NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Quarterly Environment Monitoring Report
First Quarter of 2021

January to March 2021

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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
CA	Concession Agreement between the NNP1PC and GOL
CAP	Corrective Action Plan
COD	Commercial Operation Date
CVC	Conventional Vibrated Concrete
CWC	Civil Works Contract
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
GOL	Government of Lao PDR
GIS	Geographic Information Systems
HMWC	Hydraulic Metal Works Contract
HR	Human Resources
IEE	Initial Environmental Examination
IMA	Independent Monitoring Agency
INRMP	Integrated Natural Resources Management Plan
ISP	Intergraded Spatial Planning
kV	kilo-Volt
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
NCR	Non-Compliance Report
NNP1PC	Nam Ngiep 1 Power Company Limited
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
TSS	Total Suspended Solids
UAE	United Analysis and Engineering Consultant Company Ltd.
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 reports 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 2021, the preparation of ISO 14001:2015 documentation was in progress; mandatory and non-mandatory (but commonly used) documents are gathered and being prepared by the relevant parties. The mandatory documents are expected to be ready for the ISO14001 Internal Audit by May 2021 after the Internal Audit training by SGS (Lao) Sole Co., Ltd. A short-term ISO document preparation consultant (2-month contract) was assigned to support preparation of documents. The consultant is expected to start the work by the middle of April 2021.

EMO received four Detailed Work Program (DWP) & Site Specific Environmental and Social Management and Monitoring Plan (SS-ESMMP) for review and approval. A total of nine Observations of Non-Compliance (ONCs) and two Non-Compliance Reports (NCRs) were active during Q1 2021. Out of these, eight ONCs and two NCRs were resolved during the reported period. One ONC has been carried over to Q2 2021.

EMO continued working with the wastewater treatment expert in upgrading the operation of the wastewater treatment system (WWTS) at OSVO1, OSOV2 and the Main Dam Powerhouse. NNP1PC has received technical proposals for improvement and modification work of the wastewater treatment systems (WWTS) from two interested bidders. The proposals have been evaluated, and the selected contractor is expected to commence the work by April 2021.

On 20 January 2021, the Environment Management Unit (EMU) of Bolikhan District resumed the monthly site visits by focusing on the progress of environmental activities and on the status of decommissioned and rehabilitated sites before handing over to the GOL. The general environmental work progress has also been discussed during the visit. A total of 30 out of the 32 sites that have to be handed over, were initial accepted by EMU during their site visit. The two sites that the EMU did not accept included the LILAMA10 camp and the Phouhomxay village's irrigation canal spoil disposal, due to the low percentage of vegetation cover. The EMU requested additional measures to be carried out. NNP1PC therefore issued two Site Inspection Reports (SIRs) to the relevant Contractors responsible for the Phouhomxay Village Irrigation Canal Rock and Spoil Disposal area and LILAMA10 camp requesting them to implement additional measures to assure effective revegetation of the decommissioned sites. EMO re-evaluated the two sites and found that the vegetation cover had increased compared with the previous quarter.

The contract with the local waste collection contractor for project waste and community waste collection and landfills operation ended on 26 February 2021. NNP1PC received proposals from three interested bidders (local business registered companies) for a one-year service contract and NNP1PC expects to select the qualified contractors by the first week of April 2021. A total

of 54.1 m^3 solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, a decrease of 1.3 m^3 compared with Q4 2020. A total of 41.8 m^3 solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed of at the Houay Soup Landfill. A total of 2,519 kg recyclable waste was recorded at the Community Waste Bank.

The environmental flow requirements have been monitored in accordance with the ESMMP-OP and the monitored results fully complied with the requirements, except for the thalweg water depth measurements that indicated occasional 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.

During Q1 2021, the concentration of dissolved oxygen (DO) at the surface level in R05 (Main Reservoir immediately upstream of the main dam) ranged between 2 mg/L and 6 mg/L, Nam Ngiep Upstream station (NNG01), Nam Chian (NCH01) and Nam Phouan (NPH01) had DO levels above 6 mg/L. In addition, the DO concentrations in Nam Xao (except on 31 March 2021) and Nam Houay Soup (except on 31 March 2021) were above 6 mg/L.

The DO concentrations at the surface level in the re-regulation reservoir (R07) were between 1.5 and 4.2 mg/L.

The DO levels in Nam Ngiep downstream the re-regulation dam was between 2.5 mg/L and 7.8 mg/L for the first few kilometres gradually increasing to about 4 mg/L or just above 7 mg/L over the following 25 km.

The depth profile monitoring during the period indicates formation of oxyclines in the main reservoir at all stations at varying depths, except at R01 which due to its location at the narrow upper end of the reservoir behaves like a river.

The management activities as per the approved Watershed Management AIP2020 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 AIP2020 under the component of law enforcement, community outreach, and conservation linked livelihood progressed during this reporting period.

During this reporting period, the activities progressed as normal and there were no covid19 related restrictions that affected the environmental management and monitoring activities.

2 INTRODUCTION

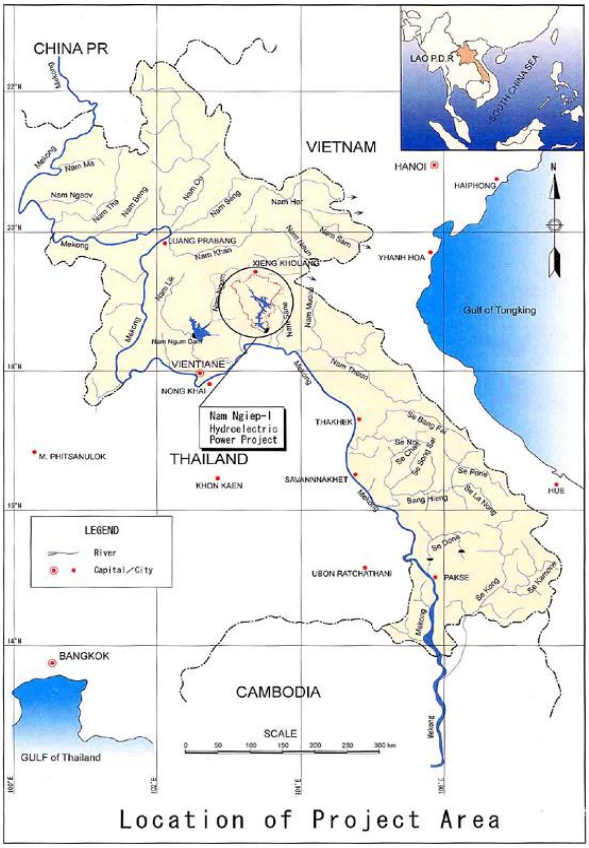
The Nam Ngiep originates in the mountains of Xiengkhuang Province, flowing through Khoun District into Thathom District of Xaysomboun Province, through Hom District and into Bolikhan District of Bolikhamxay Province. The Nam Ngiep meets the Mekong River just upstream from Paksan in Bolikhamxay Province.

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 2021**. 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 implementation of the relevant sub-plans and programmes of the Environmental and Social Management and Monitoring Plan for the Operation Phase during Q1 2021.

3.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

During Q1 2021, the preparation of ISO 14001:2015 documentation was in progress; mandatory and non-mandatory (but commonly used) documents are gathered and being prepared by the relevant parties. The mandatory documents are expected to be ready for the ISO14001 Internal Audit by May 2021 after the Internal Audit training by SGS (Lao) Sole Co., Ltd. Due to the fact of internal workload (in particular the ISO committees), and less of staffs experienced on the ISO14001:2015 resulted in EMS preparation was a bit behind the tentative work plan, therefore, a short-term ISO document preparation consultant (2-month contract) has been assigned to support preparation of documents. The consultant is expected to start the work by the middle of April 2021.

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			
		Q3	Q4	Q1	Q2	Q3	Q4
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 – **1st Stage** (***remote audit*** on the documentation review)						
10	Implement the corrective actions and preventive actions according to the 1st Stage Audit						
11	ISO 14001:2015 Assessment and Certification Audit – **2nd Stage** (***on-site audit***)						
12	Implement the corrective actions and preventive actions according to the 2nd Stage Audit						
13	**Certify of ISO14001:2015 upon successful completion of the audit**						

Notes:

	Completed activities per the original plan
	Delayed activities and postponed from the previous quarter
	Originally planned activities

3.2 CONTRACTOR SS-ESMMPS

During Q1 2021, the Environmental Management Office (EMO) of NNP1PC received Four Detailed Work Program (DWP) & Site Specific Environmental and Social Management and Monitoring Plan (SS-ESMMP), for review and approval.

All these submitted documents were cleared within the document review timeframe as shown in **Table 3-2**- more details can be found in **Appendix 1**.

TABLE 3-2: DOCUMENTS REVIEWED DURING Q1 2021

Document Name	Rev. 1	Rev. 2	Rev. 3	Approved
DWP&SS-ESMMP for Construction of Suspension Bridge in 2UR	√	√	√	√
DWP&SS-ESMMP for Filling Void at Main Powerhouse Tailrace	√	√	√	√
DWP&SS-ESMMP for DBST road repairing	√			√
DWP & SS-ESMMP for Monitoring Works on the Nam Ngiep1 Hydropower Project	√			√

3.3 RESULTS OF COMPLIANCE INSPECTIONS AT CONSTRUCTION SITES

During Q1 2021, EMO conducted bi-weekly and monthly site inspections at a total of 40 sites including at 32 previous construction sites undergoing rehabilitation, four main operation sites, and four construction sites and temporary contractor camps. A decrease of 02 monitoring sites compared with Q4 2020.

EMO continued coordinating with TD-O&M and EDL since last quarter for site inspection on the 230 kV transmission line and the 115 kV transmission line. A joint site inspection with EDL on the 115 kV transmission line was scheduled on 05 – 09 April 2021. The joint site inspection on the 230 kV transmission line with EGAT has not been confirmed yet. The latest inspection of the 230 kV transmission line was conducted during October - November 2020.

A total of nine Observations of Non-Compliance (ONCs) and two Non-Compliance Reports (NCR) were active (three ONCs and two NCRs carried over from the Q4 of 2020, and six new ONCs). Out of these, eight ONCs and two NCRs were resolved during the reported period. One ONC has been carried over to Q2 2021.

The status of Non-Compliance Reports (NCRs) and ONCs are summarized in **Table 3-3**, **Figure 3-1** and **Figure 3-2**. The progress of corrective actions is presented in **Appendix 2**.

TABLE 3-3: STATUS OF NON-COMPLIANCE REPORT DURING Q1 2021

Status	ONC	NCR-Level 1	NCR-Level 2	NCR-Level 3	Incident Report
Carried over ONC/NCR from the previous quarter	3	2	0	0	0
Newly opened ONC/NCR	6	0	0	0	0
Total No. of ONC/NCR	9	2	0	0	0
Resolved ONC/NCR	8	2	0	0	0
Unresolved ONC/NCR carried forward to the next quarter	1	0	0	0	0

FIGURE 3-1: STATUS OF ONCS DURING Q1 2021

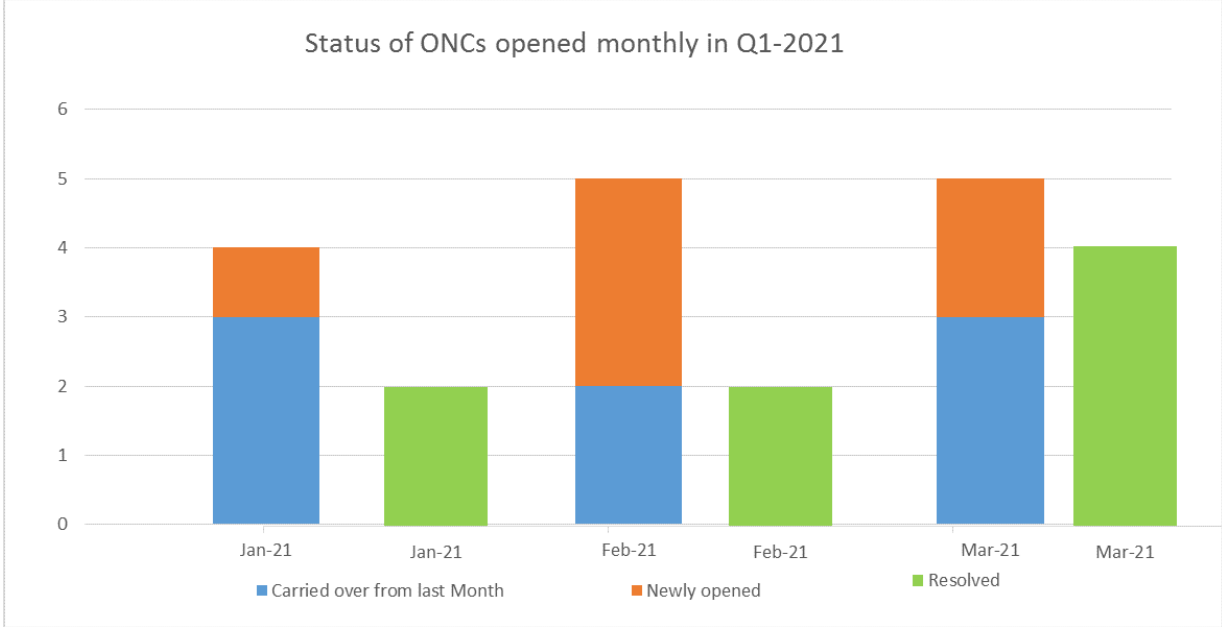
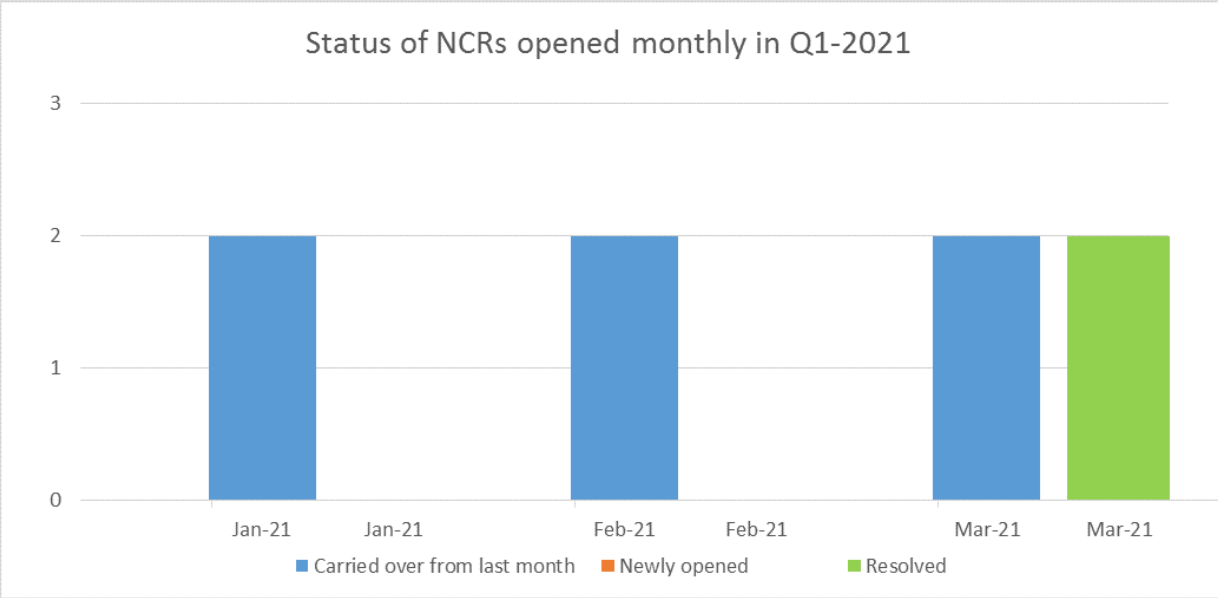


FIGURE 3-2: STATUS OF NCRS DURING Q4 2020



PHOTOGRAPH 1: JOINT SITE INSPECTION WITH EMU-BOLIKHAN DISTRICT

PHOTOGRAPH 2: JOINT SITE INSPECTION AT SUSPENSION BRIDGE CONSTRUCTION 2UR

PHOTOGRAPH 3: JOINT QUARTERLY HAZARDOUS MATERIAL AND HAZARDOUS WASTE INVENTORY AUDIT

PHOTOGRAPH 4: VISIT A RECYCLE WASTE AND HAZARDOUS WASTE TRADE COMPANY

PHOTOGRAPH 5: EMO SUPPORT VILLAGES WASTE COLLECTION AND DISPOSAL DURING THE TRANSITION OF CONTRACTOR'S CONTRACT COMPLETION

PHOTOGRAPH 6: ADDITIONAL COUNTER MEASURE BY TOPSOIL COVER FOR THE IRRIGATION CANAL SPOIL DISPOSAL

3.4 RESULTS OF SITE DECOMMISSIONING AND REHABILITATION

During the Q1 2021, EMO continued to monitor the 32 sites and associated facilities that have to be handed over to GOL and where active rehabilitation by the relevant contractors has ended. No maintenance and after-care activities have been implemented by the Civil work Contractor after the end of the defect's liability period on 31 January 2021. A total of 30 out of the 32 sites were initially accepted by EMU for hand-over during their site visit on 20 January 2021. The two sites that the EMU did not accept include the LILAMA10 camp and the Phouhomxay village's irrigation canal spoil disposal, due to the low percentage of vegetation cover. The EMU requested that additional counter measures should be carried out. NNP1PC therefore issued two Site Inspection Reports (SIRs) to the relevant Contractors of the Phouhomxay Village Irrigation Canal Rock and Spoil Disposal area and the LILAMA10 camp requesting them to implement additional measures to assure effective revegetation of the decommissioned sites. The VSP Contractor completed additional topsoil cover at the Phouhomxay Village Irrigation Canal Rock and Spoil Disposal area, but no action was taken by the HM Hydro contractor for the LILAMA1 camp (the Contractor disagreed to conduct additional measures and claimed that the site was a disturbed area before the Contractor took possession of the land and established their labour camp). However, EMO re-evaluated the two sites and found that the vegetation covers had somewhat slightly increased compared with the previous quarter (as presented in photographs 1 – 4) and expected to be more in the next quarters.

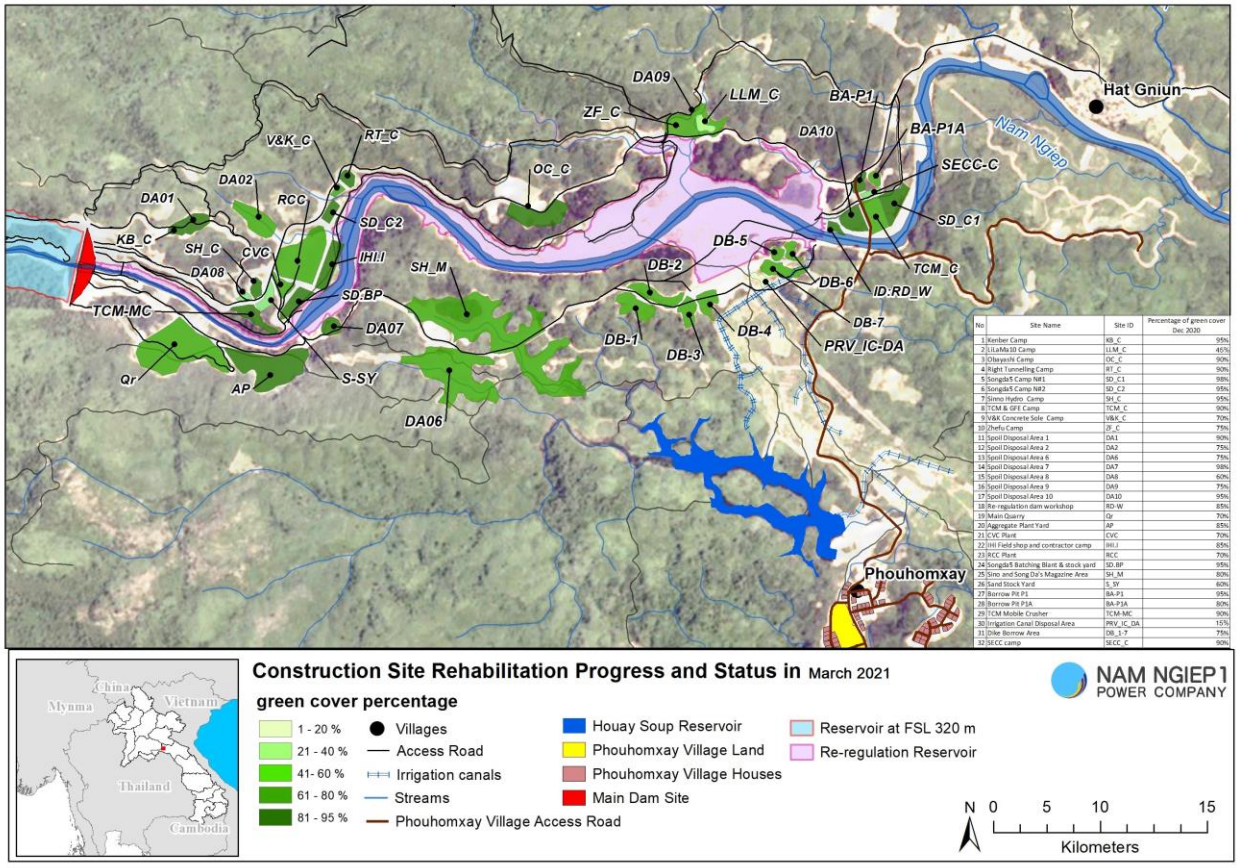
The status of site rehabilitation and revegetation is summarized in **Table 3-4** and the revegetated sites are shown in **Figure 3-3** with the relevant photographs.

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

No	Site Name	Status of Decommissioning	Percentage of Vegetation Cover Evaluation			
			Jun-2020	Sep-2020	Dec-2020	Mar-2021
01	TCM & GFE Camp	Completed	70%	90%	90%	90%
02	Spoil Disposal Area 7	Completed	-	98%	98%	98%
03	Spoil Disposal Area 9	Completed	-	75%	75%	75%
04	Spoil Disposal Area 10	Completed	80%	95%	95%	95%
05	Borrow Pit P1	No need for decommissioning	-	95%	95%	95%
06	Borrow Pit P1A	No need for decommissioning	-	80%	80%	80%
07	TCM Mobile Crusher	Completed	-	90%	90%	90%
08	Dike Borrow Areas	No need for decommissioning	-	75%	75%	75%
09	SECC camp	Completed	-	90%	90%	90%
10	KENBER Camp	Completed	80%	95%	95%	95%
11	LILAMA10 Camp	Completed	5%	20%	40%	45%
12	Obayashi Camp	Completed	80%	90%	90%	90%

No	Site Name	Status of Decommissioning	Percentage of Vegetation Cover Evaluation			
			Jun-2020	Sep-2020	Dec-2020	Mar-2021
13	Right Tunnelling Camp	Completed	70%	90%	90%	90%
14	Songda5 Camp N#1	Completed	90%	98%	98%	98%
15	Songda5 Camp N#2	Completed	80%	95%	95%	95%
16	Sino Hydro Camp	Completed	80%	95%	95%	95%
17	V&K Concrete Sole Camp	Completed	50%	70%	70%	70%
18	Zhefu Camp	Completed	60%	75%	75%	75%
19	Spoil Disposal Area 1	Completed	80%	90%	90%	90%
20	Spoil Disposal Area 2 & main dam workshop	Completed	60%	75%	75%	75%
21	Spoil Disposal Area 6	Completed	70%	75%	75%	75%
22	Spoil Disposal Area 8	No need for decommissioning	40%	60%	60%	60%
23	Re-regulation dam workshop	Completed	80%	85%	85%	85%
24	Main Quarry	Completed	50%	70%	70%	70%
25	Aggregate Plant Yard	Completed	80%	85%	85%	85%
26	CVC Plant	Completed	60%	70%	70%	70%
27	IHI Field shop and contractor camp	Completed	70%	85%	85%	85%
28	RCC Plant	Completed	50%	70%	70%	70%
29	Songda5 Batching Plant & Stock yard	Completed	80%	95%	95%	95%
30	Sino and Song Da's Magazine Area	Completed	70%	80%	80%	80%
31	Sand Stock Yard	No need for decommissioning	-	60%	60%	60%
32	Irrigation Canal Spoil Disposal Area *Phouhomxay Village*	No need for decommissioning	-	5%	10%	15%

FIGURE 3-3: REVEGETATION SITES MAP DURING Q1 2021



No	Site Name	Site ID	Percentage of green cover Dec 2020
1	Kenber Camp	KB_C	95%
2	LiLaMa10 Camp	LLM_C	45%
3	Dhayashi Camp	OC_C	90%
4	Right Tunnelling Camp	RT_C	90%
5	Songda5 Camp NR1	SD_C1	98%
6	Songda5 Camp NR2	SD_C2	95%
7	Sinno Hydro Camp	SH_C	95%
8	TCM & GPE Camp	TCM_C	90%
9	V&K Concrete Sole Camp	V&K_C	70%
10	Zhefu Camp	ZF_C	75%
11	Spoil Disposal Area 1	DA1	90%
12	Spoil Disposal Area 2	DA2	75%
13	Spoil Disposal Area 6	DA6	75%
14	Spoil Disposal Area 7	DA7	98%
15	Spoil Disposal Area 8	DA8	60%
16	Spoil Disposal Area 9	DA9	75%
17	Spoil Disposal Area 10	DA10	95%
18	Re-regulation dam workshop	RD-W	85%
19	Main Quarry	Qr	70%
20	Aggregate Plant Yard	AP	85%
21	CVC Plant	CVC	70%
22	IHI Field shop and contractor camp	IHI.I	95%
23	RCC Plant	RCC	70%
24	Songda5 Batching Plant & stock yard	SD_BP	95%
25	Sino and Song Da's Magazine Area	SH_M	80%
26	Sand Stock Yard	S_SY	60%
27	Borrow Pit P1	BA-P1	95%
28	Borrow Pit P1A	BA-P1A	80%
29	TCM Mobile Crusher	TCM-MC	90%
30	Irrigation Canal Disposal Area	PRV_IC_DA	15%
31	Dike Borrow Area	DB_1-7	75%
32	SECC camp	SECC_C	90%

The photos below presented the different of green colour and vegetation covering compare between Q4 2020 and Q1 2021

PHOTO OF THE LILAMA10 CAMP	
PHOTOGRAPH 1: Q4 2020	PHOTOGRAPH 2: Q1 2021
	
AERIAL PHOTO OF THE PHOUHOMXAY VILLAGE'S IRRIGATION CANAL SPOIL AND ROCK DISPOSA AREAS	
PHOTOGRAPH 3: Q4 2020	PHOTOGRAPH 4: Q1 2021
	

3.5 WASTE MANAGEMENT AT THE CONSTRUCTION SITES

3.5.1 General Waste Management

During Q1 2021, a total of 54.1 m^3 solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, a decrease of 1.3 m^3 compared with Q4 2020.

