N (mg/L)-bottom						<0.2	0.2										
8-Feb-22	NH_3-N (mg/L)-bottom					<0.2												
9-Feb-22	NH_3-N (mg/L)-bottom						<0.2	0.3										
8-Mar-22	NH_3-N (mg/L)-bottom					<0.2												
9-Mar-22	NH_3-N (mg/L)-bottom						<0.2	0.14										
24-Jan-22	NO_3-N (mg/L)-bottom					0.12												
25-Jan-22	NO_3-N (mg/L)-bottom						<0.02	<0.02										
8-Feb-22	NO_3-N (mg/L)-bottom					0.12												
9-Feb-22	NO_3-N (mg/L)-bottom						0.14	0.11										
8-Mar-22	NO_3-N (mg/L)-bottom					0.11												
9-Mar-22	NO_3-N (mg/L)-bottom						0.07	0.08										

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir					Within / Re-regulation Reservoir		Downstream			Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
24-Jan-22	TKN-bottom					<1.5												
25-Jan-22	TKN-bottom						<1.5	<1.5										
8-Feb-22	TKN-bottom					<1.5												
9-Feb-22	TKN-bottom						<1.5	<1.5										
8-Mar-22	TKN-bottom					<1.5												
9-Mar-22	TKN-bottom						<1.5	<1.5										
24-Jan-22	Total Dissolved Phosphorus (mg/L)-bottom					<0.01												
25-Jan-22	Total Dissolved Phosphorus (mg/L)-bottom						<0.01	0.03										
8-Feb-22	Total Dissolved Phosphorus (mg/L)-bottom					0.01												
9-Feb-22	Total Dissolved Phosphorus (mg/L)-bottom						0.01	0.03										
8-Mar-22	Total Dissolved Phosphorus (mg/L)-bottom					0.02												
9-Mar-22	Total Dissolved Phosphorus (mg/L)-bottom						0.02	0.02										
24-Jan-22	Total Phosphorus (mg/L)-bottom					<0.01												
25-Jan-22	Total Phosphorus (mg/L)-bottom						<0.01	0.04										
8-Feb-22	Total Phosphorus (mg/L)-bottom					0.02												
9-Feb-22	Total Phosphorus (mg/L)-bottom						0.01	0.05										
8-Mar-22	Total Phosphorus (mg/L)-bottom					0.03												
9-Mar-22	Total Phosphorus (mg/L)-bottom						0.03	0.03										
24-Jan-22	Hydrogen Sulfide (mg/L)-bottom					<0.02												
25-Jan-22	Hydrogen Sulfide (mg/L)-bottom						<0.02	<0.02										
8-Feb-22	Hydrogen Sulfide (mg/L)-bottom					<0.02												
9-Feb-22	Hydrogen Sulfide (mg/L)-bottom						<0.02	<0.02										
8-Mar-22	Hydrogen Sulfide (mg/L)-bottom					<0.02												
9-Mar-22	Hydrogen Sulfide (mg/L)-bottom						<0.02	<0.02										
24-Jan-22	Phytoplankton Biomass (g dry wt/m^3)-bottom					2.6												
25-Jan-22	Phytoplankton Biomass (g dry wt/m^3)-bottom						4.6	2.4										

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
Date	Parameters (Unit)	Guideline																
8-Feb-22	Phytoplankton Biomass (g dry wt/m³)-bottom					2.6												
9-Feb-22	Phytoplankton Biomass (g dry wt/m³)-bottom						2.8	3.2										
8-Mar-22	Phytoplankton Biomass (g dry wt/m³)-bottom					3.4												
9-Mar-22	Phytoplankton Biomass (g dry wt/m³)-bottom						3.2	4										