EMO visited a recycle waste company to observe the site conditions and management practices for waste recycling and hazardous waste disposal and elimination. The visited company (Panitha Export-Import Sole Co., Ltd.) will be contracted to provide relevant waste management services to NNP1PC during the operation phase.

No recyclable waste was sold during the reporting period. The amount of accumulated recyclable wastes is shown in **Table 3-5**.

TABLE 3-5: AMOUNTS OF RECYCLABLE WASTE DURING Q1 2021

Source and Type of Recyclables		Unit	Total in Q1 2021 (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	80	0	80
3	Aluminium	kg	39	0	39
4	Paper/Cardboard	kg	98	0	98
5	Glass	kg	187	0	187
Sub-Total 2		**kg**	**404**	**0**	**404**
Grand Total 1+2		**kg**	**404**	**0**	**404**

3.5.2 Hazardous Waste Management

During Q1 2021, the joint hazardous materials and waste inventory inspections were carried out at the OSOV1 warehouse, the Main Dam Powerhouse and the Re-regulation Dam Powerhouse.

The amounts of hazardous waste and hazardous materials that were collected, stored and disposed of during Q4 2021 are shown in **Table 3-6.** No disposal of hazardous waste during the reporting period**.** The remaining waste will be collected, treated and also disposed of by Panitha Export-Import Sole Co., Ltd.

TABLE 3-6: HAZARDOUS MATERIAL AND HAZARDOUS WASTE RECORDED DURING Q1 2021

No.	Type of Hazardous Material	Unit	Total in Q1 2021	Used/ Disposed	Remaining
01	Diesel	Litre	20,400	14,476	**5,924**
02	Gasoline	Litre	2,228	1,069	**1,159**
03	Lubricant (Turbine oil)	Litre	7,810	10	**7,800**
04	Colour paint	Litre	266	16	**250**
05	Tinner	Litre	12	4	**8**
06	Grease oil	Litre	725	565	**160**
07	Gear Oil	Litre	450	0	**450**
08	Chlorine Liquid	Litre	120	117	**3**
09	Chlorine Powder	Kg	65	0	**65**
10	Fire Extinguisher (18Kg)	Unit	0	0	**0**
11	Sika	Litre	7	0	**7**
	Type of Hazardous Waste				
12	Used Oil (Hydraulic + Engine)	Litre	960	0	**960**
13	Used oil mixed with water	Litre	150	0	**150**
14	Empty used oil drum/container (drum 200L)	Unit	3	1	**2**
15	Used oil filters	Unit	0	0	**0**

No.	Type of Hazardous Material	Unit	Total in Q1 2021	Used/ Disposed	Remaining
16	Contaminated soil, sawdust and textile material	M3	1.24	0	**1.24**
17	Used tyre	Piece	21	3	**18**
18	Empty used chemical drum/container (drum 20L)	Unit	10	0	**10**
19	Lithium-ion batteries	Unit	0	0	**0**
20	Lead acid batteries	Unit	7	2	**5**
21	Empty paint and spray cans	Can	139	0	**139**
22	Halogen/fluorescent bulbs	Unit	281	15	**266**
23	Empty cartridge (Ink)	Piece	189	0	**189**
24	Clinic Waste	Kg	10.5	10	**0.5**

3.5.3 Animal Fodder (Pig Feed) Collection Programme

During Q1 2021, local villagers collected 1,850 kg of food waste from the Owner's Site Office and Village (OSOV) for feeding their animals, a decrease of 66.6 kg compared with Q4 2020.

3.5.4 Community Solid Waste Management and Recycling Programme

The trading of recyclable materials at the Community Recycle Waste Bank during Q1 2021 is summarized in **Table 3-7.**

TABLE 3-7: AMOUNTS OF RECYCLABLES SOLD AT THE COMMUNITY RECYCLE WASTE BANK

Type of Waste	Unit	Remaining in Q4 2020	Purchased/ Collected in Q1 2021	Sold	Disposed	Remaining in Q1 2021
Plastic bottle	kg	35	0	0	0	35
Aluminum	kg	0	0	0	0	0
Paper/Cardboard	kg	296.5	0	0	170.5	126
Glass	kg	2,358	0	0	0	2,358
Scrap metal	kg	0	0	0	0	0
Total	**kg**	**2,689.5**	**0**	**0**	**170.5**	**2,519**

During the Q1 2021, before the contract ended on 26 February 2021. The local waste collection contractor continued to carry out landfill operation and maintenance which included daily and weekly waste cover, repairing the damaged perimeter at the landfills, grass mowing, storage cleaning and clean up sediment in the open ditches around the leachate ponds.

NNP1PC received proposals from the three interested bidders for the general waste management and landfills operation, all the three are local registered companies. As of 31 March 2021, the bidding evaluation (technical and financial) was in progress and NNP1PC expects to select the qualified contractors to execute the works by the first week of April 2021.

3.5.5 Houay Soup Landfill

During Q1 2021, approximately 41.8 m^3 of solid waste was collected from Thaheua, Hat Gniun and Phouhomxay villages and transported to Houy Soup Landfill for disposal. The basic landfill

maintenance was carried out which included fixing the fence, cleaning up the open ditches and mowing grass.

3.6 RESERVOIR OPERATIONS

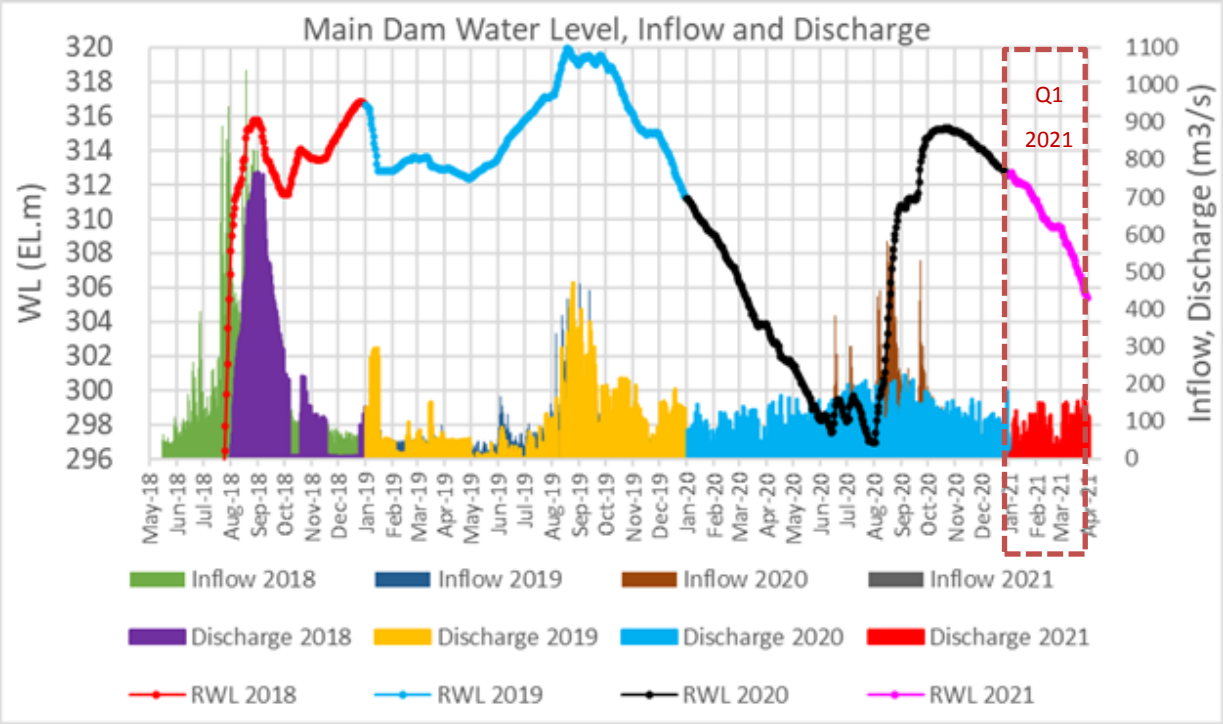
3.6.1 Main Reservoir

The water level in the main reservoir, inflow to the reservoir and discharge from the reservoir since May 2019 are displayed in the graph in ***Figure 3-4*** .

During Q1 2021, the mean daily inflow to the main reservoir was 34 m^3/s. The minimum daily inflow was 16 m^3/s, maximum daily inflow was recorded at 100 m^3/s, and 25th percentile of 36 m^3/s and 75th percentile of 55 m^3/s.

During Q1 2021, the water level in the main reservoir decreased with 7.22 m from El. 312.53 m asl. to El. 305.31 m asl. The maximum water level was observed at 312.68 m asl. on 04 January 2021, and the lowest water level was observed at El. 305.31 m asl. on 31 March 2021.

FIGURE 3-4: WATER LEVEL, INFLOW AND DISCHARGE FOR 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 2021 are summarized in ***Table 3-8***.

TABLE 3-8: SUMMARY OF EFRS COMPLIANCE MONITORING IN Q1 2021

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)	Four measurements at some measuring points located 5.7 km from the re-regulation dam did not comply during times with dam discharged 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

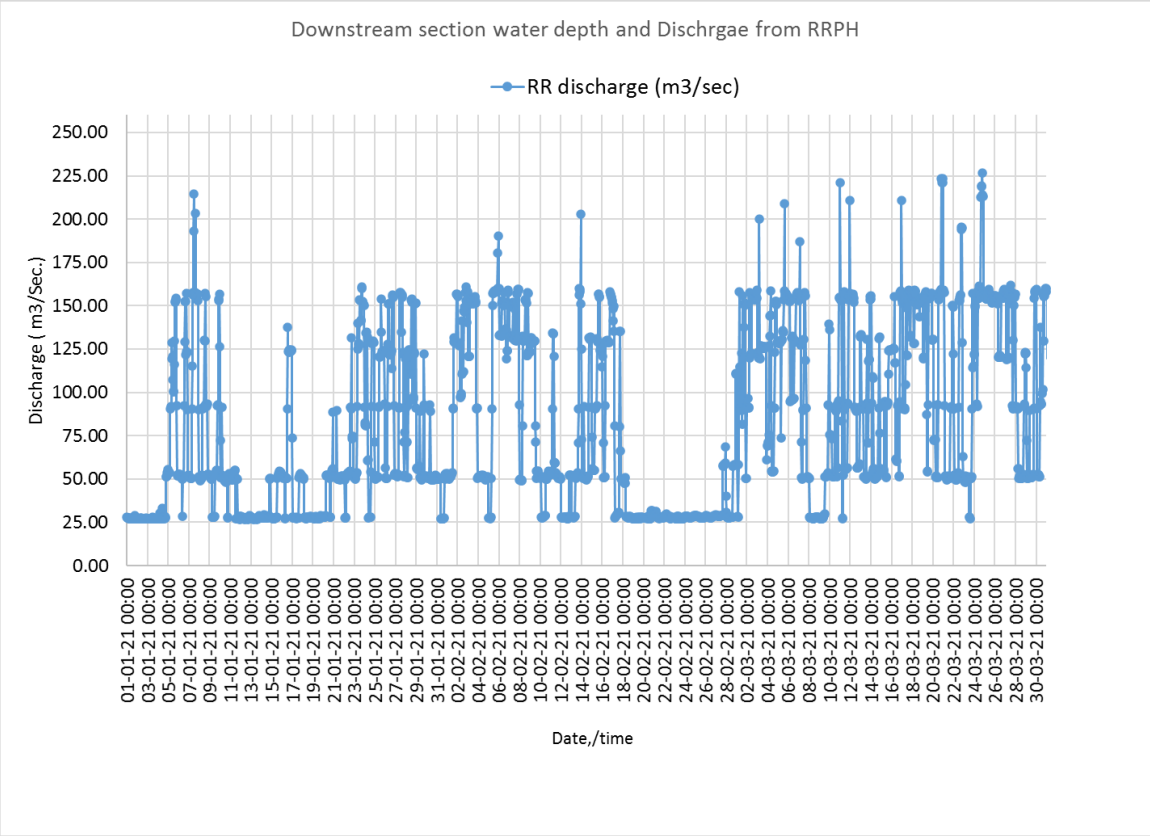
3.6.2.1 Minimum Flow Requirements

The discharge monitoring data for the re-regulation dam during Q1 2021 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 3-5.***

During Q1 2021, the mean discharge from the re-regulation dam was about 60 m^3/s in January 2021 and about 69 m^3/s and 108 m^3/s in February and March 2021 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 was no complaint related to the flow discharges or fluctuation levels downstream the Re-regulation dam during the reporting period.

FIGURE 3-5: DISCHARGE FROM THE RE-REGULATION DAM DURING Q1 2021



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 3-6.*** 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 (at least 0.5 m measured immediately downstream the re-regulation dam).

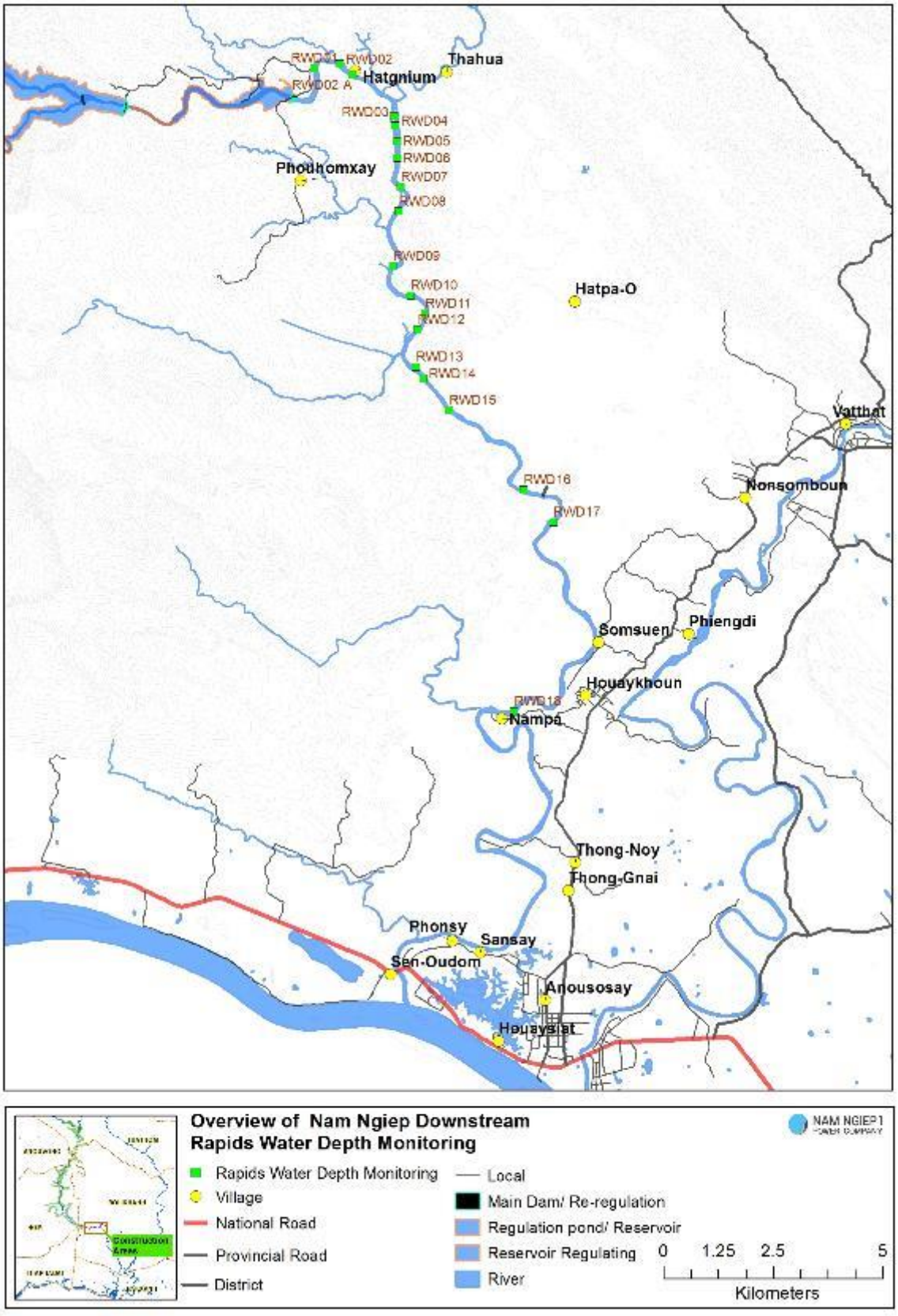
Starting in December 2020, the water depths were measured across the river channel where visual observations or boat navigation indicate shallow waters to ensure that the measurements represent the river thalweg.

The results of the monitoring are presented in ***Table 3-9***. During Q1 2021, four measurements at some measuring points until RWD05 located within 5.7 km downstream of the re-regulation dam had a depth of less than 0.5 m during times when the Re-regulation Dam discharge was less than 30 m^3/s but none of them were found to be difficult to navigate. There was no complaint related to the water depth less than 0.5 m downstream the Re-regulation dam during the reporting period.

TABLE 3-9: 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	5.66	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)
6-Jan-21	50.1	0.75	0.65	0.76	0.82	0.86	0.5	0.82	0.87	0.98	0.77	0.78	0.99	0.83	1.08	1.17	1.38	1.28	1.48	0.98
13-Jan-21	27.5	0.5	0.46	0.54	0.6	0.65	0.3	0.58	0.66	0.75	0.55	0.57	0.76	0.61	0.86	0.96	1.15	1.37	1.47	0.74
20-Jan-21	52.1	0.8	0.7	0.81	0.84	0.88	0.52	0.84	0.85	0.9	0.7	0.71	0.88	0.75	0.95	0.98	1	0.92	1.08	0.78
27-Jan-21	157.8	1.73	1.58	1.68	1.63	1.65	1.15	1.3	1.5	1.45	1.55	1.57	1.6	1.65	1.68	1.88	1.95	1.9	2.05	1.4
3-Feb-21	152.6	1.72	1.6	1.7	1.77	1.82	1.45	1.77	1.83	1.92	1.72	1.73	1.93	1.78	1.94	2.1	2.3	2.25	2.45	1.95
10-Feb-21	28.9	0.52	0.4	0.5	0.57	0.62	0.35	0.6	0.63	0.72	0.55	0.57	0.73	0.6	0.75	0.9	1.1	1.05	1.25	0.85
17-Feb-21	29	0.42	0.3	0.4	0.47	0.42	0.28	0.52	0.55	0.65	0.6	0.68	0.85	0.75	0.9	1.15	1.3	1.25	1.5	1.1
24-Feb-21	28	0.45	0.35	0.43	0.5	0.55	0.3	0.52	0.55	0.62	0.5	0.53	0.67	0.56	0.69	0.8	1	0.95	1.05	0.75
3-Mar-21	125.9	1.52	1.4	1.5	1.57	1.62	1.25	1.57	1.63	1.73	1.53	1.54	1.75	1.6	1.76	1.95	2.13	2.08	2.28	1.85
10-Mar-21	51.4	0.77	0.67	0.78	0.84	0.88	0.52	0.85	0.9	1	0.8	0.83	1.05	0.88	1.15	1.24	1.52	1.4	1.62	1.1
17-Mar-21	104.3	1.62	1.5	1.6	1.67	1.72	1.35	1.65	1.7	1.8	1.58	1.6	1.7	1.65	1.73	1.95	2.1	2.05	2.1	1.75
24-Mar-21	155.7	1.72	1.6	1.7	1.82	1.85	1.5	1.83	1.87	1.95	1.78	1.8	1.9	1.88	1.95	2.2	2.35	2.3	2.38	2.05
31-Mar-21	152.9	1.65	1.55	1.63	1.78	1.8	1.45	1.78	1.83	1.91	1.74	1.76	1.92	1.9	1.98	2.23	2.38	2.35	2.43	2.1

FIGURE 3-6: ***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.

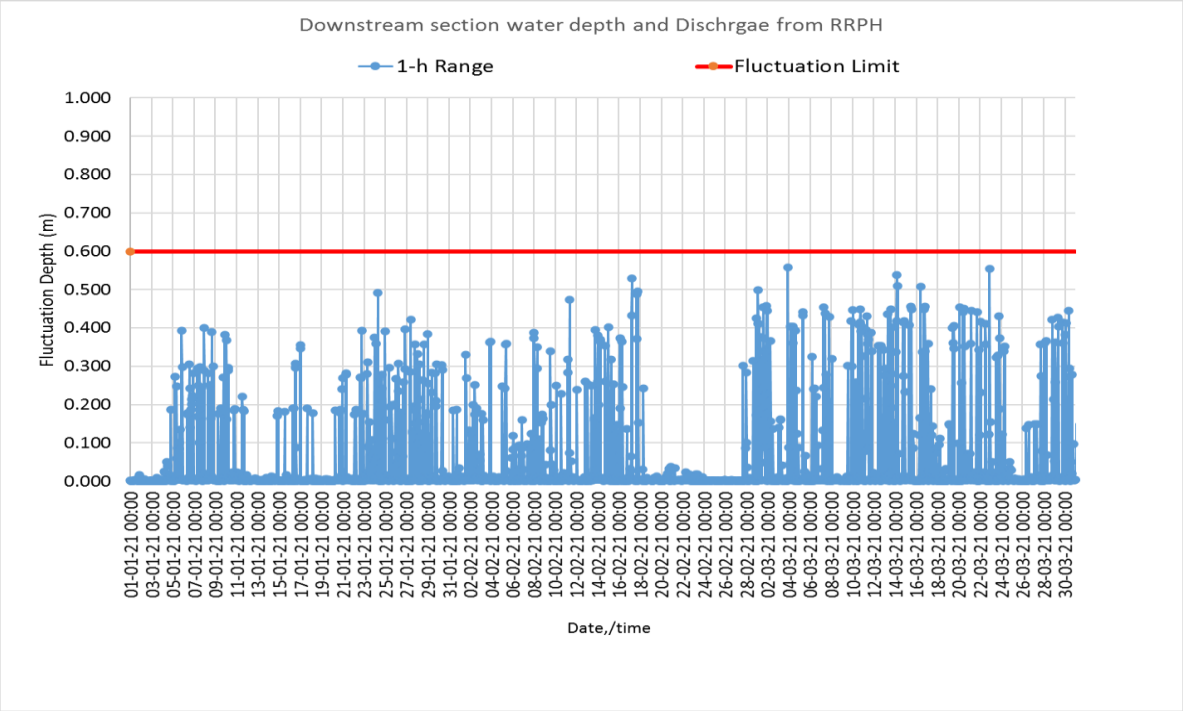
For the 0.6 m in 1-hour maximum fluctuation EFR, the cumulative rises and falls are calculated from the hourly water level recordings.

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 2021, 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 3-7.**

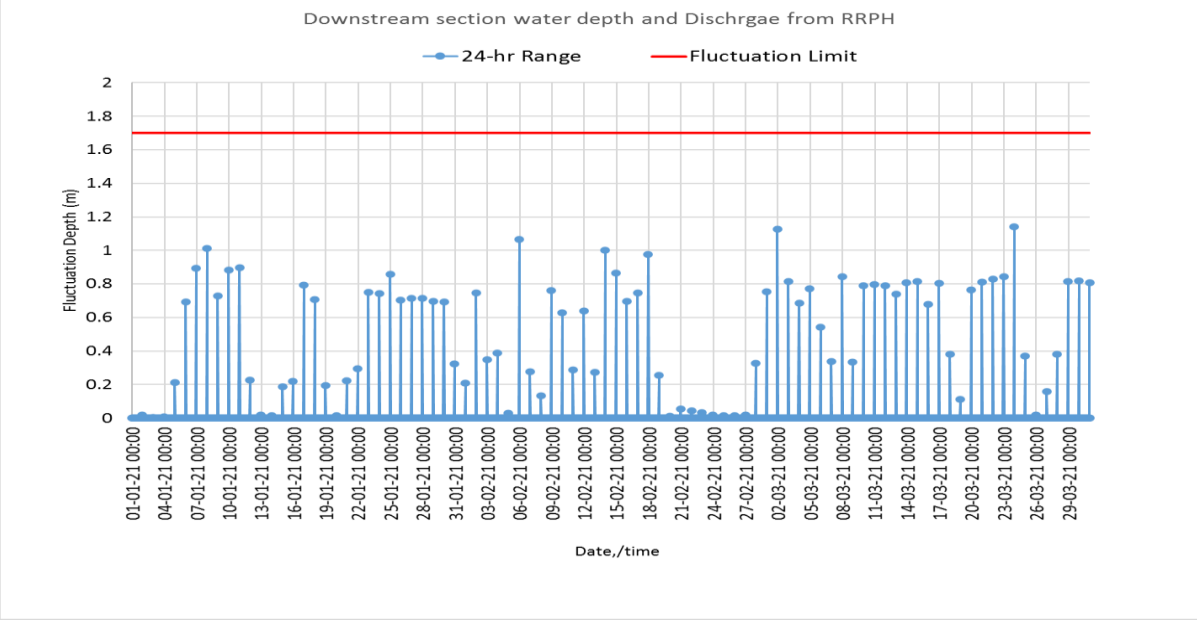
FIGURE 3-7: *HOURLY STAGE HEIGHT FLUCTUATIONS DURING Q1 2021*



During Q1 2021, the maximum range in stage of 1.7 m over 24-hour was complied with for all 24-hour periods (00:00 – 23:00).

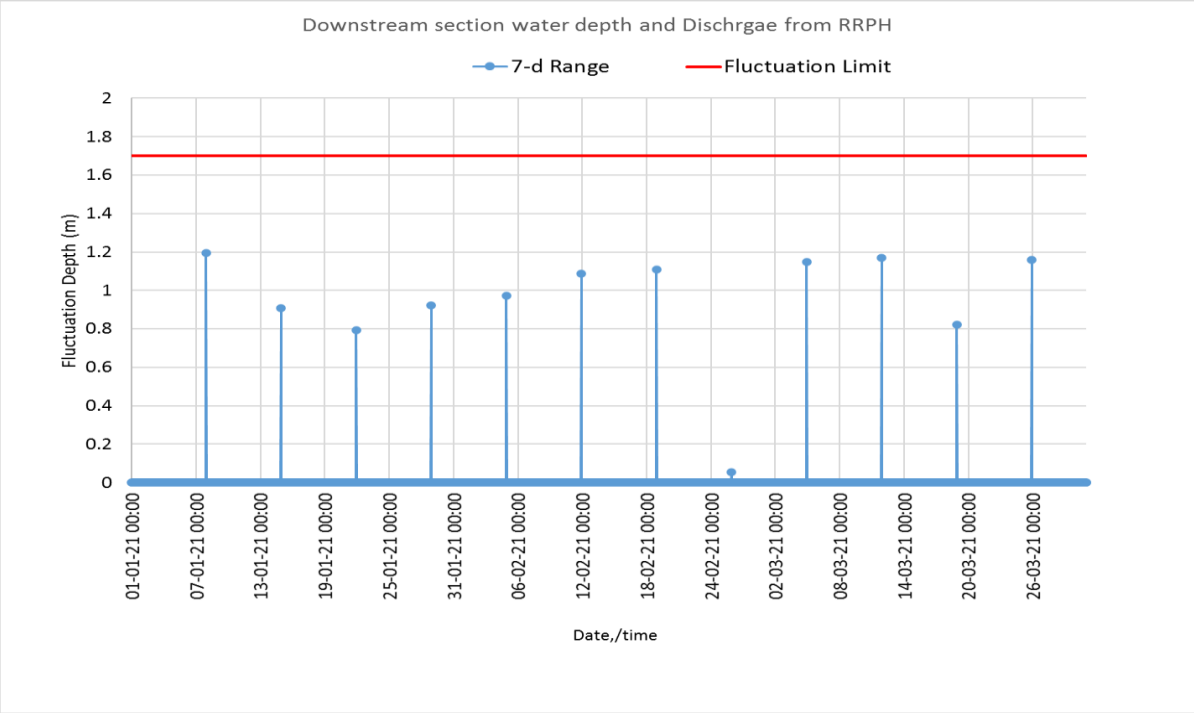
The results of the monitoring are presented in **Figure 3-8.**

FIGURE 3-8: *24-HOUR STAGE HEIGHT DIFFERENCE (M) DURING Q1 2021*



During Q1 2021, 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 3-9.**

Figure 3-9: *7-day Stage Height Difference (M) during Q1 2021*



3.7 WATER QUALITY MONITORING

3.7.1 Surface Water (River) and Depth Profile Water Quality

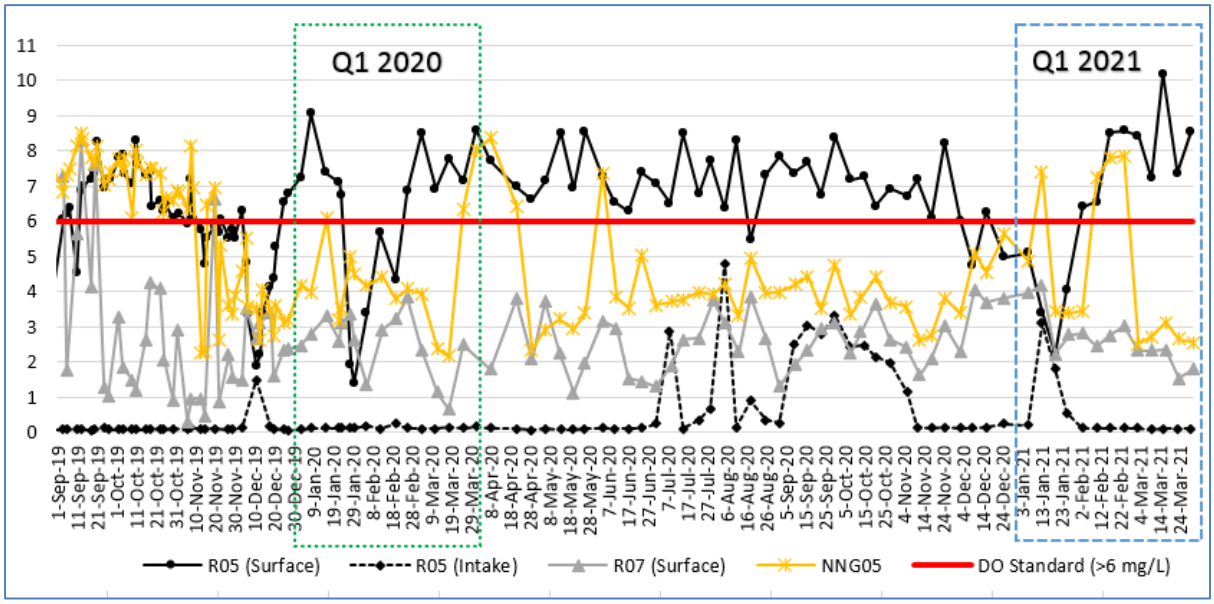
Descriptions of each monitoring station, surface water and depth profile water quality monitoring parameters, and the location of sampling map can be found in ***Appendix 3*** and all surface water quality data for Q1 2021 are listed in ***Appendix 5.1***

Dissolved Oxygen (DO)

The results of DO measurements for the station immediately upstream of the main dam (R05 – surface and intake at 296 m asl.) and station R07 in the re-regulation dam (surface) and immediately downstream of the re-regulation dam (NNG05) are presented in ***Figure 3-10,*** and the full set of surface water quality data are shown in ***Table 3-10.*** During Q1 2021, the water intake located below the reservoir surface water level between 9.31 and 16.68 m. in a period of minimum water level and maximum water level at 305.31 and 312.68, respectively.

The water temperature and DO depth profiles in the main reservoir at R05 during Q1 2020, Q4 2020 and Q1 2021 are presented in **Figure 3-11** to **Figure 3-13.**

FIGURE 3-10: ***DISSOLVED OXYGEN IMMEDIATELY UPSTREAM AND DOWNSTREAM OF THE MAIN DAM***



Main Reservoir

Figure 3-13 presents the monthly average depth profiles in the Main Reservoir from September 2018 to March 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 profiles monitoring during Q1 2021 indicates formation of oxyclines in the main reservoir at all stations at varying depths, except at R01, which due to its location at the narrow upper end of the reservoir behaves like a river.

When comparing Q1 2021 with Q1 2020, the second half of Q1 2021 shows a significant shallower thermocline and a corresponding shallower oxycline. The mean DO concentration in the upper 10 m was about 6 mg/L similar to Q1 2020 and Q4 2020.

At R05 (the station closest to the main dam), as the water temperatures dropped over the course of the first 3 weeks of January 2021, the thermocline deepened to a depth of about 35 m, and over the course of the month, the DO levels in the upper 35 m dropped from about 5 mg/L to just below 2 mg/L - likely due to a gradually increased mixing and equalization of upper DO rich(er) water with DO deficient water in the lower layers enabled by the deepening of the thermocline.

As the water temperatures increased over February and March 2021, the thermocline gradually moved upwards to a depth interval of 8 m to 14 m with an average DO concentration of 8.4 mg/L in the upper 8 m varying between 6.3 mg/L and 10.3 mg/L. Sharp decreases in DO concentrations to levels at or below 2 mg/L were measured at depths between 11 m and 14 m corresponding to 18 m above the centre line of the intake in early February 2021 to 14 m above the centre line by the end of the month - taking into consideration the lowering of the reservoir level over the period.

In R05, at the level of the water intake, the DO concentrations fluctuated between 0.2 mg/L to 3.1 mg/L in January 2021, then dropped to less than 0.2 mg/L during February and March 2021.

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 2021, followed by reappearance of the thermocline and a corresponding oxycline at depths between 8 m to 12 m over February and March 2021.

At R3, a layer of water with slightly higher DO concentrations (average 3 mg/L) was measured at 32 m - 36 m below the surface likely due to inflow of colder oxygen rich water from Nam Phouan (a right-bank tributary to the reservoir upstream R03).

Anoxic conditions in the main reservoir were found at depths between 45 m and 70 m in January 2021, between 30 m and 60 m in February 2021, and between 15 m and 100 m in March 2021.

Re-regulation Reservoir (R6 and R7)

There is no indication of a thermocline at R06 and R07 in the re-regulation reservoir, because the re-regulation reservoir behaves more like a river than a lake.

The DO concentrations at R06 gradually decreased over the course of the quarter from a monthly average over the entire water column of 3.2 mg/L in January, 2.7 mg/L in February to 1.6 mg/L in March 2021. A similar pattern was found at R07, although with slightly lower DO concentrations. The water quality in the Re-regulation Reservoir represented by R06 and R07 generally matches with the water quality in R05 at or near the intake level, 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 Chian (NCH01) and Nam Phouan (NPH01) had DO concentrations above 6 mg/L.

Downstream Stations

During January 2021, the discharge from the re-regulation dam mainly went through the turbine; however, during the monitoring missions on 13 January, 10 February, 17 February and 24 February 2021, the discharge went through the gate.

During periods with gate discharge, the downstream DO levels were above 6 mg/L (the National Surface Water Quality Standard) due to the aeration generated by the turbulence at the gate.

During periods with turbine discharge, over the course of Q1 2021, the downstream DO levels generally decreased. This corresponds quite well with the pattern in the re-regulation reservoir. At NNG05 about 1.8 km from the re-regulation dam the monthly average DO

concentration (during periods with turbine discharge) decreased from 3.9 mg/L in January 2021 to 2.7 mg/L in March 2021. At NNG07 located 25 km from the dam, the monthly average DO concentration dropped from 6.8 mg/L to 4.7 mg/L and in NNG08 the monthly average DO concentration decreased from 7.3 mg/L in January 2021 to 5.6 mg/L in March 2021.

No dead fish was observed in Nam Ngiep downstream during Q1 2021.

NNP1PC is in the process of compilating all monitoring information for the design of additional aeration system to improve the DO level at downstream.

FIGURE 3-11: ***MAIN RESERVOIR DISSOLVED OXYGEN AT THE END OF Q1 2021***

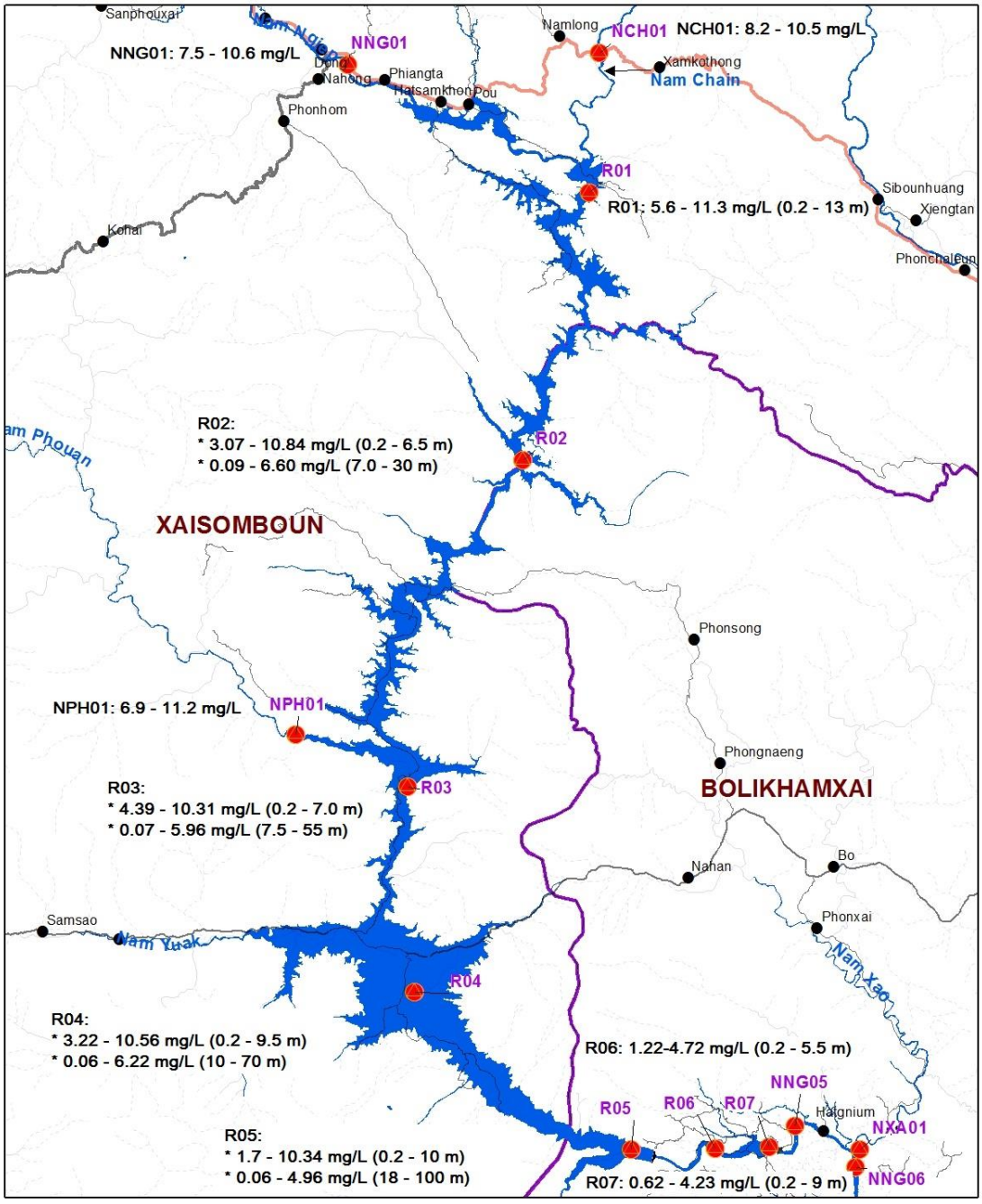
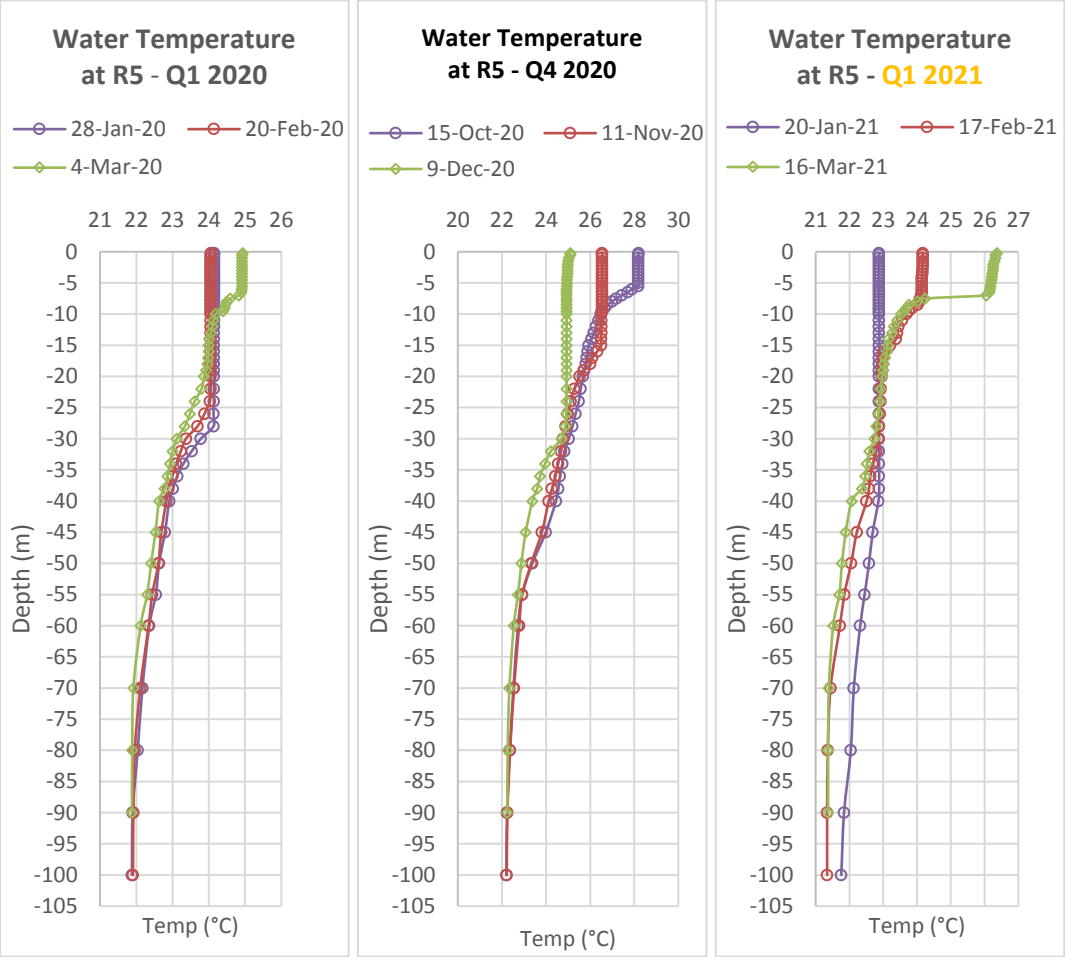
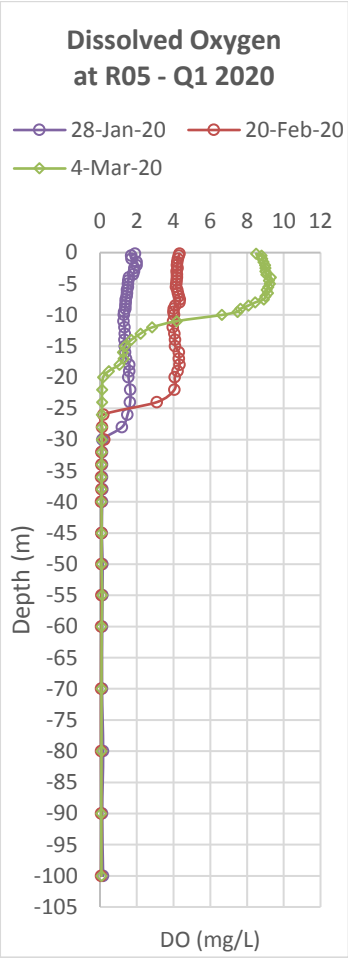
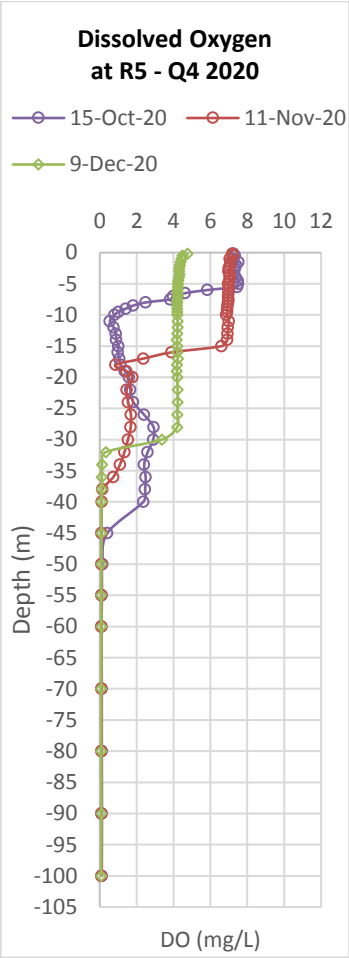


FIGURE 3-12: *WATER TEMPERATURE AND DISSOLVED OXYGEN – DEPTH PROFILES IN THE MAIN RESERVOIR IMMEDIATELY UPSTREAM OF THE MAIN DAM (R05)*




Dissolved Oxygen
at R05 - Q1 2020
28-Jan-20
20-Feb-20
4-Mar-20
0 2 4 6 8 10 12
0 -5 -10 -15 -20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105
Depth (m)
DO (mg/L)


Dissolved Oxygen
at R5 - Q4 2020
15-Oct-20
11-Nov-20
9-Dec-20
0 2 4 6 8 10 12
0 -5 -10 -15 -20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105
Depth (m)
DO (mg/L)

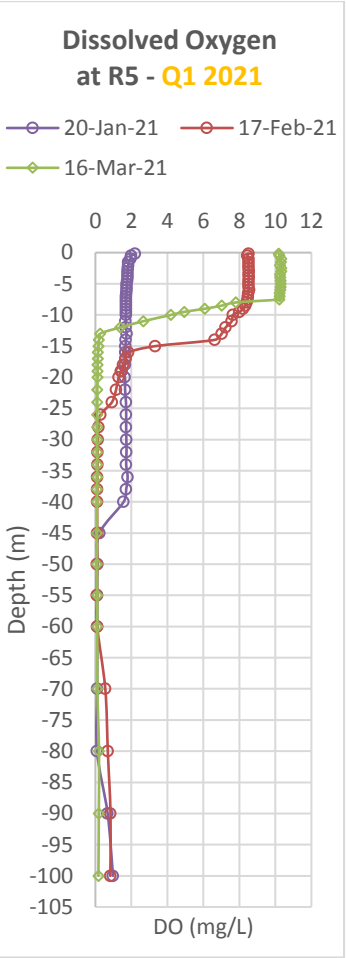

Dissolved Oxygen
at R5 - Q1 2021
20-Jan-21
17-Feb-21
16-Mar-21
0 2 4 6 8 10 12
0 -5 -10 -15 -20 -25 -30 -35 -40 -45 -50 -55 -60 -65 -70 -75 -80 -85 -90 -95 -100 -105
Depth (m)
DO (mg/L)

FIGURE 3-13: ***MONTHLY AVERAGE OF WATER TEMPERATURE AND DO DEPTH PROFILES IN THE MAIN RESERVOIR (R01 - R03), WITH POSITION OF INTAKE AT THE ACTUAL WATER LEVEL DURING SEPTEMBER 2018 – MARCH 2021***