APPENDIX 5-2: EFFLUENT CAMP MONITORING RESULTS – Q1 2022

		Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
27-Jan-22	pH	6.0 - 9.0	6.75	7.73	6.97
04-Feb-22	pH	6.0 - 9.0	6.82	7.93	7.81
11-Feb-22	pH	6.0 - 9.0	6.59	7.41	7.2
18-Feb-22	pH	6.0 - 9.0	7.32	7.47	7.22
22-Feb-22	pH	6.0 - 9.0	7.17	7.59	7.59
01-Mar-22	pH	6.0 - 9.0	7.62	7.81	8.05
11-Mar-22	pH	6.0 - 9.0	6.92	7.49	7.49
18-Mar-22	pH	6.0 - 9.0	6.86	7.22	7.9
25-Mar-22	pH	6.0 - 9.0	7.07	7.54	
27-Jan-22	Sat. DO (%)		44.7	70.4	86.1
04-Feb-22	Sat. DO (%)		49.2	86.2	73.4
11-Feb-22	Sat. DO (%)		39.9	73.6	78.8
18-Feb-22	Sat. DO (%)		53	78.1	89.9
22-Feb-22	Sat. DO (%)		47.2	96.3	87.2
01-Mar-22	Sat. DO (%)		45.7	77.6	68.8
11-Mar-22	Sat. DO (%)		42	80.1	51.6
18-Mar-22	Sat. DO (%)		47.5	87.3	69
25-Mar-22	Sat. DO (%)		40.3	84	
27-Jan-22	DO (mg/L)		3.77	6.06	6.89
04-Feb-22	DO (mg/L)		4.07	7.15	5.81
11-Feb-22	DO (mg/L)		3.24	6.02	6.11
18-Feb-22	DO (mg/L)		4.28	6.36	7.01
22-Feb-22	DO (mg/L)		4.05	8.26	7.1
01-Mar-22	DO (mg/L)		3.76	8.06	5.49
11-Mar-22	DO (mg/L)		3.38	6.41	4
18-Mar-22	DO (mg/L)		3.82	7.27	5.33
25-Mar-22	DO (mg/L)		3.18	6.64	
27-Jan-22	Conductivity (µs/cm)		429	610	981
04-Feb-22	Conductivity (µs/cm)		488	663	980
11-Feb-22	Conductivity (µs/cm)		410	618	999
18-Feb-22	Conductivity (µs/cm)		412	573	989
22-Feb-22	Conductivity (µs/cm)		276	430	907
01-Mar-22	Conductivity (µs/cm)		355	527	941
11-Mar-22	Conductivity (µs/cm)		332	543	959
18-Mar-22	Conductivity (µs/cm)		343	505	908
25-Mar-22	Conductivity (µs/cm)		245	376	
27-Jan-22	Temperature (°C)		23.81	22.86	26.58
04-Feb-22	Temperature (°C)		24.88	24.64	27.31
11-Feb-22	Temperature (°C)		25.86	25.45	28.33
18-Feb-22	Temperature (°C)		25.8	25.65	27.95
22-Feb-22	Temperature (°C)		22.68	23.02	25.73
01-Mar-22	Temperature (°C)		25.12	24.02	26.7
11-Mar-22	Temperature (°C)		26.63	26.75	28.45
18-Mar-22	Temperature (°C)		26.47	26.46	28.43
25-Mar-22	Temperature (°C)		17.67	26.99	

		Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
04-Feb-22	Turbidity (NTU)		0.61	12.1	8.28
11-Feb-22	Turbidity (NTU)		0.57	15.2	6.59
18-Feb-22	Turbidity (NTU)		1.53	10.9	9.15
22-Feb-22	Turbidity (NTU)		2.16	7.45	17.2
01-Mar-22	Turbidity (NTU)		3.29	18.9	5.83
11-Mar-22	Turbidity (NTU)		0.82	11.8	7.55
18-Mar-22	Turbidity (NTU)		0.7	8.64	10.1
25-Mar-22	Turbidity (NTU)		2.13	6.61	
27-Jan-22	TSS (mg/L)	<50	<5	10.08	14.43
04-Feb-22	TSS (mg/L)	<50	<5	11	20
11-Feb-22	TSS (mg/L)	<50	<5	15.09	<5
18-Feb-22	TSS (mg/L)	<50	<5	14.26	13.16
22-Feb-22	TSS (mg/L)	<50	<5	5.71	15.75
01-Mar-22	TSS (mg/L)	<50	<5	17.2	6.4
11-Mar-22	TSS (mg/L)	<50	<5	14.8	14.62
18-Mar-22	TSS (mg/L)	<50	1.64	7.72	9.92
25-Mar-22	TSS (mg/L)	<50	1.25	9.91	
27-Jan-22	BOD_5 (mg/L)	<30	<6	6.18	8.34
04-Feb-22	BOD_5 (mg/L)	<30	6.03	6.96	10.65
11-Feb-22	BOD_5 (mg/L)	<30	<6	8.79	6.18
18-Feb-22	BOD_5 (mg/L)	<30	7.38	10.83	7.35
22-Feb-22	BOD_5 (mg/L)	<30	<6	<6	7.05
01-Mar-22	BOD_5 (mg/L)	<30	<6	<6	<6
11-Mar-22	BOD_5 (mg/L)	<30	<6	7.23	6.66
18-Mar-22	BOD_5 (mg/L)	<30	7.4	<6	<6
25-Mar-22	BOD_5 (mg/L)	<30	<6	<6	
27-Jan-22	COD (mg/L)	<125	<25	40	44
04-Feb-22	COD (mg/L)	<125	<25	44.3	42
11-Feb-22	COD (mg/L)	<125	<25	41	46.2
18-Feb-22	COD (mg/L)	<125	<25	59.6	40
22-Feb-22	COD (mg/L)	<125	<25	<25	44.8
01-Mar-22	COD (mg/L)	<125	<25	38.2	32.8
11-Mar-22	COD (mg/L)	<125	<25	39.2	54.4
18-Mar-22	COD (mg/L)	<125	<25	33	42
27-Jan-22	NH_3-N (mg/L)	<10.0	6.2	30.1	8.1
04-Feb-22	NH_3-N (mg/L)	<10.0	7.1	34	11.5
11-Feb-22	NH_3-N (mg/L)	<10.0	6.6	27.5	7.8
18-Feb-22	NH_3-N (mg/L)	<10.0	4.7	27.6	9.5
22-Feb-22	NH_3-N (mg/L)	<10.0	2.9	17.1	4.9
01-Mar-22	NH_3-N (mg/L)	<10.0	3.7	24.2	7.1
11-Mar-22	NH_3-N (mg/L)	<10.0	2.8	26.3	27.8
18-Mar-22	NH_3-N (mg/L)	<10.0	4.1	21.6	12.6
27-Jan-22	Total Nitrogen (mg/L)	<10.0	7.11	40.6	9.17
04-Feb-22	Total Nitrogen (mg/L)	<10.0	8.18	35.9	12
11-Feb-22	Total Nitrogen (mg/L)	<10.0	8.73	30	8.5
18-Feb-22	Total Nitrogen (mg/L)	<10.0	5.41	28	10.9

		Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
22-Feb-22	Total Nitrogen (mg/L)	<10.0	3.76	19	5.2
01-Mar-22	Total Nitrogen (mg/L)	<10.0	6.3	30.7	17.5
11-Mar-22	Total Nitrogen (mg/L)	<10.0	4.36	33.7	28.5
18-Mar-22	Total Nitrogen (mg/L)	<10.0	5.11	23.2	13.9
27-Jan-22	Total Phosphorus (mg/L)	<2	1.53	1.95	6.82
04-Feb-22	Total Phosphorus (mg/L)	<2	1.55	2.52	8.13
11-Feb-22	Total Phosphorus (mg/L)	<2	1.63	2.14	3.29
18-Feb-22	Total Phosphorus (mg/L)	<2	1.64	2.86	8.4
22-Feb-22	Total Phosphorus (mg/L)	<2	1.01	1.49	3.21
01-Mar-22	Total Phosphorus (mg/L)	<2	1.22	2.27	7.26
11-Mar-22	Total Phosphorus (mg/L)	<2	1.51	2.39	7.73
18-Mar-22	Total Phosphorus (mg/L)	<2	1.51	1.88	7.56
27-Jan-22	Faecal Coliform (MPN/100 mL)	<400	1600	1600	0
04-Feb-22	Faecal Coliform (MPN/100 mL)	<400	1600	540	3500
11-Feb-22	Faecal Coliform (MPN/100 mL)	<400	3500	0	2
18-Feb-22	Faecal Coliform (MPN/100 mL)	<400	3500	170	16000
22-Feb-22	Faecal Coliform (MPN/100 mL)	<400	1600	0	1600
01-Mar-22	Faecal Coliform (MPN/100 mL)	<400	920	920	1600
11-Mar-22	Faecal Coliform (MPN/100 mL)	<400	540	920	1600
18-Mar-22	Faecal Coliform (MPN/100 mL)	<400	1600	7.8	13
25-Mar-22	Faecal Coliform (MPN/100 mL)	<400	1600	0	
27-Jan-22	Total coliform (MPN/100 mL)	<400	1600	1600	2
04-Feb-22	Total coliform (MPN/100 mL)	<400	1600	1600	3500
11-Feb-22	Total coliform (MPN/100 mL)	<400	5400	23	2
18-Feb-22	Total coliform (MPN/100 mL)	<400	3500	1600	16000
22-Feb-22	Total coliform (MPN/100 mL)	<400	1600	240	1600
01-Mar-22	Total coliform (MPN/100 mL)	<400	920	1600	1600
11-Mar-22	Total coliform (MPN/100 mL)	<400	920	1600	1600
18-Mar-22	Total coliform (MPN/100 mL)	<400	1600	23	23
25-Mar-22	Total coliform (MPN/100 mL)	<400	1600	0	