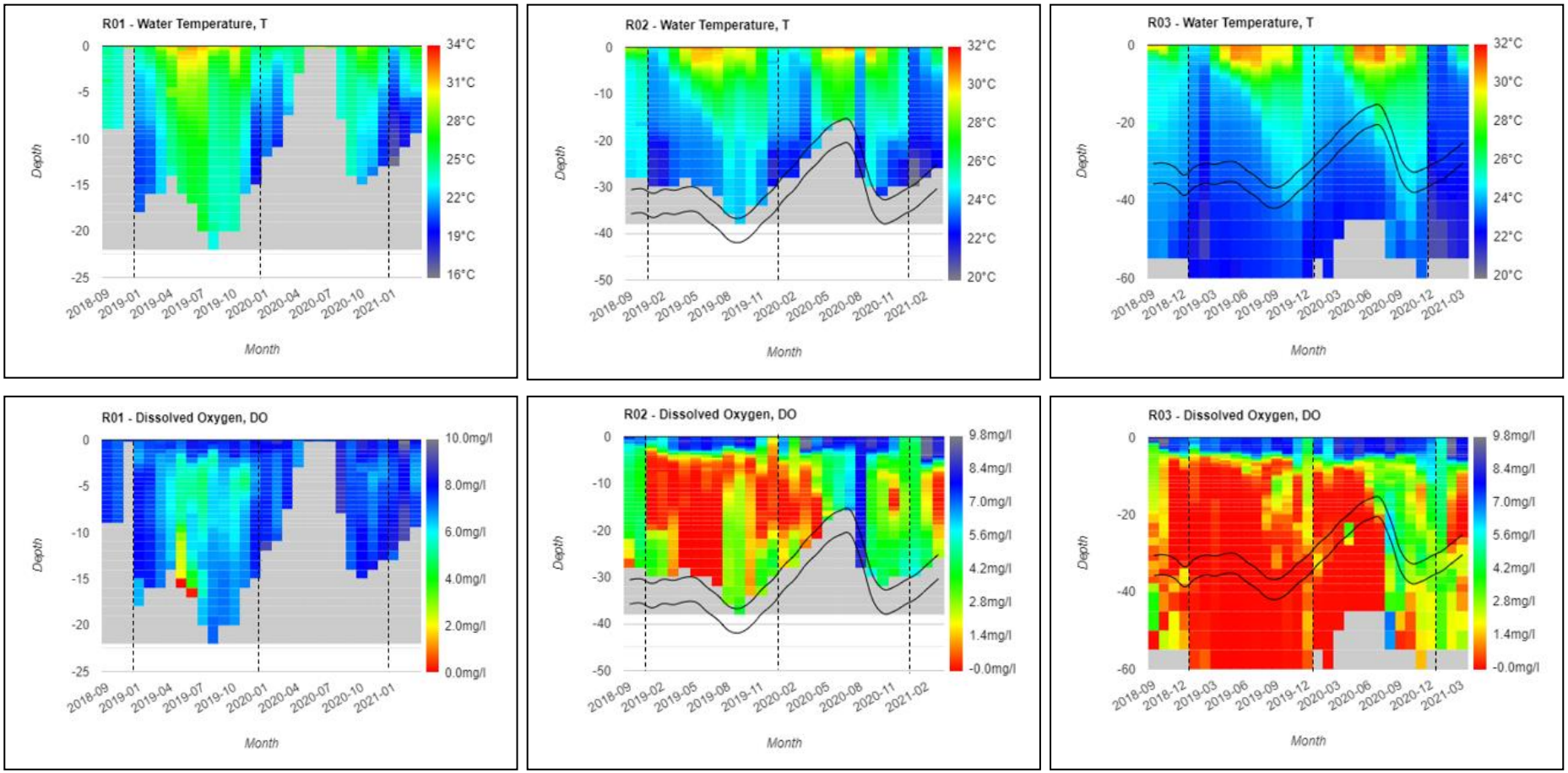


FIGURE 3-14: ***MONTHLY AVERAGE OF WATER TEMPERATURE AND DO DEPTH PROFILES IN THE MAIN RESERVOIR (R04 - R05), WITH POSITION OF INTAKE AT THE ACTUAL WATER LEVEL DURING SEPTEMBER 2018 – MARCH 2021***

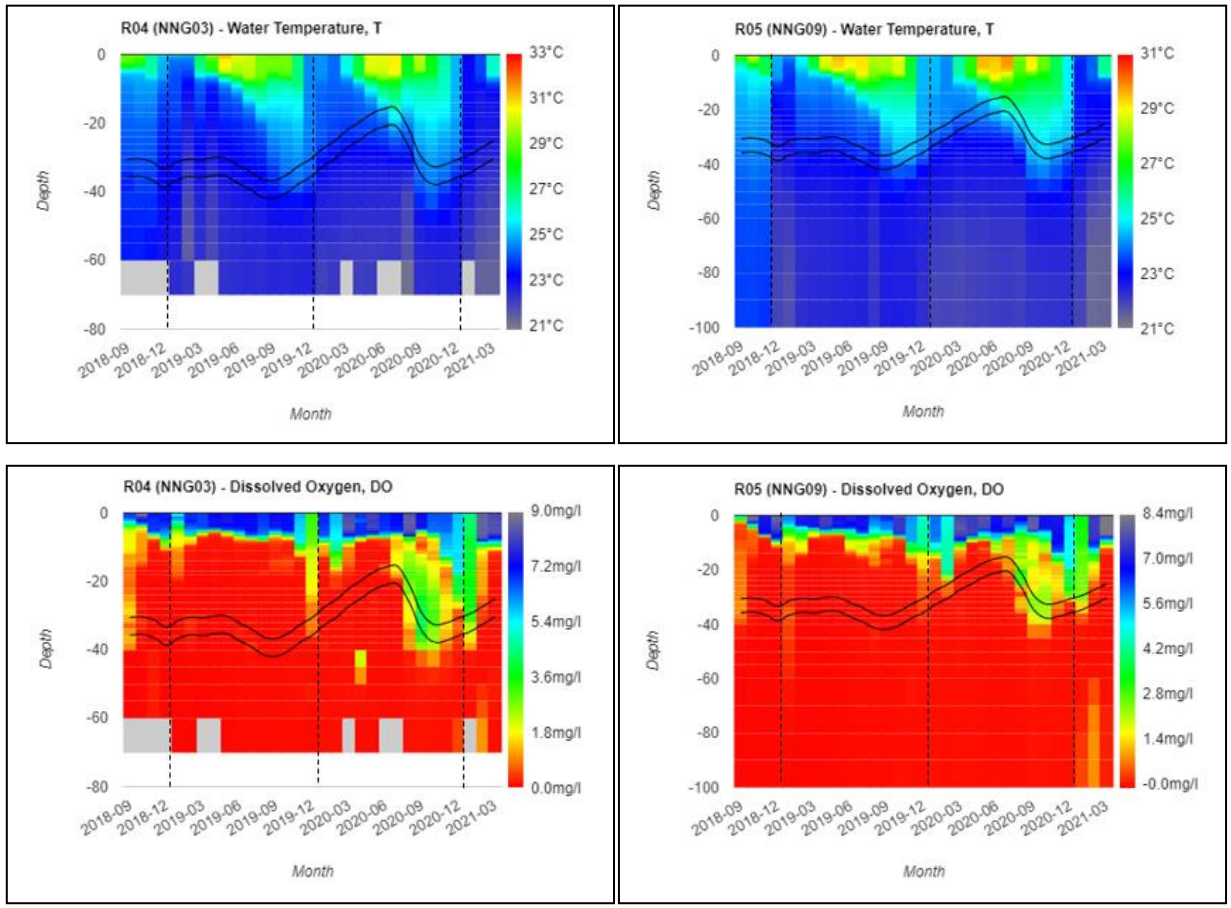


TABLE 3-10: *DO (MG/L) RESULTS OF SURFACE WATER IN MAIN RESERVOIR, RE-REGULATION RESERVOIR, NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 2021*

(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
5-Jan-21		6.4	3.9	4.65	4.1									6.87		
6-Jan-21						5.11	4.22	3.96	4.88	5.37	6.45	6.95			7.85	8.08
11-Jan-21	10.06												10.06			
12-Jan-21		8.63	6.29	6.11	5.18									11.24		
13-Jan-21						3.4	4.72	4.19	7.4	7.14	7.24	7.26			7.56	8.09
19-Jan-21		7.86	5.26	5.32	3.61									9.08		
20-Jan-21						2.21	3.48	2.23	3.43	5.26	7.58	7.94			7.41	7.7
25-Jan-21	9.52												10.54			
26-Jan-21		8.93	5.16	6.54	5.71	4.05								8.63		
27-Jan-21							2.23	2.77	3.39	4.05	6.42	7.09			6.32	6.84
2-Feb-21		8.63	6.86	7.95	6.59									8.55		
3-Feb-21						6.41	2.45	2.82	3.45	3.59	4.78	5.43			7.17	6.04
8-Feb-21	9.44												9.58			
9-Feb-21		9	10.19	10.12	9.38									11.04		
10-Feb-21						6.56	3.12	2.44	7.25	6.72	5.57	6.08			6.9	6.98
16-Feb-21		11.3	10.34	9.89	9.38									10.26		
17-Feb-21						8.51	2.87	2.75	7.8	6.7	5.13	5.1			7.71	7.27
22-Feb-21	9.72												9.15			
23-Feb-21		10.62	9.75	9.37	9.01									9.29		
24-Feb-21						8.57	2.81	3.01	7.86	7.36	7.44	7.28			7.43	7.61
2-Mar-21		8.02	7.82	7.69	7.48									7.57		
3-Mar-21						8.44	1.96	2.32	2.5	2.83	4.61	5.51			6.32	6.14
8-Mar-21	7.48												8.47			
9-Mar-21		8.16	8.12	7.62	7.63									7.55		
10-Mar-21						7.23	1.61	2.33	2.71	4.62	4.95	5.72			6.16	6.5
16-Mar-21					10.22	10.19										
17-Mar-21							1.39	2.34	3.13	3.21	5.73	6.15			6.41	7.01

Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
22-Mar-21	10.57												8.24			
23-Mar-21					7.3	7.37										
24-Mar-21							1.65	1.53	2.65	4.02	4.45	5.97			6.55	6.14
30-Mar-21					8.48	8.55										
30-Mar-21							2.01	1.79	2.54	2.98	4.12	4.68			5.57	5.41

Ammonia Nitrogen

Since 2014, the Ammonia Nitrogen concentration in the Upper Nam Ngiep River and its tributaries have been below the detection limit (<0.2 mg/L). In Q1 2021, Ammonia Nitrogen complied with the National Surface Water Quality Standard (<0.2 mg/L) in all monitored stations.

TABLE 3-11: ***AMMONIA NITROGEN (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 2021***

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

Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH0 1	NXA 01	NHS 01
11-Jan-21	<0.2												<0.2			
12-Jan-21		<0.2		<0.2	<0.2									<0.2		
12-Jan-21 Hypolimnion				<0.2	<0.2											
13-Jan-21						<0.2										
13-Jan-21 Hypolimnion						<0.2										
9-Feb-21		<0.2		<0.2	<0.2								<0.2			
9-Feb-21				<0.2	<0.2											
10-Feb-21						<0.2	<0.2	<0.2						<0.2		
10-Feb-21						0.74										
8-Mar-21	<0.2												<0.2			
9-Mar-21		<0.2		<0.2	<0.2									<0.2		
9-Mar-21				<0.2	<0.2											
10-Mar-21						<0.2										
10-Mar-21						<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 2021 indicate some exceedances and noteworthy are the elevated BOD levels in the hypolimnion in the main reservoir representing water that is transferred downstream. NNP1PC is in the process of compilating all monitoring information for the design of additional aeration system to improve the BOD level at downstream.

TABLE 3-12: *BOD_5 (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 2021*

(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
11-Jan-21	<1												<1			
12-Jan-21		1.21		<1	<1									<1		
12-Jan-21 Hypolimnion				<1	2.37											
13-Jan-21						1.95	3.96	3.33	<1	<1	<1	<1			<1	<1
13-Jan-21 Hypolimnion						3.15										
8-Feb-21	<1												<1			
9-Feb-21		<1		<1	<1									3.3		
9-Feb-21 Hypolimnion				<1	<1											
10-Feb-21						<1	3.06	2.56	<1	<1	<1	<1			1.26	2.28
10-Feb-21 Hypolimnion						2.92										
8-Mar-21	<1												<1			
9-Mar-21		1.48		<1	<1									<1		
9-Mar-21 Hypolimnion				<1	<1											
10-Mar-21						1.29	2.84	1.51	2.47	1.72	<1	<1			<1	<1
10-Mar-21 Hypolimnion						1.29										

Chemical Oxygen Demand (COD)

The COD measurements in Q1 2021 are presented in ***Table 3-13***.

TABLE 3-13: *COD (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q1 2021*

(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
11-Jan-21	15.1												12.1			
12-Jan-21														9.5		
13-Jan-21							7.6	7.1	6	5.4	6.7	8.3			8.1	8.3
8-Feb-21	<5												<5			
9-Feb-21														<5		
10-Feb-21							<5	<5	<5	<5	<5	7.9			6.8	16.2
8-Mar-21	<5												6.7			
9-Mar-21														9.8		
10-Mar-21							<5	<5	17.5	15.8	9.3	15			10.2	6.7

Faecal Coliform Bacteria

The results of the faecal coliform analyses in Q1 2021 are presented in **Table 3-14**.

Faecal coliform complied with the standard in all stations during the Quarter 1 2021, except in the tributaries (Nam Phouan [NPH01], Nam Xao [NXA01] and Nam HouaSoup [NHS01]).

TABLE 3-14: *FAECAL COLIFORMS (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q1 2021*

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

Station Code	NNG 01	R0 1	R0 2	R0 3	R0 4	R0 5	R0 6	R0 7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA0 1	NHS0 1
11-Jan-21	430												13			
12-Jan-21		4		0	0									34		
12-Jan-21 Hypolimnion				0	0											
13-Jan-21						0	0	0	8	11	8	11			49	110
13-Jan-21 Hypolimnion						2										
8-Feb-21	350												79			
9-Feb-21		130		0	0									1,600		
9-Feb-21 Hypolimnion				0	0											
10-Feb-21						0	2	0	22	27	79	79			1,600	1,600
10-Feb-21 Hypolimnion						1.8										
8-Mar-21	540												170			
9-Mar-21		11		0	0									79		
9-Mar-21 Hypolimnion				0	0											
10-Mar-21						0	2	11	7	11	17	170			26	34
10-Mar-21 Hypolimnion						0										

Total Coliform Bacteria

The results of measurements for total coliform bacteria are presented in **Table 3-15.** 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 3-15: *TOTAL COLIFORMS (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q1 2021*

(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	NNG0 6	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS0 1
11-Jan-21	1,600												33			
12-Jan-21		540		2	8									240		
12-Jan-21 Hypolimnion				0	0											
13-Jan-21						13	79	23	23	130	49	49			110	170
13-Jan-21 Hypolimnion						23										
8-Feb-21	1,600												130			
9-Feb-21		240		33	33									1,600		
9-Feb-21 Hypolimnion				11	13											
10-Feb-21						2	33	130	350	920	540	920			1,600	1,600
10-Feb-21 Hypolimnion						4										
8-Mar-21	1,600												540			
9-Mar-21		49		0	0									920		
9-Mar-21				0	0											

Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG0 6	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS0 1
Hypolimnion																
10-Mar-21						0	17	17	26	22	130	350			40	170
10-Mar-21 Hypolimnion						6.8										

3.7.2 Compliance Monitoring of Effluents from Camps

A total of 03 sites discharged effluents in Q1 2021, 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 3-5.** The effluent camp EF14 was connected with EF13 and treated as EF13.

The results are described in ***Table 3-16*** and the full data set is in ***Appendix 5.2***.

The status of compliance as of 31 March 2021 can be summarized as follows:

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

FIGURE 3-15: ***LOCATION OF EFFLUENT MONITORING POINTS***

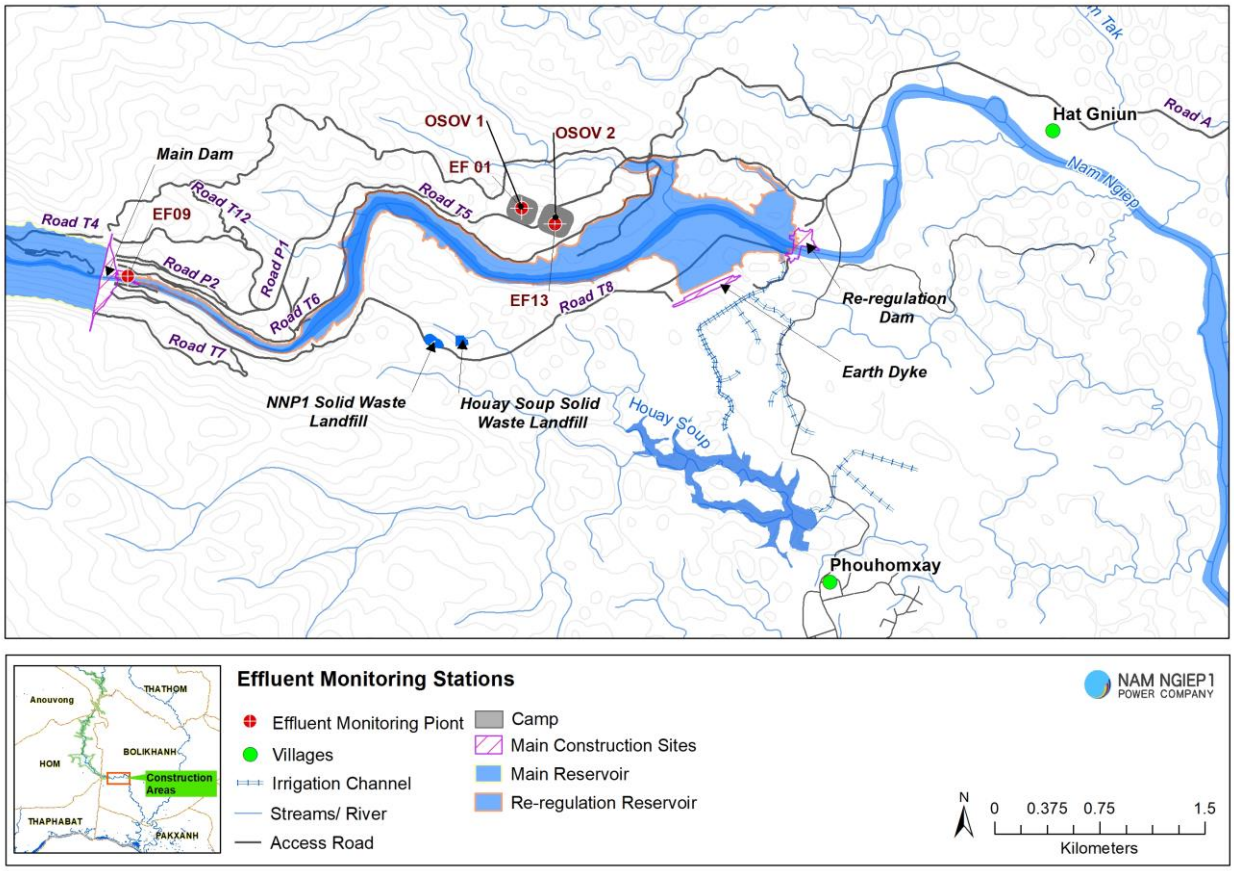


TABLE 3-16: *RESULTS OF THE EFFLUENT WATER QUALITY MONITORING OF THE CAMPS IN Q1 2021 (NON-COMPLIANCE PARAMETERS ONLY)*

		Site Name	OSOV 1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
4-Jan-21	COD (mg/L)	<125	<25	62	70.8
18-Jan-21	COD (mg/L)	<125	<25	70	56.8
4-Feb-21	COD (mg/L)	<125	<25	75	
15-Feb-21	COD (mg/L)	<125	<25	69	33.8
1-Mar-21	COD (mg/L)	<125	<25	46	
15-Mar-21	COD (mg/L)	<125	<25	142	124
4-Jan-21	NH_3-N (mg/L)	<10.0	<2	27.2	26.7
18-Jan-21	NH_3-N (mg/L)	<10.0	<2	22.2	29.3
4-Feb-21	NH_3-N (mg/L)	<10.0	3.0	25.0	
15-Feb-21	NH_3-N (mg/L)	<10.0	6.0	8.9	9.4
1-Mar-21	NH_3-N (mg/L)	<10.0	12.0	15.1	
15-Mar-21	NH_3-N (mg/L)	<10.0	8.0	15.4	42.3
4-Jan-21	Total Nitrogen (mg/L)	<10.0	8.11	29.6	30.6
18-Jan-21	Total Nitrogen (mg/L)	<10.0	1.02	29	35.6
4-Feb-21	Total Nitrogen (mg/L)	<10.0	11	35	
15-Feb-21	Total Nitrogen (mg/L)	<10.0	10.7	12.7	13.7
1-Mar-21	Total Nitrogen (mg/L)	<10.0	27	17.7	
15-Mar-21	Total Nitrogen (mg/L)	<10.0	13	21.3	62.8
4-Jan-21	Total Phosphorus (mg/L)	<2	1.0	2.2	6.0
18-Jan-21	Total Phosphorus (mg/L)	<2	1.0	6.2	2.0
4-Feb-21	Total Phosphorus (mg/L)	<2	1.0	1.9	
15-Feb-21	Total Phosphorus (mg/L)	<2	2.0	1.2	3.8
1-Mar-21	Total Phosphorus (mg/L)	<2	1.9	2.4	
15-Mar-21	Total Phosphorus (mg/L)	<2	1.8	1.3	8.7
4-Jan-21	Total coliform (MPN/100 mL)	<400	130	0	0
18-Jan-21	Total coliform (MPN/100 mL)	<400	79	0	0
4-Feb-21	Total coliform (MPN/100 mL)	<400	540	0	
15-Feb-21	Total coliform (MPN/100 mL)	<400	240	0	0
1-Mar-21	Total coliform (MPN/100 mL)	<400	27	0	
15-Mar-21	Total coliform (MPN/100 mL)	<400	17	0	0

TABLE 3-17: *COMPLIANCE STATUS OF EFFLUENT DISCHARGE FROM THE CAMPS IN Q1-2021*

Site	ID	WWTS	Key Non-Compliance Issues[1] in Q1-2021	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	- Total Nitrogen (<10 mg/L): Non-compliance in 4 out of 6 samplings. Q1 mean 11.8 mg/L. - Total coliform (<400 MPN/100 mL): Non-compliance in 1 out of 6 samplings. Q1 mean 172 MPN/100 mL. - Ammonia Nitrogen (<10 mg/L): Non-compliance in 1 out of 6 samplings. Q1 mean 7.3 mg/L.	A local contractor was selected to implement WWTSs Improvement starting in April 2021.
OSOV 2 (ESD Camp)	EF13	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Ammonia-nitrogen (<10 mg/L): Non-compliance in all 6 samplings. Q1 mean 18.9 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in all 6 samplings. Q1 mean 24.2 mg/L. - COD (<125 mg/L): Non-compliance in 1 out of 6 samplings. Q1 mean 77 MPN/100 mL. - Total Phosphorus (<2 mg/L): Non-compliance in 3 out of 6 samplings. Q1 mean 2.5 mg/L.	As above.
Main Powerhouse	EF19	Septic tanks (grey and black water), biofilm tank and chlorination tank.	- Ammonia-nitrogen (<10 mg/L): Non-compliance all 4 samplings. Q1 mean 26.9 mg/L. - Total Nitrogen (<10 mg/L): Non-compliance in all 4 samplings. Q1 mean 35.6 mg/L. - Total Phosphorus (<2 mg/L): Non-compliance in 3 out of 4 samplings. Q1 mean 5.1 mg/L.	As above

[1] The values in brackets indicate the applicable standard

3.7.3 Groundwater Quality Monitoring

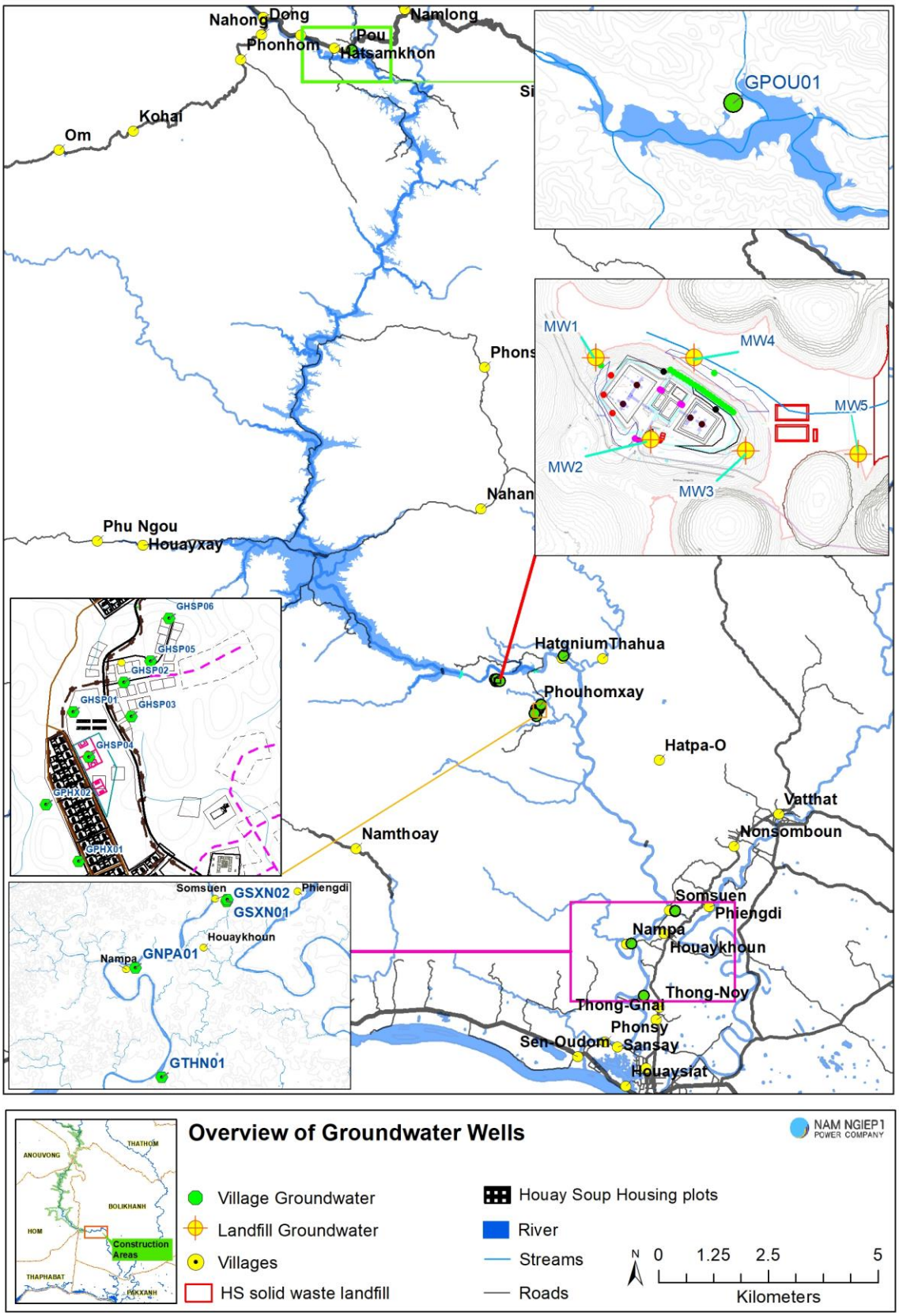
During Q1 2021, a total of six boreholes at Somseun, Nam Pa, Thong Noy, Pou Villages (one borehole in each village) and Phouhomxay Village (two new boreholes – commencing in June 2020) have been monitored for the following parameters:

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*: 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 3-16** and the groundwater monitoring data is presented in ***Appendix 5.3.***

FIGURE 3-16: *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 pH (February 2021), faecal coliform and *E.coli* in all Q1 2021 samples.

Somsuen Village: all monitored parameters complied with the standard, except pH (February 2021), and faecal coliform and *E.coli* (March 2021).

NamPa Village: all monitored parameters complied with the standard, except pH (February 2021).

Pou Village: all monitored parameters complied with the standard, except faecal coliform and *E.coli* in January 2021 sample.

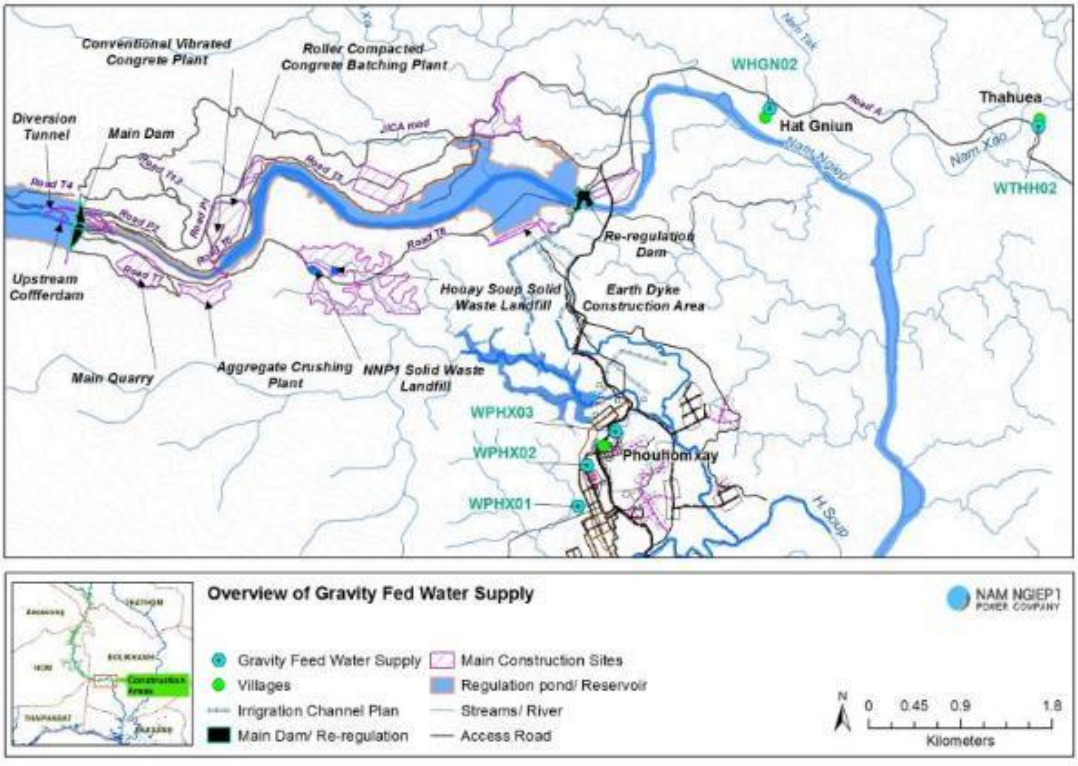
Phouhomxay Village: pH and total iron at GPHX01 in February 2021 samples, and pH (February 2021) at GPHX02 did not comply with the relevant standard. All other parameters complied with the standard.

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.

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 3-17: *OVERVIEW OF GRAVITY FED WATER SUPPLY*



Water samples were taken from the taps for analysis during the reported period and selected results are shown in ***Table 3-18***. The full set of data is presented in ***Appendix 5.4.***

TABLE 3-18*: THE GFWS MONITORING RESULT IN Q1 2021*

Date	Parameter (Unit)	Site Name	Thaheua Village	Hatngiun Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
		Guideline				
08-Jan-21	*E. Coli* (MPN/100 mL)	0	33	7.8	49	170
12-Feb-21		0	22	7.8	49	23
05-Mar-21		0	11	170	280	110
08-Jan-21	Faecal coliform (MPN/100 mL)	0	70	7.8	79	350
12-Feb-21		0	22	7.8	79	79
05-Mar-21		0	11	170	280	110

Thahuea Village (WTHH02): all parameters complied with the standard, except pH (February 2021) faecal coliform and *E.coli*.

Hat Gniun Village (WHGN02): all parameters complied with the standard, except pH (February 2021) 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 2021 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.

3.7.5 Landfill Leachate Monitoring

The landfill leachate monitoring was not conducted at NNP1 Project Landfill and Houay Soup Solid Waste Landfill due to the ponds were dry.

3.7.6 Compliance of water quality monitoring

During Q1 2021, the non-compliance issues relating to water quality monitoring were observed and summarized in **Table 3-19**.

TABLE 3-19*: NON-COMPLIANCES RELATING TO WATER QUALITY MONITORING IN Q1 2021*

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 is still in the process of compilating all monitoring information for the design of additional aeration system to improve the DO level at downstream. - The preliminary studies had been conducted on its feasibility of installation, approx. cost and also the adverse impact on the generation.	- A proper action to resolve the issue is not yet finalized. - A trial to operate the labyrinth Spillway at the Re-regulation Dam is scheduled in August 2021 to see the improvement of DO values downstream and possibility to operate the spillway routinely.
2	Effluents discharged from the Wastewater Treatment Systems (WWTS) at OSOV1, OSOV2 and the Man Dam exceeded the National Effluent Standard Guideline in 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.	- A contractor has been hired for WWTS improvement and modification. The works commenced since April 2021. - The works is now on-going as scheduled and expected to complete by the end of August 2021.
3	Groundwater quality monitored for the communities (Thong Noy, Som Seun, and Pou Village) were not complied with the National Groundwater Quality Standard for drinking purpose on Faecal Coliform and E.*coli* parameters	- A full inspection of water supply systems in Som Seun, Nam Pa and Thong Noy Village was conducted in September 2020 by NNP1PC team including consulting with the Village Water Use Committee (VWUC) and also interviewed some consumers (detailed in Q4 2020 Report). - Potential contamination sources of coliform were identified and recommendation of water supply system maintenance and operational cares 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	- The villagers were advised/encouraged to boil water before drinking.

No	Non-compliance Issues	Corrective Actions	Status
		readily drinkable but would normally have to be boiled or otherwise treated before it would be suitable for drinking.	
4	Gravity Fed Water Supply monitored for the communities (Thaheua, Hatngiun, 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 feces from birds may contributed 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.

4 WATERSHED AND BIODIVERSITY MANAGEMENT

4.1 WATERSHED MANAGEMENT

4.1.1 Implementation of Watershed Management Plan

A handover ceremony for two aluminium boats of Xaysomboun WRPO was organized on 14 January 2021 at NNP1 Main Dam Site. The boats were handed over by NNP1PC ESD management and received by the Head of Xaysomboun WRPO with participation of representatives from EMO and GOL agencies. EMO team also delivered two boat trailers. One trailer is kept at Ban Houay Xay, Hom District and the other trailer is kept at Ban Pou, Thathom District.

BSP organized a discussion with Xaysomboun and Bolikhamxay WRPO on 07 and 15 January 2021 respectively about the law enforcement and patrolling strategy, monthly patrolling planning, and SMART implementation. BSP also provided technical assistance to document the results of reservoir and patrolling activities between 2019 and 2020 into the SMART system. The analysis and further updates will be communicated during the monthly meetings with WRPOs.

The EMO team noted the challenges for WRPO and their Management to understand the importance and benefits of the SMART system for the conservation work. The EMO team is considering the applicability of SMART or other application to support the WRPO patrolling activity. This will be further discussed with WRPOs and BSP Team.

Xaysomboun WRPO commenced the reservoir patrolling during 15 to 22 January 2021 with the participation of BSP technical team as an observer and another patrolling during 22 February to 02 March 2021. The results were entered into the SMART database with the technical support from BSP. The report highlighted the concerns and issues related to encroachment, resource extraction and illegal fishing in NNP1 watershed TPZ by local people.

SMO Infrastructure and EMO Watershed teams reviewed the detailed design and Bill of Quantity (BoQ) of the Xaysomboun WRPO sub-office, which will be established at Ban Houay Xay, Hom District under the approved AIP2020. Xaysomboun WRPO informed that that the construction of the sub-office was started on 23 February 2021. The construction of two patrolling sub-stations and two reservoir check-points will also be done by the same GOL

contractor after the completion of sub-office construction. NNP1PC ESD requested Xaysomboun Provincial Governor and Xaysomboun PAFO during the discussion on 12 March 2021 for better coordination on the construction plan, information sharing, and progress of WRPO facilities.

Bolikhamxay WRPO conducted reservoir and forest patrolling during 01 to 10 February 2021 and 02 to 11 March 2021. The results were entered into the SMART database with the technical support from BSP. The report highlighted the concerns and issues related to encroachment, resource extraction and illegal fishing in NNP1 watershed as well as land clearance within NNP1 concession area.

EMO team handed over the SMART system equipment to Bolikhamxay WRPO on 15 January 2021 and installed the new reservoir warning sign near Houay Sao, Hom District on 19 January 2021.

The camera-trap installation within NNP1 watershed TPZ area was scheduled during 26 March to 07 April 2021 with a total of 97 camera-traps in 53 blocks within Xaysomboun Province and 03 camera-traps in two blocks within Bolikhamxay Province. The training for camera trap installation was organized on 24-25 March 2021 to the key GOL staffs however the field implementation had to be postponed until there is further agreement about the accommodation allowance for the filed work in the remote or forest area.

EMO was also exploring the collaboration opportunities with GOL institutions and universities for providing training courses on the land-use and forest resources management to WRPO and GOL staffs under Activity 1.4 of the approved NNP1 WMP - Strengthening of institutional capacity of village authorities, WRPO and relevant government agencies related to land use and natural resource management.

EMO team sent training needs assessment forms to WRPOs in the first week of March 2021. The assessment will be used for prioritizing the training needs on the knowledge and skills of GOL staffs who are involved in implementing land use and forest management. EMO team received three completed training needs assessment (land use and forest management) forms from Bolikhamxay WRPO in the third week of March 2021 and continues to follow-up with Xaysomboun and Bolikhamxay WRPO on the submission of the remaining assessments.

Following the discussion on the possibility of collaboration in providing the training courses of land-use and forest management for WRPO and GOL staff with professors at Bolikhamxay Agriculture and Forestry College in February 2021, the College submitted a draft budget proposal for four training courses. EMO will organize further discussion with the College in April 2021 and the training is scheduled to be organized in June or July 2021.

EMO team prepared the ToR for a Short-term Individual Consultant to support implementing the Action Plan on Sustainable Livelihood Opportunities under component 6 of the approved WMP. The assessment report and ToR for the assignment were shared with SMO team to seek the support internally from SMO team. EMO and SMO Team will have further internal discussion in April 2021 prior to deciding to procure the service or manage it internally.

4.1.2 Preparation of Annual Implementation Plan (AIP) 2021

A meeting with NNP1 watershed and biodiversity committees including DOF-MAF on the issues related with GOL financial policy was organized on 25 January 2021. The meeting was chaired by Head of the Section of DOF-MAF and participated by representatives from DOF-

MAF, Xaysomboun and Bolikhamxay WRPO, Bolikhamxay NC-NX BOMU, and EMO. Two main discussion points and agreement during the meeting include:

1. Xaysomboun and Bolikhamxay WRPO as well as NC-NX BOMU to coordinate with NNP1PC for the preparation of a 5-year plan (2021-2025) as the reference for preparing the detail annual implementation plans over the next 5 years. The draft AIP 2021 of WPRO and NC-NX BOMU should be finalized by February 2021 to ensure the continuation of management activities in NNP1 watershed and NC-NX offset site.
2. The additional accommodation allowance for field activities in the remote places such as patrolling under GOL CA budget should be provided while under NNP1 NNL budget it is subject to the discussion and agreement between NNP1PC and ADB. It is necessary to review the overall budget under watershed and biodiversity program with the increase of additional accommodation allowance and the consultation meeting should be organized to agree on the activity budget between NNP1PC, GOL, and ADB.

Following the meeting on 25 January 2021, the EMO team have prepared the 5-year WMP budget plan (2021-2025) for Xaysomboun and Bolikhamxay WRPO. This plan will serve as the reference for WRPO on the scope of the activities and budget sealing in formulating their AIPs. The plan has been reviewed by the EMO team and shared to DOF-MAF and the Head of Xaysomboun and Bolikhamxay PAFO/Vice Chairman of WRPC of Xaysomboun and Bolikhamxay as well as BSP Team in the third week of March 2021.

The discussion about allowances for Bolikhamxay WRPO and NC-NX BOMU with the Head of Bolikhamxay PAFO was also organized on 03 March 2021. It is noted that the Head of Bolikhamxay PAFO agrees with NNP1PC that the accommodation allowance shall not be provided for regular patrolling work in remote areas that do not have any accommodation according to the MoF Financial Policy. However, it is noted that at the end of March 2021, both Bolikhamxay WRPO and NC-NX BOMU are requesting further consultations with DOF-MAF prior to agreeing with the recommendations put forward by the Head of Bolikhamxay PAFO.

The discussion about allowances and other topics related to Xaysomboun WRPO implementation activities between NNP1PC ESD management, the Xaysomboun Provincial Governor and relevant GOL offices was organized on 12 March 2020 at the XSB Provincial Governor Office in Anouvong. The key remarks from the discussion include:

- The Provincial Governor principally agreed with NNP1PC proposal that accommodation allowance as per MoF Policy (No. 4000) should not be applied for activities in remote places that do not have any accommodation.
- It was recommended for the company and WRPC/WRPO to follow the current practice unless a new national financial regulation is issued, which anyway should also be discussed among the relevant parties for its suitability before implementing.
- WRPC/WRPO to inform relevant staffs to avoid impacts on staff performance.
- The decision made on 12 March 2021 should be respected and implemented accordingly. The Governor also encouraged the company to bring any immediate concerns to the attention of the provincial leadership.

Bolikhamxay WRPO further improved the draft AIP2021 elaborating on the comments from the meeting on 25 January 2021. The improved draft was submitted to DOF-MAF at the end of March 2021 for their review and prior to further submission to NNP1PC.

EMO reviewed the draft AIP2021 of Xaysomboun WRPO which was submitted on 23 December 2020 and Xaysomboun WRPO continues improving the draft based on EMO comments, the comments during the meeting on 25 January 2021, and further inputs from Hom and Thathom districts related to the reservoir management activities.

A working session between EMO, Xaysomboun WRPO, and BSP was organized on 11 March 2021 focusing on the Component 4 of the approved NNP1 WMP - TPZ biodiversity protection. It is noted that the key priority activities recommended under this component shall include: 1) commencing the TPZ patrol; 2) preparation of law enforcement strategy; and 3) preparation of outreach strategy for conservation work. Xaysomboun WRPO confirmed that the draft AIP2021 will be submitted to DOF-MAF first before further submission to NNP1PC.

FIGURE 4-1: ***(a) HAND-OVER CEREMONY OF THE TWO BOATS OF XAYSOMBOUN WRPO AT NNP1PC MAIN DAM SITE ON 14 JANUARY 2021 AND (b) HARD-OVER SMART EQUIPMENT TO BOLIKHAMXAY WRPO ON 15 JANUARY 2021***

FIGURE 4-2: ***RESERVOIR SIGNS AT THE ENTRY OF TPZ1 (LEFT PHOTO) AND TPZ2 (RIGHT PHOTO)***

4.2 BIODIVERSITY OFFSET MANAGEMENT

4.2.1 Engagement of Biodiversity Service Provider (BSP)

The MOU between NNP1PC, ADB and WCS was signed by ADB and WCS in January 2021.

The EMO team and BSP continued to make progress on the preparation of a Law Enforcement Strategy (LES) document for NC-NX offset site, the overall biological monitoring program for NNP1 watershed and NC-NX offset site, community outreach program, and the conservation linked livelihood.

4.2.2 Implementation of Biodiversity Offset Management Plan

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

a. Component 1 - Spatial Planning and Regulation

At the end of January 2021, Bolikhamxay NC-NX BOMU finalized the plan for the TPZ boundary demarcation in the remaining village, Ban Vangphieng of Viengthong District. However, the activity has to be postponed to second quarter 2021 due to the unavailability of NC-NX BOMU and relevant GOL staffs.

b. Component 2 – Enforcement

Starting first quarter 2021, three patrolling teams focused the work in the NC-NX TPZ highest priority area while one patrol team focused in other NC-NX TPZ higher priority area. Even though the approved BOMP prioritisation is the TPZ highest priority areas but the reason that NC-NX BOMU keep one team rotating in the two TPZ high priority areas is because if without the presence of the patrolling team in the areas for too long then villagers or hunters would access the areas without any hesitation then the level of threat could be increased or became severe, then it would be too late to address the issue once the target of the TPZ highest priority area is achieved

The results of patrolling in the first quarter 2021 are as follow:

Team	Patrolling Area/distance	Observations/Actions Taken
1	**07-26 January 2021** Nam Kha Gni, Nam Houng, Nam Lak, Nam Cham Hang, Nam Chantui and Houy Kasae (16 days covering a distance of 97 km of forest patrol and 21 km of road patrol)	**07-26 January 2021** The team heard a gunshot at Nam Cham Hang and assumed that it was shot by local hunter(s) either from Sopkhone or Meungcham village.
	14 February – 05 March 2021 TPZ highest priority area including Nam San, Nam Chouan, Nam Sone, Houy Poung and Houy Payang (12 days covering a distance of 68.5 km on forest patrolling)	**14 February – 05 March 2021** The team did not encounter any threats during patrolling.
	21 March – 09 April 2021 TPZ highest priority area including Nam Chouan, Nam Sone and Houy Xay Gnai (12 days covering a distance of 65 km on forest patrolling and 12 km on road patrol)	**21 March – 09 April 2021** The team encountered and destroyed three new fishing camps at Nam Chouan. The team also observed three motorbikes entering TPZ highest priority area for fishing.
2	**07-26 January 2021** TPZ highest priority area including Nam Chang and Nam Sone (16 days covering a distance of 89 km on forest patrolling and 24 km on road patrolling)	**07-26 January 2021** The team did not encounter any threats during patrolling but found carcasses at Nam Chang including one fresh muntjac, some fresh internal organs of a serow and some old hair and bones of a civet. There were no trace of hunters or poachers around the areas, and so it was assumed that these carcasses caused by other predators.
	05 - 24 February 2021 TPZ high priority area including Nam Ma, Nam Pang and Nam Ma Mountain ridge (15 days covering a distance of 112.8 km on forest patrolling)	**05 - 24 February 2021** The team did not encounter any threats during patrolling but found carcasses of an eagle and a wild pig at Nam Ma. However, the team was not able to identify the cause of death.
	12 – 31 March 2021	**12 – 31 March 2021** The team encountered and destroyed a hunting camp at Houy Kasae and three

Team	Patrolling Area/distance	Observations/Actions Taken
	TPZ high priority area including Nam Houng, Nam Lak and Houy Kasae & mountain ridge (16 days covering a distance of 92 km on forest patrolling)	fishing camps at Houy Kapa & Houy Bon. The team also encountered with six men illegally fishing at Nam Houng within the TPZ area. The fishing gears were seized and a written warning was issued to them. The team also found a carcass of a wild pig at Houy Kasae but they could not identify the cause of death.
3	**07-26 January 2021** TPZ highest priority area including Nam Chouan, Nam Sone, Houy Xay Noi and Houy Xay Gnai (16 days covering a distance of 61 km on forest patrolling and 18 km on road patrolling) **05 - 24 February 2021** TPZ highest priority area including Nam Chang, Nam Sone and mountain ridge between Nam Sone and Nam Chang (16 days covering a distance of 85 km on forest patrolling and 12 km on road patrolling) **12 – 31 March 2021** TPZ highest priority area including Nam San & Nam San tributaries, Nam Phai and mountain ridges. (12 days covering a distance of 53 km on forest patrolling)	**07-26 January 2021** The team found and destroyed a fresh hunting camp at Houy Xay Gnai that was used by local hunters from the villages in the northwest of NC-NX offset site. **05 - 24 February 2021** The team did not encounter any threats during patrolling. **12 – 31 March 2021** The team encountered and destroyed an old hunting camp located between Nam Mong Mountain ridge and Nam Phai.
4	**07-26 January 2021** TPZ highest priority area around Nam San (16 days covering a distance of 70 km on forest patrolling) **05 - 24 February 2021** TPZ highest priority area including Houy Xay Noi, Houy Xay Gnai, Nam Xi, Nam Chuan and ridges	**07-26 January 2021** The team did not encounter any threats during patrolling but found a carcass of a wild pig at Nam San which was assumed killed by hunters. **05 - 24 February 2021** The team did not encounter any threats during patrolling.

Team	Patrolling Area/distance	Observations/Actions Taken
	(16 days covering a distance of 78 km on forest patrolling and 12 km on road patrolling) **12 – 31 March 2021** TPZ highest priority at Nam San including streams and mountain ridges. (12 days covering a distance of 46 km on forest patrolling)	**12 – 31 March 2021** The team did not encounter any threats during patrolling.