APPENDIX 5-3: COMMUNITY GROUNDWATER QUALITY MONITORING RESULTS – Q1 2022

Month Year	Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	NamPa Village	ThongNoy Village	Pou Village		
		Station	GPHX 01	GPHX 02	GSXN01	GNPA 01	GTHN 01	GPOU 01	GPOU 02	GPOU 03
		Guideline								
25-Jan-22	pH	6.5 - 9.2								
07-Feb-22	pH	6.5 - 9.2						6.78		
17-Feb-22	pH	6.5 - 9.2	6.87	6.81	6.99	7.13	7.06			
21-Feb-22	pH	6.5 - 9.2							7.84	6.92
07-Mar-22	pH	6.5 - 9.2						7.23	7.92	
14-Mar-22	pH	6.5 - 9.2	6.65	6.71	7.02	7.18	6.96			
25-Jan-22	Sat. DO (%)									
07-Feb-22	Sat. DO (%)							105.2		
17-Feb-22	Sat. DO (%)		34.3	24.6	61.9	88	55.5			
21-Feb-22	Sat. DO (%)								47.9	45.5
07-Mar-22	Sat. DO (%)							81.8	76.1	
14-Mar-22	Sat. DO (%)		32	24.7	69.2	80.7	51.6			
25-Jan-22	DO (mg/L)									
07-Feb-22	DO (mg/L)							8.76		
17-Feb-22	DO (mg/L)		2.81	2.03	5.02	7.2	4.55			
21-Feb-22	DO (mg/L)								4.04	3.81
07-Mar-22	DO (mg/L)							6.48	6.15	
14-Mar-22	DO (mg/L)		2.59	2.04	5.23	6.36	4.05			
25-Jan-22	Conductivity (µS/cm)									
07-Feb-22	Conductivity (µS/cm)							27		
17-Feb-22	Conductivity (µS/cm)		421	423	130	418	421			
21-Feb-22	Conductivity (µS/cm)								355	224
07-Mar-22	Conductivity (µS/cm)							28	333	
14-Mar-22	Conductivity (µS/cm)		320	448	359	420	418			
25-Jan-22	Temperature (°C)									
07-Feb-22	Temperature (°C)							24.57		
17-Feb-22	Temperature (°C)		25.79	25.26	26.03	25.47	25.64			
21-Feb-22	Temperature (°C)								24.09	25.67
07-Mar-22	Temperature (°C)							27.66	26.15	
14-Mar-22	Temperature (°C)		26.07	25.73	28.21	27.61	28.39			
07-Feb-22	Turbidity (NTU)	<20						2.55		
17-Feb-22	Turbidity (NTU)	<20	2.03	2.42	0.19	0.28	0.32			
21-Feb-22	Turbidity (NTU)	<20							1.11	12.5
07-Mar-22	Turbidity (NTU)	<20						1.28	0.35	
14-Mar-22	Turbidity (NTU)	<20	0.43	0.27	0.47	0.51	0.54			
25-Jan-22	Fecal coliform (MPN/100mL)	0						0		