FIGURE 4-3: ***MAP OF PATROLLING TRACK FROM JANUARY-MARCH 2021***

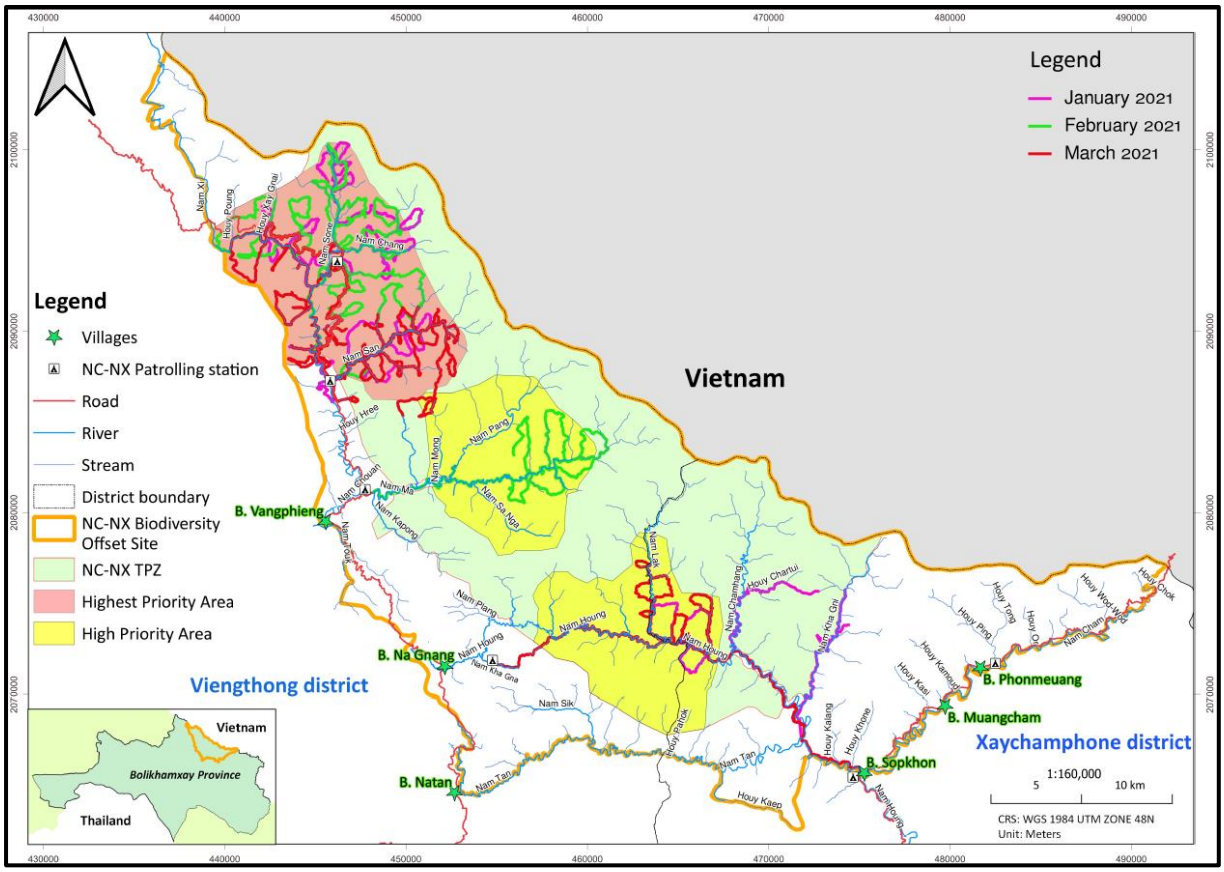


FIGURE 4-4: *MAP OF THREATS FROM JANUARY-MARCH 2021*

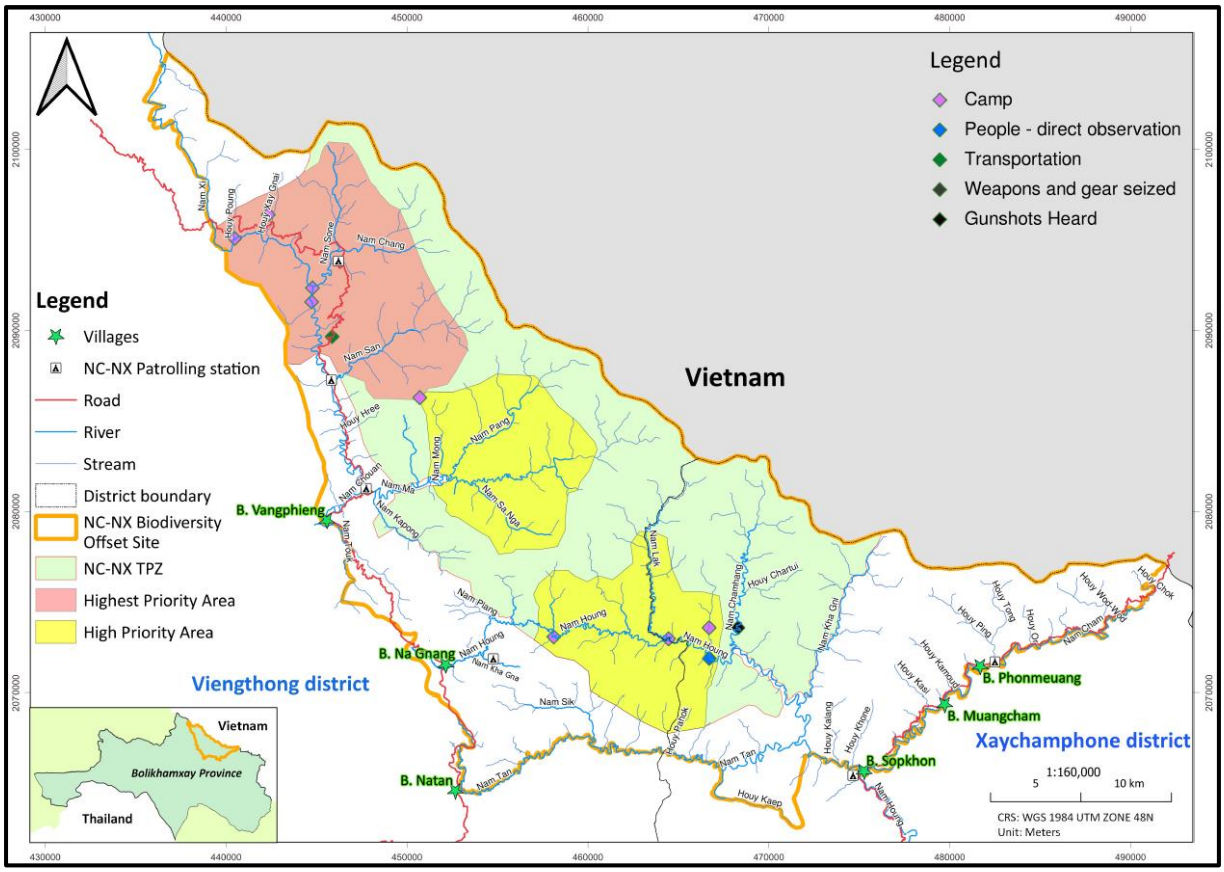


FIGURE 4-5: ***FRESH CARCASS OF MUNTJAC OBSERVED BY PATROLLING TEAM AT NAM CHANG IN JANUARY 2021***

FIGURE 4-6: ***FRESH HUNTING CAMP AND WILDLIFE TRAP OBSERVED BY PATROL TEAM AT TPZ HIGHEST PRIORITY AREA IN JANUARY 2021***

FIGURE 4-7: ***ILLEGAL FISHING FOUND BY TEAM 2 AT NAM HOUNG IN MARCH 2021***

FIGURE 4-8: ***OLD HUNTING CAMP LOCATED BETWEEN NAM MONG MOUNTAIN RIDGE AND NAM PHAI IN MARCH 2021***

c. Component 3 – Conservation Outreach

The results of pre-assessment survey as part as the development of community outreach strategy were presented by BSP Team to EMO on 29 January 2021. BSP team further presented and discussed with EMO and NC-NX BOMU on the overall schedule of outreach activity in 2021 on 03 February 2021.

A meeting with BOMU, Viengthong and Xaychamphone District outreach team was organized on 01 - 04 March 2021 in Viengthong District. The key objectives of the meeting include presenting the results of pre-survey that was conducted in the fourth quarter 2020, development of outreach conceptual modelling, design and prioritize outreach activities, design outreach tools and training on activity implementation. BSP prepared the report on the results of the training activity and the overall scheduled of outreach activity is being

updated accordingly. It is noted that the activity was expected to start at the end of April 2021 or the first week of May 2021. BSP also shared the report (Lao language) of pre-survey to BOMU and EMO on 12 March 2021.

d. Component 4 – Conservation linked livelihood

The improved final plan was re-submitted to ADB and IAP on 30 December 2020. ADB Social Team provided additional comments on 20 January 2021 while there was no feedback from ADB Environmental Team and IAP until end of January 2021. The Lao version was finalized on 22 February 2021 after ADB and IAP review and submitted to Bolikhamxay NC-NX BOMU for their final review in February 2021.

In January and February 2021, Bolikhamxay NC-NX BOMU was still discussing the Snare Removal Plan with EMO and BSP. The final snare removal plan (Lao version) was shared to NC-NX BOMU and EMO on 10 March 2021. The village team establishment in Vangphieng Village was organized during 16 to 19 March 2021 and the training was organized on 23 – 26 March 2021.

e. Component 6 – Biological Monitoring

BSP team was further improving the monitoring matrix in January 2021 elaborating the comments and recommendations from IAP and ADB during the virtual mission between 09 and 10 December 2020. EMO and BSP team had discussion on 22 February 2021 on the improved monitoring matrix and the preparation of other surveys that are scheduled in 2021. BSP will have further discussion with ADB and IAP on the fishery survey and bird survey in the NC-NX offset site, and turtle survey in the NNP1 watershed.

NC-NX BOMU, EMO, and BSP team installed a total of 100 camera traps at 56 target locations within NC-NX offset site during 27 October to 27 November 2020. The team started retrieving the camera traps on 19 January 2021 and completed the activity in the second week of February 2021. There are a total of six camera traps and one memory cards lost on site. EMO extracted and compiled all the images from the camera traps for further analysis by BSP team.

The draft ToR for Lao Newt and Bent-toe gecko survey in the NNP1 watershed, Otter survey in the NC-NX, and fish survey for the NNP1 watershed and NC-NX were drafted by BSP and have been reviewed by EMO. It is noted per further discussion between EMO and BSP that the biological monitoring matrix will be further updated and shared to ADB and IAP together with the TORs for the surveys. Further procurement of the experts/specialist for the survey under NNP1 NNL fund will be processed after ADB and IAP acknowledgement.

4.2.3 Preparation of Annual Implementation Plan (AIP) 2021

Bolikhamxay NC-NX BOMU submitted the improved draft plan to EMO on 27 January 2021. The draft plan in English was finalized and submitted to ADB and IAP on 18 February 2021. ADB and IAP provided their comments on 18 and 22 February 2021 respectively. EMO and BSP Team have provided the clarification accordingly and the improved plan was re-submitted to ADB and IAP on 26 February 2021 for their confirmation and approval.

NNP1PC re-submitted the plan to ADB and IAP on 10 March 2021 with response to ADB's comments. The budget plan was approved by ADB and IAP on 18 March 2021. EMO Team has refined the plan and shared it with NC-NX BOMU on 24 March 2021. EMO, NC-NX BOMU, and BSP will further work on the activityy schedule and budget partition in quarterly basis prior to

finalizing the official document in Lao language and submission of fund disbursement request to NNP1PC.

5 BIOMASS CLEARANCE / FLOATING DEBRIS REMOVAL

NNP1PC EMO completed the removal of temporary log-boom from the main reservoir on 22 January 2021.

FIGURE 5-1: ***REMOVAL OF TEMPORARY LOG-BOOM FROM THE NNP1 MAIN RESERVOIR***

6 FISHERY MONITORING

The monitoring results will be discussed at the second quarter reporting due to late completion in data collection between January to March 2021 related with the COVID-19 lockdown.

7 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 2021) are provided in ***Table 7-1.***

TABLE 7-1: SAFETY INCIDENTS REPORTED DURING THE OPERATION PHASE (SEPTEMBER 2019 TO MARCH 2021)

Type of Incidents	LTI	RI	NM	PD	FI	MVI	Total
No. of Incidents in March 2021	0	0	0	0	0	0	0
Cumulative Total Incidents to 31 March 2021	0	0	0	0	0	0	**0**

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

During Q1 2021, there no incident or accident occurred. The basic firefighting trainings and emergency fire hydrant drill were conducted as follows:

- On 20 January 2021, the 1st firefighting training for NNP1PC staff on site (11 participants).
- On 27 January 2021, the 2nd firefighting training for NNP1PC staff on site (17 participants).

- On 18 March 2021, the Emergency Fire Hydrant Drill was conducted at OSOV1 for NNP1PC staff on site (6 participants).


The schedule on other associated trainings and drills will be issued after the EREP is updated and implementing.

8 External missions and visits

- On 20 January 2021, the Environment Management Unit (EMU) of Bolikhan District resumed the monthly site visit by focusing on the progress of environmental activities and on the status of decommissioned and rehabilitated sites before handing over to the GOL. The general environmental work progress has also been discussed during the visit.

- A joint ADB and IAP virtual mission was conducted during 07 to 11 December 2020 and there were some pending queries from ADB to be addressed including the responses to IAP Report No.15 to be provided to IAP during Q1 2021.

The virtual mission was successfully completed and action priorities recommended by ADB and IAP are listed for further follow up as follows:

No	Requested/Recommended Actions	Status as of 31 March 2021
1	Conclusion of the Environment and Social LTA Contract extension.	Pending - ADB shared the drafted LTA's ToR for NNP1PC consideration on 19 February 2021, the TOR was still under review by NNP1PC.
2	Hiring of a new EMO staff and provide the job descriptions of EMO key positions.	**Completed** – the vacant position of Biodiversity Management Senior Officer was filled in early January 2021. The job descriptions of EMO key positions were shared to ADB on 01 April 2021.
3	Provide a timeline of next steps to resolve the issue of low oxygen levels/feasibility study.	Pending – the timeline was shared to ADB on 01 April 2021 with some information of the feasibility studies but the issue has not yet been solved.
4	Submit the draft GOL AIP2021 of WRPOs and BOMU for ADB review and approval as soon as possible.	Pending – relating to the disagreement between the GOL and NNP1PC on the request for additional accommodation allowance for the patrol teams, the approved BOM AIP2021 by ADB in February 2021 has not yet finalized and approved for implementing by BOMU, as well as the WM AIP2021 of BLX and XSB WRPO were not yet submitted to NNP1PC for further share to ADB for review and approval.
5	Analysis of Fish Monitoring Data up to 2020 by a Fishery Expert.	**Completed** – the Biennial Fisheries Report 2020 (analysis of data collected during 2015 to 2020) written by an external Fishery Expert was shared to ADB on 01 April 2021.
6	Provide the Transmission Lines (TLs) monitoring report which was planned to conduct by EGAT in Q4 2020.	**Completed** – the Site Inspection Report of 230 kV TL was shared to ADB on 26 March 2021. The inspection of 115 kV was scheduled to be conducted by EDL in April 2021 and the report will be translated from Laos to English and shared to ADB within Q2 2021.
7	Provide the latest dam safety report.	**Completed** – the report was shared to ADB in Dec 2020.
8	Provide the landslide monitoring report.	Pending – the report is expected to be completed by the end of April 2021 and will be shared to ADB after submission to DSRP.
9	Provide the rehabilitation plans agreed with the Government.	**Completed** in Dec 2020 and prepared for the GOL inspection in Jan 2021.
	H&S and Emergency Plans	

No	Requested/Recommended Actions	Status as of 31 March 2021
10	Provide the Organization Chart for H&S Team and identifying first aiders.	**Completed** in Dec 2020
11	Provide the updated H&S plans that include relevant measures on navigation safety and incident response.	Pending - the H&S plan is still under review and updating. It is expected to be ready in June 2021.
12	Revise the Emergency Preparedness and Response Plan (EPRP) for the project operations, including an update on associated training and emergency drills performed.	Pending - the plan is still under review. It is expected to be ready in June 2021.
13	Revise/update the Emergency Action Plan (EAP), engagement with the emergency authorities, and perform desktop and field test.	Pending - the plan is still under review. It is expected to be ready in April 2021, the desktop and field-testing s are scheduled in July 2021.
14	Revise/update the Emergency Evacuation Plan (EEP) including an update on associated training and drills performed.	Pending - the plan is still under review. It is expected to be ready in June 2021.
	Watershed Management and Biodiversity Offset Management Program	
15	Analyse patrol information notably snare encounter rates in the highest priority area of NCNX. Based on results, either quickly evolve patrolling effort in NCNX to be highly concentrated in the highest priority area or produce clear case-specific justification to depart from the BOMP.	**Completed** - already discussed with BSP for further actions.
16	Implement law enforcement activities in Sub-catchment to full capacity as soon as possible.	**Completed** – already discussed with BSP for further actions
17	Determine effects of proposed boundary changes to Sub-catchment Totally Protected Zones and take appropriate follow-on actions.	**Completed** – already discussed with BSP for further actions
18	Finalize and implement NC-NX Community Development Plan.	Pending – the plan was improved per ADB and IAP comments and submitted to GOL for their final review and approval.

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 2021

No	Site name	Document Name	Contractor / Subcontractor	Approval Status by EMO/NNP1 (date)	Detailed Site Information	Monthly Construction & Operation Status as of 31 March 2021
1	Suspension Bridge 2UR	DWP&SS-ESMMP for Construction of Suspension Bridge in 2UR	Khounmeuangxay Development Construction Co., Ltd	3rd submission on 04 January 2021. No objection with No comment on 04 November 2020	Suspension Bridge construction site and temporary contractor camp	In progress
2	Main Powerhouse Tailrace	DWP&SS-ESMMP for Filling Void at Main Powerhouse Tailrace	CV General Construction Sole Co., Ltd. (CVGC)	3rd submission on 25 March 2021. No objection with comment on 30 March 2021	Construction site, batching plant and temporary contractor camp	Completed
3	Road A and Road P1	DWP&SS-ESMMP for DBST road repairing	PKCC Construction Sole company	1st submission on 17 March 2021. No objection with comment on 18 March 2021.	Road maintenance	In progress
4	Main dam and Re-regulation dam	DWP & SS-ESMMP for Monitoring Works on the Nam Ngiep1 Hydropower Project	PKCC Construction Sole company	1st submission on 23 March 2021. No objection with no comment on 24 March 2021.	Dam bodies and powerhouses monitoring stations	In progress

APPENDIX 2: ENVIRONMENTAL MONITORING CORRECTIVE ACTIONS Q1 2021

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
ONC_AM-0003	28.02.2020	OSOV	Issued to ADM to improve the second wetland pond similarly to the first wetland pond. (Based on the LTA's recommendation made during the mission in August 2019 to improve the OSOV's WWTS)	ADM shall carry out a basic improvement of the second wetland pond similarly to the first wetland pond.	12.03.2020	26.03.2020	**Unresolved** NNP1 received two technical proposals from the two interested bidders. The technical proposal evaluation is on progressed. It's expected to have the construction started by early April 2021.
NCR_HM-0007	06.04.2020	LILAMA 10 Camp	Non-Compliance with the site revegetation requirements at HM Hydro's Labour Camp No.2 (LILAMA10 Camp).	In accordance with the rehabilitation measures provided in the Construction Site Decommissioning and Rehabilitation Plan (CSDRP), the SIR Ref. NNP1-ESD-EMO-SIR-HM-0020 dated 11 November 2019 and a mutual agreement made during the Joint Site Inspection between	15.07.2020	31.12.2020	**Closed** EMO issued a Site Inspection Report (SIR) to the contractor and instructed to take additional counter measures based on the GoL-EMO comments. But the Contractor disagreed to take corrective action with

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				NNP1PC (EMO, O&M and ADM) and HM Hydro Contractor on 06 December 2019, the HM Contractor is instructed to assess the LILAMA10 camp area for further revegetation during the wet season of this year (which is considerably starting since April 2020) to ensure successful site revegetation under one-year liability period.			claimed that the site was a disturbance land before the contractor's temporary occupying. The site will be held for one wet season to be re-evaluated before hand-over to GoL.
ONC_OC-0349	24.03.2020	OC camp	Instructed the OC Contractor to use only the approved tree species for revegetation and dead plant replacement.	The Contractor was instructed to take appropriate corrective action as the following: - Commercial trees need to be added if any future replacement of the dead and weak trees; and	Action needed throughout the Liability Period	20/01/2020	**Resolved**

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				- No further flowers, fruit trees are allowed to be additional planted/replaced.			
NCR_VSP-0001	10.07.2020	HSRA's Irrigation Spoil and Rock Disposal Area	Non-Compliance with site rehabilitation at the Spoil Disposal Area for the construction of the irrigation canal.	Add more suitable local vegetation or local grass in some part of the areas that slow growth.	24.07.2020	08.02.2020	**Resolved** On 02 February 2021, the contractor completed topsoil covering at the Phouhomxay Village's Irrigation Canal Rock and Spoil Disposal area correspond GoL-EMO comments before the completion of liability period on 31 January 2021. The site will be held for one wet season to be re-evaluated before hand-over to GoL.
ONC_SC.JV.K-0001	16.12.2020	Suspension	During a joint bi-weekly inspection, EMO found out that:	The Contractor was instructed to perform the following corrective	30.12.2020	25.01.2020	**Resolved**

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
		Bridge, 2UR	- No perimeter fence for camp and construction sites to restrict public, cattle and pets; - No waste management on site which resulted in disposing of solid waste and food waste on the ground. This posted potential hygienic and sanitary risks to workers. - No wastewater collection ponds for grey water generated from cooking and washing areas.	actions by the specified deadline: - Install secure fence for camp and construction areas to restrict public cattle and pet's entry; - Designate location for temporary collection of waste generated from camp and construction site operation; - Provide a waste pit (size: 1.5m x 1.5m x 1m) for disposal of food waste; - Construct series of two wastewater ponds (size: 2m x 2m x1 m each) to collect wastewater generated from camp operation.			
ONC_SC.JV.K-0002	21.01.2021	Suspension bridge	On 16 December 2020, NNP1PC (TD, INFRA and EMO) conducted the first joint site inspection at the	The Contractor was instructed to perform the following corrective	04.01.2021	04.02.2021	**Resolved**

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
		and contractor's camp (2UR)	Suspension Bridge Construction Site in 2UR to follow up the status of civil work and camp operation. The findings during the site inspections are: - No perimeter fence for camp and construction sites to restrict public and prevent the cattle and pets; - No proper waste management on site which resulted in disposing of solid waste and food waste on the ground. This posted potential hygienic and sanitary risks to workers and the areas; - No wastewater collection ponds for grey water generated from cooking and washing areas. On 07 January 2020, a bi-weekly joint site inspection (INFRA, EMO and the Contractor) to follow up the progress and status of corrective action. The corrective actions taken on the above findings No. 1 and 3 have been completed but the finding No. 2 (waste	actions by the specified deadline: 1. Provide the clear waste segregation labels (recycle waste and general waste) at the temporary waste drop-off station; 2. Segregate and remove the disposed recycle waste from the general waste disposal pit. Only the organic waste and the general waste are allowed to dispose in the designated pit. 3. Install a 20 cm high perimeter bund at toilets and bathing areas to prevent grey water directly spreading and releases to natural land; 4. Install ditch or piping to connect and drain			

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			management) was still in process. EMO verbally instructed the Contractor to continue and improve the pending issue of the improper waste management on site with additional instructions as follow: - Improve the washing area with a concrete pavement and properly drain the grey water from the washing area to the wastewater retaining ponds; - Install a 20 cm high bunding for the toilet and bathing area to prevent grey water spreading on the ground; - Provide a proper drainage/ditch to drain grey water from the toilets and bathing area to the grey water retaining ponds. During this Bi-weekly Joint Site Inspection, the Contractor completed an improvement of washing area with concrete pave. However, no improvement and/or corrective action have been taken	the grey water from the toilets and bathing area to the wastewater retaining ponds.			

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			for the two significant issues of waste management and grey water management in the toilets and bathing area as per EMO commented on the previous inspection. Waste management: - The Contractor committed to provide the clear labels of waste segregation at the waste drop-off station within one day after the previous joint site inspection on 07 January 2021 but there was no labels available observed during the inspection on 21 January 2021; - Improper waste segregation was continually observed as the recycle waste (aluminium can and plastic bottles) was still disposed in the general waste disposal pit. EMO has clearly explained to the Contractor on what and how to do it properly during the previous Bi-weekly Joint Site Inspection on 07 January 2021 that:				

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			- The recyclable waste shall be segregated, collected and stored on site for further selling to local recycling waste firm or transport to the Contractor head office for further trading; - Only the organic waste and the general waste are allowed to dispose into the provided temporary waste disposal pit. Grey water management in the toilets and bathing area: - No installation of a 20 cm height bunding for the toilet and bathing area to prevent grey water spreading on the ground; - No provision of a proper drainage/ditch to drain grey water from the toilets and bathing area to the grey water retaining ponds.				
ONC_SC.JV.K-0003	04.02.2021	Suspension bridge and contrac	EMO continued monitor the Contractor's implementation and environmental management practice on site since the mobilizing in. It was found that the	The Contractor was instructed to implement and follow the counter measures proposed on their approved SS-	18.02.2021	10.03.2021	**Resolved**

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
		tor's camp (2UR)	Contractor did not follow the counter measures proposed on the approved SS-ESMMP. This clearly evidence of potential risk of non-compliance was observed during the bi-weekly joint site inspection (ref; previous two SIRs in the past two months). During this bi-weekly joint site inspection. There was no appropriate temporary hazardous material storage on site. A few fuel drums (20 L) and oily equipment are stored directly on the ground without spillage protection facilities.	ESMMP as follows: - All re-fuelling of machinery will be undertaken from local service (fuel station) and fuelling truck with appropriate safeguards and protection measures to prevent any spillage or contamination by chemical wastes or maintenance oils, lubricants etc; - No hazardous material is expected to be stored on site. However, the contractor shall notify the NNP1PC if there is future need for storing any hazardous material on site. **Otherwise:** A temporary hazardous material with proper spillage protection			

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
				facility (i.e., concrete floor, bunding 110% of the largest storage container) with a proper roofing including spill response kits and signage are required.			
ONC_SC.JV.K-0004	04.02.2021	Suspension bridge and contractor's camp (2UR)	After EMO have verbally commented to the Contractor during the previous joint site inspections, the riverbank slope disturbance/excavation at the area outside the approved designated Suspension Bridge Boundary was still observed.	The Contractor was instructed to: - Stop to disturb the riverbank's slope at the outside area of the designated bridge alignment and boundary; - Install a check-dyke along the riverbank where disturbed (see sketch on the below photo), to limit further disturbance, protect sediment and soil falling into the river.	18.02.2021	16.02.2021	**Resolved**

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
ONC_HM-0031	10.02.2021	LILAMA 10 Camp	As per descripted above background, the re-vegetation works have been completed by the late wet season (08 September 2020). From the site inspection, a less vegetation germination was observed and potentially not achieve the expectation of more than 70 percentage of vegetation covering. - During the site inspection GOL-Environmental Management Unit of Bolikhan (EMU) on 20 January 2021, which focused on an evaluation the successful of site rehabilitation for further handing over back to GOL under Concession Agreement (CA). The GOL-EMU confirmed that the current status of vegetation cover percentage at the former LILAMA10 Camp is not acceptable and commented for additional corrective actions with the two options as follow (more information of EMU's Site Visiting Report is attached):	To avoid a delay of the temporary construction sites handing over back to GOL which is scheduled within 2 years after COD (under Concession Agreement). EMO, on behalf of NNP1PC, would instruct the Contractor to take action follows the first option above by taking additional counter measure to cover the decommissioned area with topsoil and also scratch the compacted areas to aid a natural growth during the coming wet season. **Note:** The corrective action plan needs to be prepared and submitted to NNP1PC (EMO) for comment and approval	25.02.2021	25.03.2021	**Resolved**

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			a) Additional corrective action is taken by adding topsoil before handling over the area back to GOL (more details can be found in the EMU's Site Visiting Report, section 2.2 and 3.2, as attached); b) If no corrective action is taken, then the area is not handing over by this year and the site can be re-assessed after the next wet season of 2021 to see whether its condition would be acceptable or further correction action is required.	prior the work commencement.			
ONC_SC.JV.K-0005	02.03.2021	Suspension bridge and contractor's camp (2UR)	Reference to previous site inspection report (ref: NNP1-ESD-EMO-SIR-SC.JV.K-0003), dated 09 February 2021, and the MoM of the previous bi-weekly meeting dated on 16 February 2021, EMO instructed the contractor to: 1. Provide an appropriate temporary hazardous material storage on site; and 2. All oily fuel drums and equipment/tools must be stored in	The Contractor was instructed to implement and follow the counter measures with the specified deadline. Otherwise, this ONC will be raised up to NCR; - Provide a temporary hazardous material storage with proper spillage protection facility (i.e. concrete	16.03.2021	16.03.2021	**Resolved**

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			a designated temporary storage area. During the site inspection on 02 March 2021, it was observed that there is no corrective action taken by the Contractor to address the NNP1PC-EMO instructions. The findings during the site inspection are: - No provision of temporary hazardous material storage on site; - Oil spilt onto the ground without clean up; - Oily machinery and fuel drums are stored on the ground without spillage protection facilities; - Oily absorbent sheets from machine maintenance activities are un-tidy disposed and scattered on the ground; - The staffs on site including site manager are yet cleared and acknowledged on what and how to deal with the hazardous material	floor, bunding 110% of the largest storage container) with a proper roofing including spill response kits and signage, etc; - Any oil or grease spills on the ground including oily absorbent sheets shall be collected and cleaned up immediately by putting in appropriate container/bag for further disposal and elimination by proper methodologies; - Hazardous materials and hazardous wastes, including oily tools, will be stored in in designated hazardous material storage after each use; and - Provide trainings of hazardous material and			

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
			and hazardous waste management.	waste management awareness to workers on site.			
ONC_SC.JV.K-0006	02.03.2021	Suspension bridge and contractor's camp (2UR)	As per a statement on the above. During the last bi-weekly joint site inspection and followed up on 16 February 2021. NNP1PC-EMO found an improper waste management and poor housekeeping on the construction site. EMO instructed the Contractor as stated in the MoM and requested the Contractor to provide at least a daily site clean up to manage the scattering of garbage on site. During this week's bi-weekly joint site inspection and meeting on 02 March 2021, it was observed that there is no action taken by the Contractor. Many garbage and plastic bottles are continuing disposed and scattered on the camp yard and working places.	The Contractor was instructed to: - Collect the scattered garbage and plastic bottles for further proper disposal; - Provide waste bins on site where applicable (i.e., temporary workshop, temporary accommodation, cooking areas and working places); and - Provide a camp man or maid for daily waste collection and cleaning.	16.03.2021	16.03.2021	**Resolved**

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

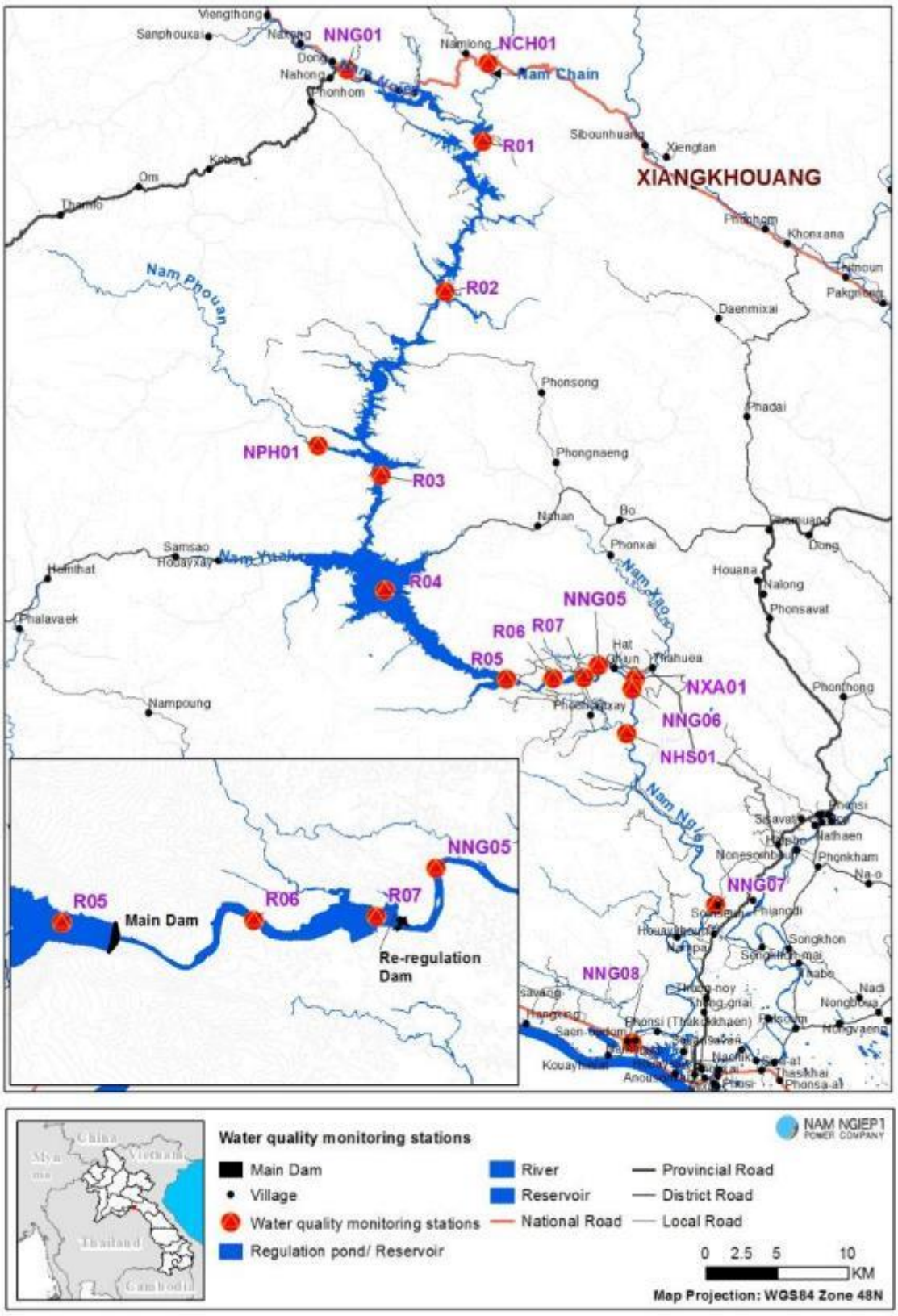
SITE CODES AND LOCATION STATION FOR SURFACE WATER QUALITY MONITORING

Site Code	Location station	Zone
NNG01	Nam Ngiep Upstream of Ban Phiengta	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 Ban Sop-Youak / 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 Ban Hat Gniun	Downstream Project Construction Site
NNG06	Nam Ngiep Downstream of Nam Xao Confluence	
NNG07	Nam Ngiep at Ban Somsuen	
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

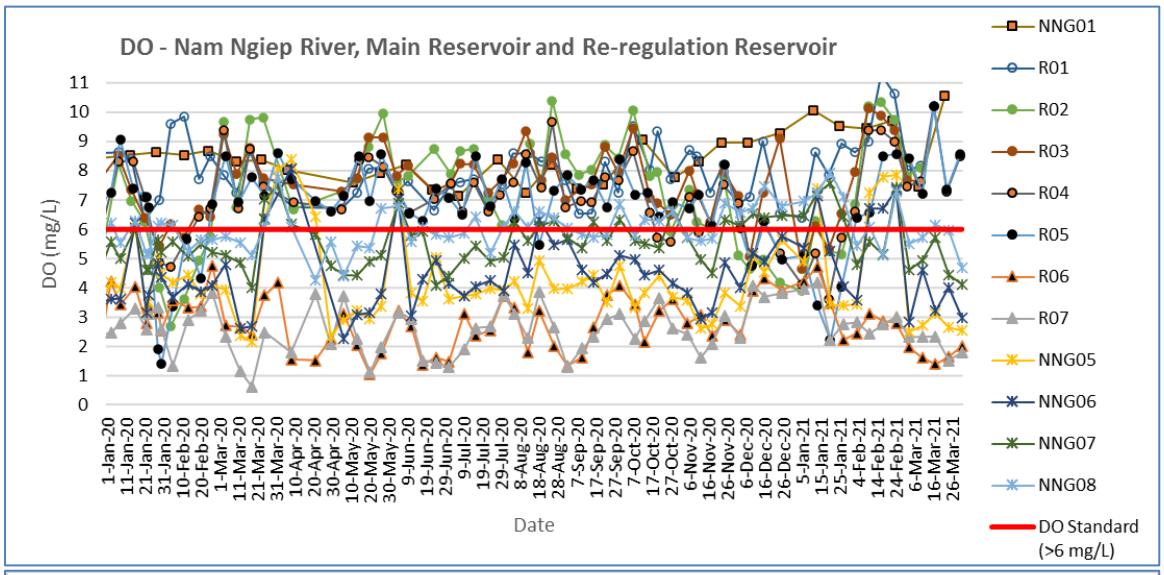
Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Weekly	pH, DO (%), DO (mg/L), Conductivity (µs/cm), TDS (mg/L), Temperature (°C), Turbidity (NTU).	- Main Reservoir: R01, R02, R03, R04, R05; - Nam Ngiep downstream: NNG05, NNG06, NNG07 and NNG08; - Tributaries: Nam Phouan [NPH01], Nam Xao [NXA01]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

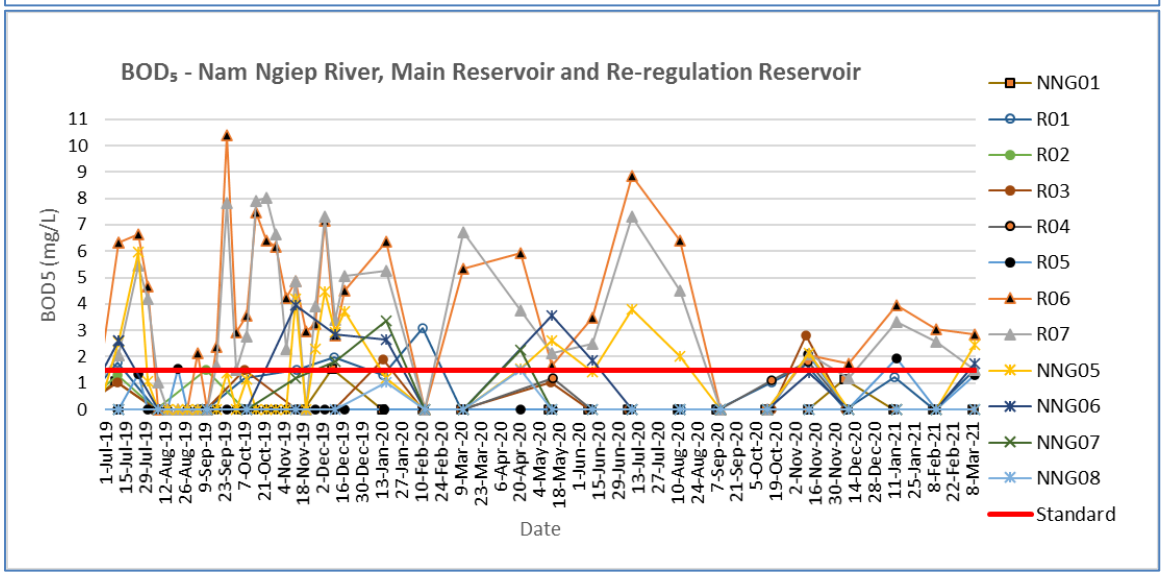
SURFACE WATER QUALITY MONITORING LOCATIONS

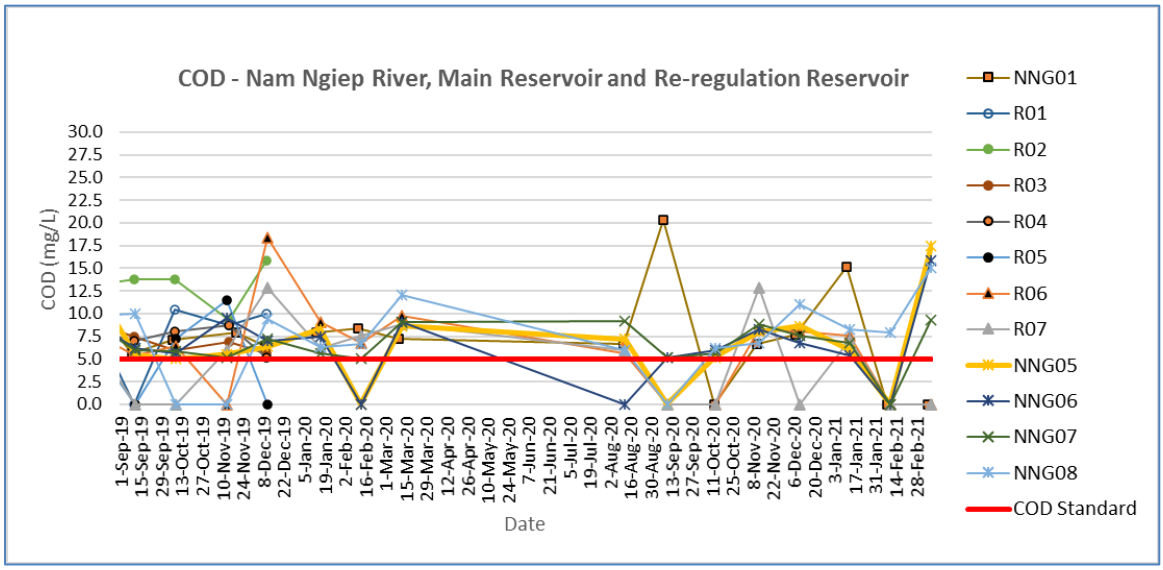


APPENDIX 4: KEY TRENDS OF WATER QUALITY MONITORING FROM JANUARY 2020 TO END OF MARCH 2021 (ONLY PARAMETERS THAT EXCEEDED THE STANDARDS)

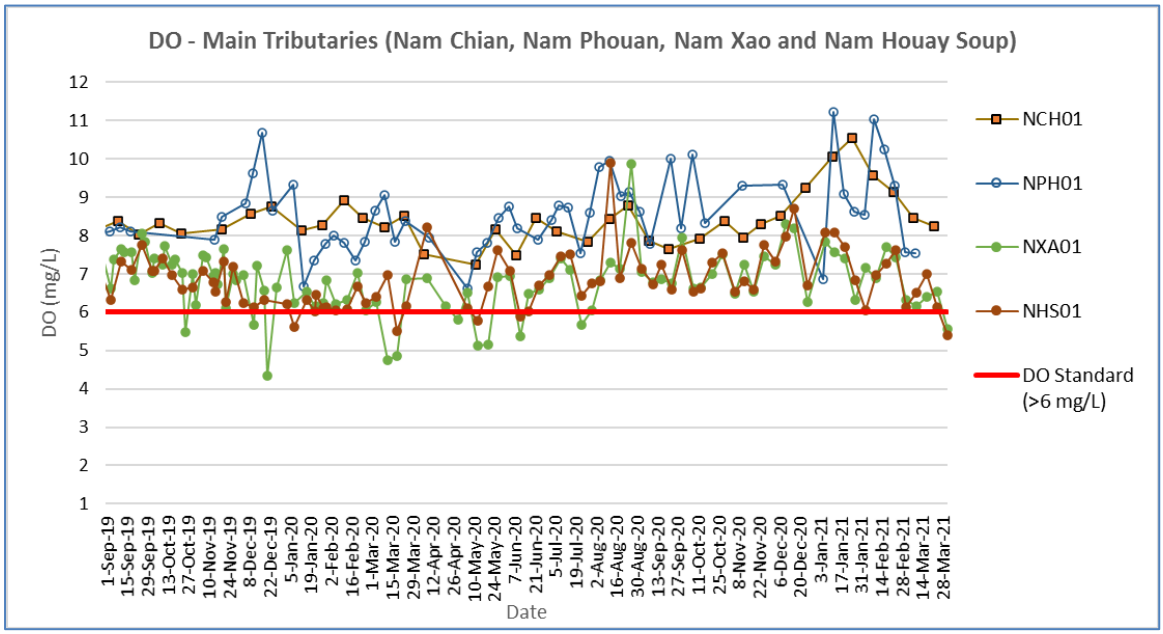
Nam Ngiep Surface Water

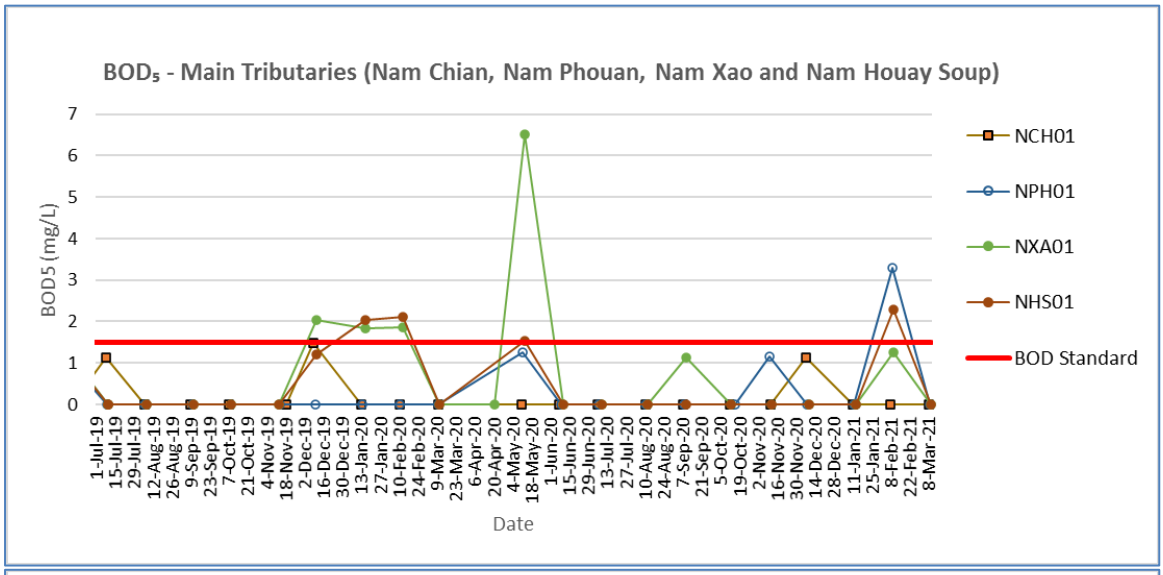


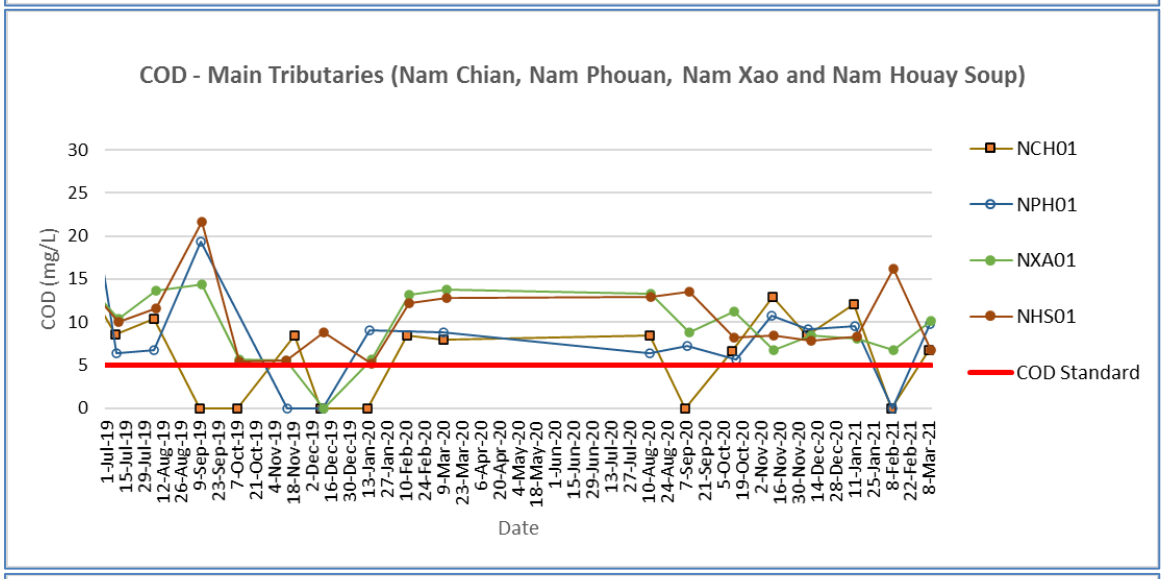


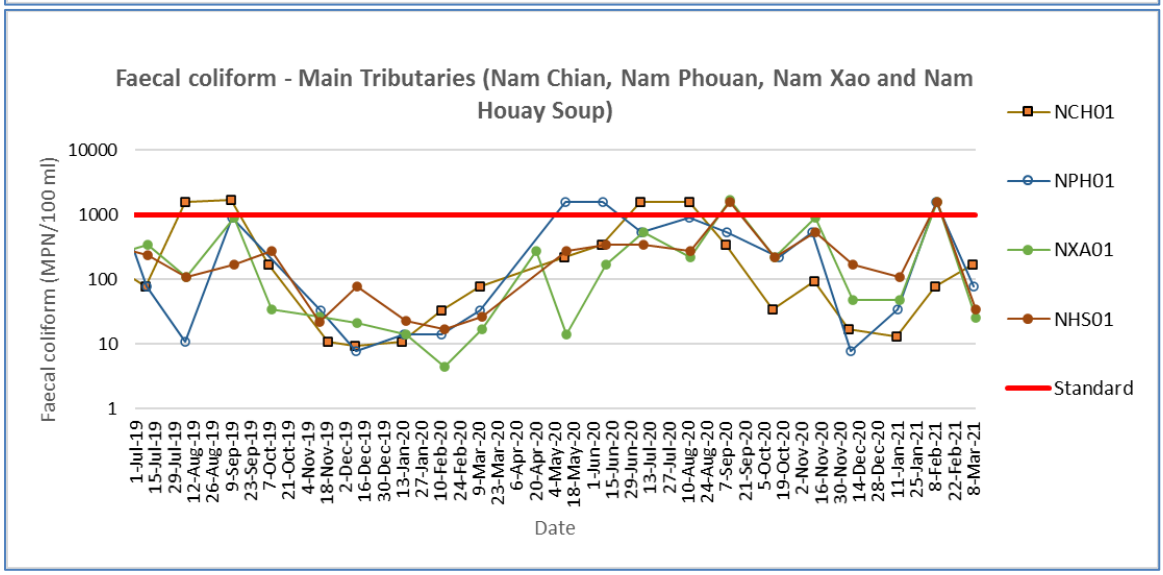


Key Water Quality Parameters for the Nam Ngiep Tributaries: Nam Chian, Nam Phouan, Nam Xao, Nam Houay Soup