Month Year	Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	NamPa Village	ThongNoy Village	Pou Village		
		Station	GPHX 01	GPHX 02	GSXN01	GNPA 01	GTHN 01	GPOU 01	GPOU 02	GPOU 03
		Guideline								
07-Feb-22	Fecal coliform (MPN/100mL)							0		
17-Feb-22	Fecal coliform (MPN/100mL)	0	0	0	0	0				
21-Feb-22	Fecal coliform (MPN/100mL)	0							49	240
07-Mar-22	Fecal coliform (MPN/100mL)	0						0	7.8	
14-Mar-22	Fecal coliform (MPN/100mL)	0	0	0	2	0	5			
25-Jan-22	*E.coli* Bacteria (MPN/100mL)	0								
07-Feb-22	*E.coli* Bacteria (MPN/100mL)	0						0		
17-Feb-22	*E.coli* Bacteria (MPN/100mL)	0	0	0	0	0	0			
21-Feb-22	*E.coli* Bacteria (MPN/100mL)	0							49	240
07-Mar-22	*E.coli* Bacteria (MPN/100mL)	0						0	4.5	
14-Mar-22	*E.coli* Bacteria (MPN/100mL)	0	0	0	0	0	2			
07-Feb-22	Arsenic (mg/L)	<0.05						<0.0003		
17-Feb-22	Arsenic (mg/L)	<0.05	0.001	0.0012	0.0015	0.0014	0.0027			
21-Feb-22	Arsenic (mg/L)	<0.05							0.0015	
07-Feb-22	Cadmium (mg/L)	<0.01						0.002		
17-Feb-22	Cadmium (mg/L)	<0.01	<0.003	<0.003	<0.003	<0.003	<0.003			
07-Feb-22	Total Iron (mg/L)	<1						0.071		
17-Feb-22	Total Iron (mg/L)	<1	0.018	<0.01	0.032	<0.01	0.01			
21-Feb-22	Total Iron (mg/L)	<1							0.032	
07-Feb-22	Total hardness (mg/L)	<500						8.1		
17-Feb-22	Total hardness (mg/L)	<500	210	230	174	194	202			
21-Feb-22	Total hardness (mg/L)	<500							186	
07-Feb-22	Mercury (mg/L)	<0.001						<0.0002		
17-Feb-22	Mercury (mg/L)	<0.001	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002			
21-Feb-22	Mercury (mg/L)	<0.01							<0.0002	
07-Feb-22	Lead (mg/L)	<0.05						0.01		
17-Feb-22	Lead (mg/L)	<0.05	<0.008	<0.008	<0.008	<0.008	<0.008			
21-Feb-22	Lead (mg/L)	<0.05							<0.008	

APPENDIX 5-4: GRAVITY FED WATER SUPPLY QUALITY MONITORING RESULTS – Q1 2022

		Site Name	Thaheau Village	Hat Gnuin Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline				
17-Feb-22	pH	6.5 - 8.5	7.05	7.15	7.02	6.97
14-Mar-22	pH	6.5 - 8.5			6.97	6.96
18-Mar-22	pH	6.5 - 8.5	6.86	6.91		
17-Feb-22	Sat. DO (%)		105.6	94.1	90.4	82.5
14-Mar-22	Sat. DO (%)				83.6	70.2
18-Mar-22	Sat. DO (%)		19	94.2		
17-Feb-22	DO (mg/L)		8.9	7.92	7.47	6.88
14-Mar-22	DO (mg/L)				6.76	6.66
18-Mar-22	DO (mg/L)		1.47	7.69		
17-Feb-22	Conductivity (µS/cm)	<1,000	81	114	139	130
14-Mar-22	Conductivity (µS/cm)	<1,000			121	139
18-Mar-22	Conductivity (µS/cm)	<1,000	85	121		
17-Feb-22	Temperature (°C)	<35	23.44	23.89	24.93	24.38
14-Mar-22	Temperature (°C)	<35			26.45	26.44
18-Mar-22	Temperature (°C)	<35	28.16	25.64		
17-Feb-22	Turbidity (NTU)	<10	1.14	1.61	0.88	0.49
14-Mar-22	Turbidity (NTU)	<10			0.41	0.79
18-Mar-22	Turbidity (NTU)	<10	0.79	1.63		
17-Feb-22	Faecal Coliform (MPN/100 mL)	0	13	79	220	540
14-Mar-22	Faecal Coliform (MPN/100 mL)	0			70	49
18-Mar-22	Faecal Coliform (MPN/100 mL)	0	70	33		
17-Feb-22	*E.coli* Bacteria (MPN/100 mL)	0	13	49	130	240
14-Mar-22	*E.coli* Bacteria (MPN/100 mL)	0			70	22
18-Mar-22	*E.coli* Bacteria (MPN/100 mL)	0	49	17		
17-Feb-22	Arsenic (mg/L)	<0.05	<0.0003	<0.0003	<0.0003	<0.0003
17-Feb-22	Cadmium (mg/L)	<0.003	<0.002	<0.002	<0.002	<0.002
17-Feb-22	Iron (mg/L)	<1	0.058	<0.01	0.106	0.048
17-Feb-22	Lead (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01
17-Feb-22	Total hardness (mg/L)	<300	42	57.4	67.1	61.5