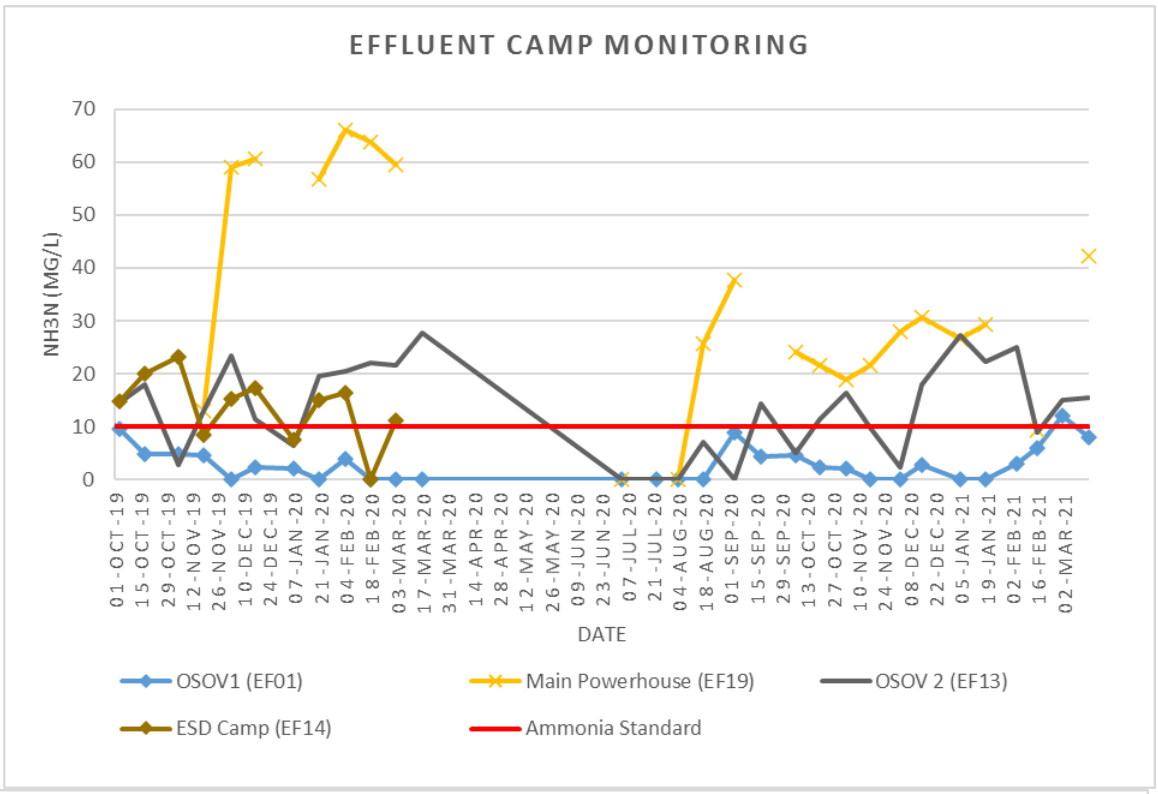


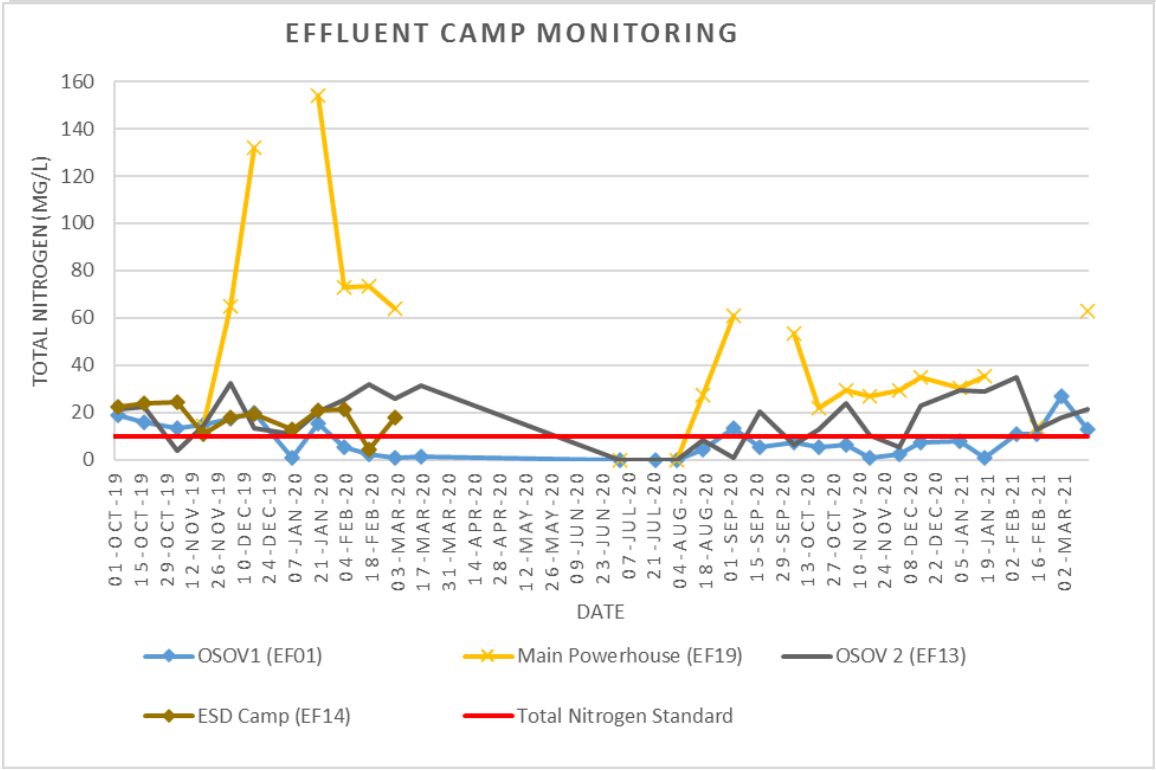

BOD₅ - Main Tributaries (Nam Chian, Nam Phouan, Nam Xao and Nam Houay Soup)
BOD5 (mg/L)
Date
NCH01
NPH01
NXA01
NHS01
BOD Standard

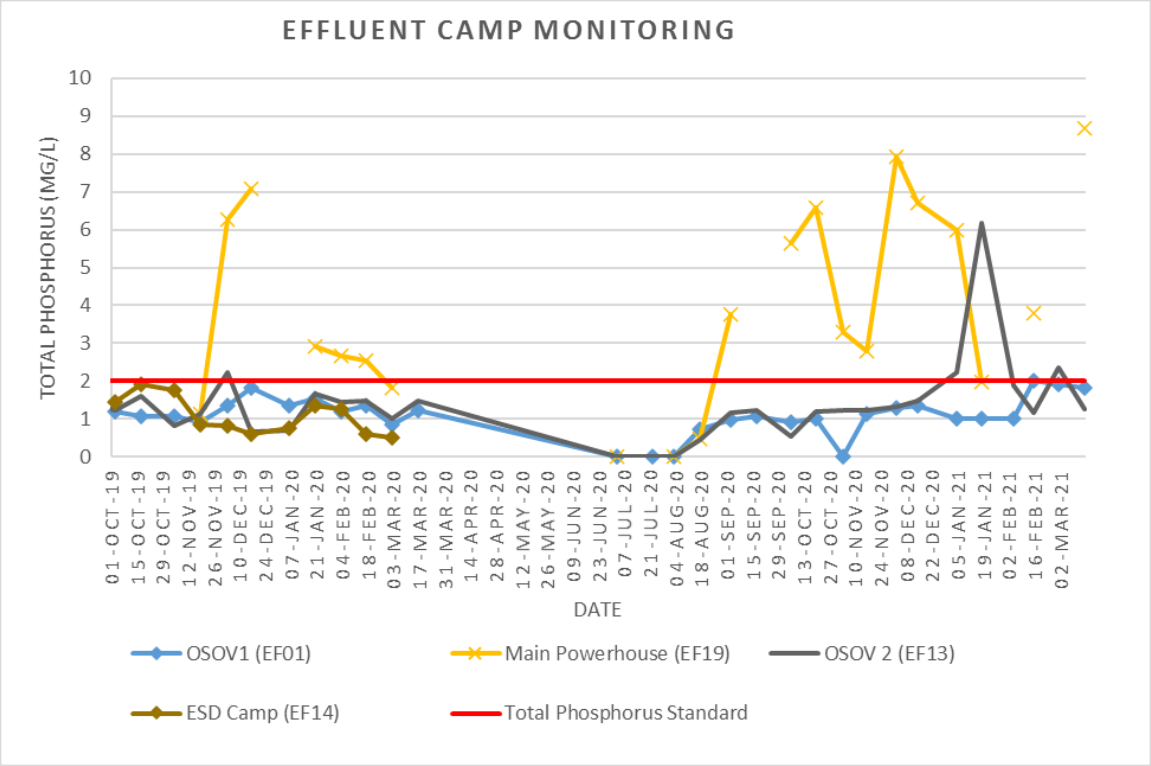

COD - Main Tributaries (Nam Chian, Nam Phouan, Nam Xao and Nam Houay Soup)
COD (mg/L)
Date
NCH01
NPH01
NXA01
NHS01
COD Standard

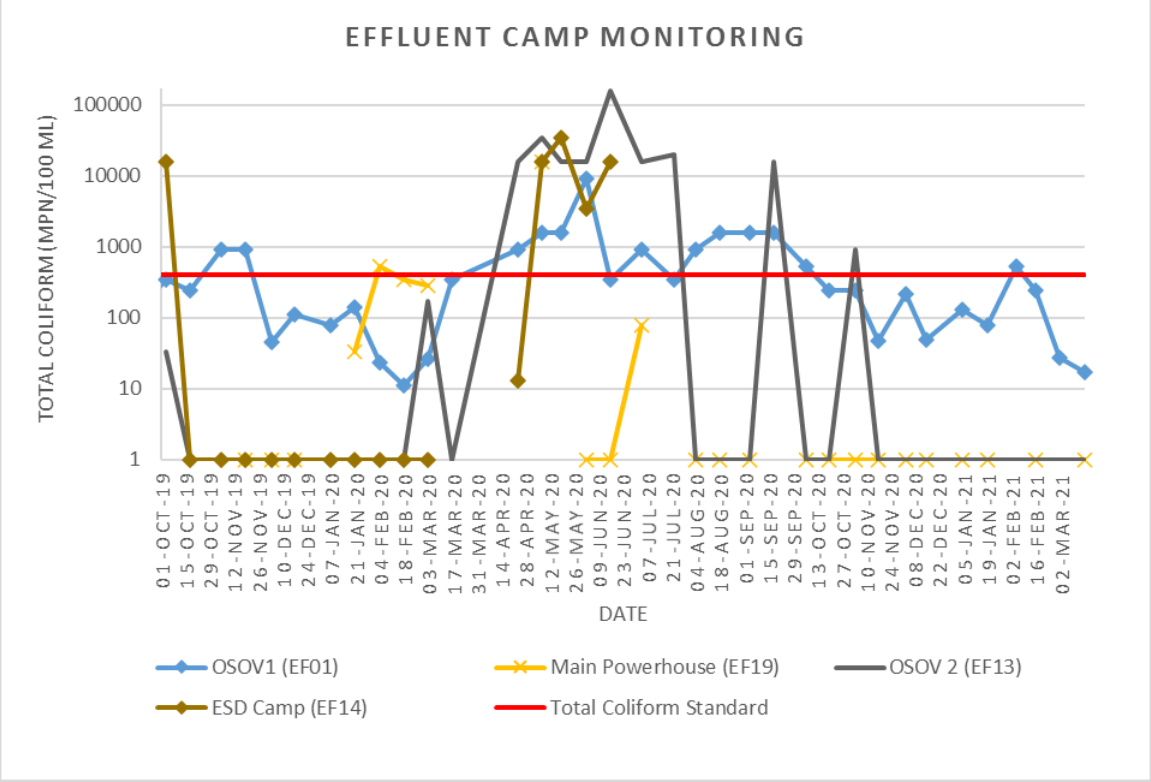

Faecal coliform - Main Tributaries (Nam Chian, Nam Phouan, Nam Xao and Nam Houay Soup)
Faecal coliform (MPN/100 ml)
Date
NCH01
NPH01
NXA01
NHS01
Standard

Camps' Effluent Water Quality Trends (Since October 2019 – January 2021)






EFFLUENT CAMP MONITORING
TOTAL PHOSPHORUS (MG/L)
10
9
8
7
6
5
4
3
2
1
0
01-OCT-19
15-OCT-19
29-OCT-19
12-NOV-19
26-NOV-19
10-DEC-19
24-DEC-19
07-JAN-20
21-JAN-20
04-FEB-20
18-FEB-20
03-MAR-20
17-MAR-20
31-MAR-20
14-APR-20
28-APR-20
12-MAY-20
26-MAY-20
09-JUN-20
23-JUN-20
07-JUL-20
21-JUL-20
04-AUG-20
18-AUG-20
01-SEP-20
15-SEP-20
29-SEP-20
13-OCT-20
27-OCT-20
10-NOV-20
24-NOV-20
08-DEC-20
22-DEC-20
05-JAN-21
19-JAN-21
02-FEB-21
16-FEB-21
02-MAR-21
DATE
OSOV1 (EF01)
Main Powerhouse (EF19)
OSOV 2 (EF13)
ESD Camp (EF14)
Total Phosphorus Standard


EFFLUENT CAMP MONITORING
TOTAL COLIFORM (MPN/100 ML)
100000
10000
1000
100
10
1
01-OCT-19
15-OCT-19
29-OCT-19
12-NOV-19
26-NOV-19
10-DEC-19
24-DEC-19
07-JAN-20
21-JAN-20
04-FEB-20
18-FEB-20
03-MAR-20
17-MAR-20
31-MAR-20
14-APR-20
28-APR-20
12-MAY-20
26-MAY-20
09-JUN-20
23-JUN-20
07-JUL-20
21-JUL-20
04-AUG-20
18-AUG-20
01-SEP-20
15-SEP-20
29-SEP-20
13-OCT-20
27-OCT-20
10-NOV-20
24-NOV-20
08-DEC-20
22-DEC-20
05-JAN-21
19-JAN-21
02-FEB-21
16-FEB-21
02-MAR-21
DATE
OSOV1 (EF01)
Main Powerhouse (EF19)
OSOV 2 (EF13)
ESD Camp (EF14)
Total Coliform Standard

APPENDIX 5: WATER QUALITY MONITORING DATA
APPENDIX 5-1: SURFACE WATER QUALITY MONITORING – Q1 2021

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
5-Jan-21	pH	5.0 - 9.0		6.89	6.81	6.75	6.62									6.4		
6-Jan-21	pH	5.0 - 9.0						6.86	6.9	6.96	6.93	6.78	6.82	6.78			6.98	6.67
11-Jan-21	pH	5.0 - 9.0	7.39												8.41			
12-Jan-21	pH	5.0 - 9.0		7.21	7.1	6.92	6.88									7.05		
13-Jan-21	pH	5.0 - 9.0						6.65	6.77	6.81	6.96	7.16	7.01	6.84			7.35	6.85
19-Jan-21	pH	5.0 - 9.0		7.1	6.78	6.85	6.73									6.9		
20-Jan-21	pH	5.0 - 9.0						6.64	6.77	6.82	6.77	6.99	7.1	7.14			7.2	7.12
25-Jan-21	pH	5.0 - 9.0	7.97												7.68			
26-Jan-21	pH	5.0 - 9.0		6.55	6.88	6.71	6.6	6.78								6.91		
27-Jan-21	pH	5.0 - 9.0							6.93	6.78	6.78	6.92	7.16	6.89			7.18	7.1
2-Feb-21	pH	5.0 - 9.0		7.05	6.75	6.84	6.9									6.7		
3-Feb-21	pH	5.0 - 9.0						6.65	6.88	6.95	6.95	7.28	7.4	7.46			7.66	7.5
8-Feb-21	pH	5.0 - 9.0	7.22												8.09			
9-Feb-21	pH	5.0 - 9.0		6.94	6.81	6.68	6.55									7.11		
10-Feb-21	pH	5.0 - 9.0						6.71	6.87	7.05	7.02	7.19	6.97	7.28			7.8	7.24
16-Feb-21	pH	5.0 - 9.0		7.33	7.05	6.97	7.15									7.12		

		River Name	Nam Ngiep								Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites								Location Refer to Construction Sites			
			Upstream/Main Reservoir					Re-regulation Reservoir		Downstream				
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
17-Feb-21	pH	5.0 - 9.0						6.68	6.83	6.92	7.02	7.13	7.1	7.3			7.42	7.55
22-Feb-21	pH	5.0 - 9.0	7.41												8.52			
23-Feb-21	pH	5.0 - 9.0		7.11	6.95	6.79	6.88									7.04		
24-Feb-21	pH	5.0 - 9.0						6.69	5.51	7.14	6.84	7.16	7.16	7.13			7.55	7.62
2-Mar-21	pH	5.0 - 9.0		7.22	7.02	6.76	6.86									6.91		
3-Mar-21	pH	5.0 - 9.0						6.49	6.94	6.98	7.09	7.42	7.57	7.8			7.5	7.8
8-Mar-21	pH	5.0 - 9.0	7.15												7.93			
9-Mar-21	pH	5.0 - 9.0		7.36	7.55	7.23	6.95									8.4		
10-Mar-21	pH	5.0 - 9.0						6.63	6.91	6.99	7.29	7.39	7.52	7.36			7.48	7.44
16-Mar-21	pH	5.0 - 9.0					6.31	6.78										
17-Mar-21	pH	5.0 - 9.0							6.87	6.76	6.59	6.94	7.2	7.33			7.03	7.55
22-Mar-21	pH	5.0 - 9.0	7.06												6.92			
23-Mar-21	pH	5.0 - 9.0					6.48	6.62										
24-Mar-21	pH	5.0 - 9.0							6.88	6.95	6.98	6.93	6.75	6.78			7.76	6.77
30-Mar-21	pH	5.0 - 9.0					6.63	6.72										
31-Mar-21	pH	5.0 - 9.0							6.55	6.84	6.92	7.06	7.3	7.44			6.97	7.33
5-Jan-21	Sat. DO (%)			73.7	46.2	53.2	48.4									71.9		
6-Jan-21	Sat. DO (%)							60.4	49.1	47.2	58.1	62.7	76.8	83.4			87.9	88.8

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
11-Jan-21	Sat. DO (%)		109.7												107.6			
12-Jan-21	Sat. DO (%)			98.6	73.9	71.9	60.8									113.5		
13-Jan-21	Sat. DO (%)							39.8	54.9	48.4	85.5	81.7	83.1	83.7			87.4	81.2
19-Jan-21	Sat. DO (%)			90.5	61.7	62.3	42.2									96.8		
20-Jan-21	Sat. DO (%)							25.8	40.5	25.8	39.7	61.1	85.8	92.2			85.7	86.6
25-Jan-21	Sat. DO (%)		113.6												129.7			
26-Jan-21	Sat. DO (%)			107.1	60.9	77.2	67.2	48.8								94.4		
27-Jan-21	Sat. DO (%)								25.8	33	39.6	47.6	76.8	85.6			75.4	77.8
2-Feb-21	Sat. DO (%)			105.2	81.7	94.7	77.8									93.7		
3-Feb-21	Sat. DO (%)							75.4	28.4	32.7	40.5	42.4	56.9	64.8			87.9	69.4
8-Feb-21	Sat. DO (%)		119.6												112.4			
9-Feb-21	Sat. DO (%)			107.1	121.3	120.8	111.6									117.9		
10-Feb-21	Sat. DO (%)							76.9	36.4	28.4	85	78.8	66.2	71.2			78.6	78.6
16-Feb-21	Sat. DO (%)			140.8	125.9	119.8	112.2									113.9		
17-Feb-21	Sat. DO (%)							101.5	33.3	31.6	91.7	78.9	61.3	61.1			92.7	84.2
22-Feb-21	Sat. DO (%)		123.4												109.4			
23-Feb-21	Sat. DO (%)			134.2	118.5	113.8	108.6									106.6		
24-Feb-21	Sat. DO (%)							102.2	32.9	35.6	93.5	87.5	90.6	91			91.8	89.1

		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						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	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
2-Mar-21	Sat. DO (%)			101.5	97.6	94.8	91.7									88		
3-Mar-21	Sat. DO (%)							102.4	22.6	27	29.1	33.1	54.3	65.7			78.3	73.4
8-Mar-21	Sat. DO (%)		96												101.2			
9-Mar-21	Sat. DO (%)			107.5	105.2	95.6	94.5									89.4		
10-Mar-21	Sat. DO (%)							88.5	18.6	28.3	31.7	54.9	60	69.6			78.6	78.1
16-Mar-21	Sat. DO (%)						128.1	126.5										
17-Mar-21	Sat. DO (%)								16.1	27.4	36.2	37.8	68.9	74.6			80.5	85.2
22-Mar-21	Sat. DO (%)		126.8												96.1			
23-Mar-21	Sat. DO (%)						90.9	91.7										
24-Mar-21	Sat. DO (%)								19.3	17.6	30.3	47	49.5	71.3			81.3	78.9
30-Mar-21	Sat. DO (%)						108.4	109.2										
31-Mar-21	Sat. DO (%)								23.4	20.3	29.7	35.2	49.5	56.2			64.6	66.2
5-Jan-21	DO (mg/L)	>6.0		6.4	3.9	4.65	4.1									6.87		
6-Jan-21	DO (mg/L)	>6.0						5.11	4.22	3.96	4.88	5.37	6.45	6.95			7.85	8.08
11-Jan-21	DO (mg/L)	>6.0	10.06												10.06			
12-Jan-21	DO (mg/L)	>6.0		8.63	6.29	6.11	5.18									11.24		
13-Jan-21	DO (mg/L)	>6.0						3.4	4.72	4.19	7.4	7.14	7.24	7.26			7.56	8.09
19-Jan-21	DO (mg/L)	>6.0		7.86	5.26	5.32	3.61									9.08		

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
20-Jan-21	DO (mg/L)	>6.0						2.21	3.48	2.23	3.43	5.26	7.58	7.94			7.41	7.7
25-Jan-21	DO (mg/L)	>6.0	9.52												10.54			
26-Jan-21	DO (mg/L)	>6.0		8.93	5.16	6.54	5.71	4.05								8.63		
27-Jan-21	DO (mg/L)	>6.0							2.23	2.77	3.39	4.05	6.42	7.09			6.32	6.84
2-Feb-21	DO (mg/L)	>6.0		8.63	6.86	7.95	6.59									8.55		
3-Feb-21	DO (mg/L)	>6.0						6.41	2.45	2.82	3.45	3.59	4.78	5.43			7.17	6.04
8-Feb-21	DO (mg/L)	>6.0	9.44												9.58			
9-Feb-21	DO (mg/L)	>6.0		9	10.19	10.12	9.38									11.04		
10-Feb-21	DO (mg/L)	>6.0						6.56	3.12	2.44	7.25	6.72	5.57	6.08			6.9	6.98
16-Feb-21	DO (mg/L)	>6.0		11.3	10.34	9.89	9.38									10.26		
17-Feb-21	DO (mg/L)	>6.0						8.51	2.87	2.75	7.8	6.7	5.13	5.1			7.71	7.27
22-Feb-21	DO (mg/L)	>6.0	9.72												9.15			
23-Feb-21	DO (mg/L)	>6.0		10.62	9.75	9.37	9.01									9.29		
24-Feb-21	DO (mg/L)	>6.0						8.57	2.81	3.01	7.86	7.36	7.44	7.28			7.43	7.61
2-Mar-21	DO (mg/L)	>6.0		8.02	7.82	7.69	7.48									7.57		
3-Mar-21	DO (mg/L)	>6.0						8.44	1.96	2.32	2.5	2.83	4.61	5.51			6.32	6.14
8-Mar-21	DO (mg/L)	>6.0	7.48												8.47			
9-Mar-21	DO (mg/L)	>6.0		8.16	8.12	7.62	7.63									7.55		

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
10-Mar-21	DO (mg/L)	>6.0						7.23	1.61	2.33	2.71	4.62	4.95	5.72			6.16	6.5
16-Mar-21	DO (mg/L)	>6.0					10.22	10.19										
17-Mar-21	DO (mg/L)	>6.0							1.39	2.34	3.13	3.21	5.73	6.15			6.41	7.01
22-Mar-21	DO (mg/L)	>6.0	10.57												8.24			
23-Mar-21	DO (mg/L)	>6.0					7.3	7.37										
24-Mar-21	DO (mg/L)	>6.0							1.65	1.53	2.65	4.02	4.45	5.97			6.55	6.14
30-Mar-21	DO (mg/L)	>6.0					8.48	8.55										
31-Mar-21	DO (mg/L)	>6.0							2.01	1.79	2.54	2.98	4.12	4.68			5.57	5.41
5-Jan-21	Conductivity (µs/cm)			79	75	68	64									63		
6-Jan-21	Conductivity (µs/cm)							63	76	71	71	79	72	71			122	42
11-Jan-21	Conductivity (µs/cm)		78												23.4			
12-Jan-21	Conductivity (µs/cm)			81	75	65	66									65		
13-Jan-21	Conductivity (µs/cm)							67	77	75	76	79	74	75			131	45
19-Jan-21	Conductivity (µs/cm)			76	75	66	67									40		
20-Jan-21	Conductivity (µs/cm)							69	73	74	74	74	75	75			96	55
25-Jan-21	Conductivity (µs/cm)		60.9												80.3			
26-Jan-21	Conductivity (µs/cm)			76	74	67	67	69								66		
27-Jan-21	Conductivity (µs/cm)								74	72	71	72	72	72			108	56

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
2-Feb-21	Conductivity (µs/cm)			77	73	67	67									65		
3-Feb-21	Conductivity (µs/cm)							68	82	81	79	79	76	75			135	57
8-Feb-21	Conductivity (µs/cm)		84												27.1			
9-Feb-21	Conductivity (µs/cm)			96	73	67	66									57		
10-Feb-21	Conductivity (µs/cm)							67	83	79	76	83	79	77			133	51
16-Feb-21	Conductivity (µs/cm)			96	72	67	67									68		
17-Feb-21	Conductivity (µs/cm)							67	86	83	78	80	78	78			137	52
22-Feb-21	Conductivity (µs/cm)		73.7												24			
23-Feb-21	Conductivity (µs/cm)			83	72	68	67									66		
24-Feb-21	Conductivity (µs/cm)							67	81	77	77	78	80	79			145	49
2-Mar-21	Conductivity (µs/cm)			82	74	68	67									69		
3-Mar-21	Conductivity (µs/cm)							67	87	82	80	81	77	77			140	49
8-Mar-21	Conductivity (µs/cm)		115												36			
9-Mar-21	Conductivity (µs/cm)			94	74	68	67									70		
10-Mar-21	Conductivity (µs/cm)							67	85	77	79	79	78	77			137	55
16-Mar-21	Conductivity (µs/cm)						68	67										
17-Mar-21	Conductivity (µs/cm)								83	80	79	79	76	76			122	44
22-Mar-21	Conductivity (µs/cm)		100												41			

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
23-Mar-21	Conductivity (µs/cm)							68	68									
24-Mar-21	Conductivity (µs/cm)									81	79	78	78	75	74			95	47
30-Mar-21	Conductivity (µs/cm)							69	68									
31-Mar-21	Conductivity (µs/cm)									78	77	77	77	74	73			128	50
5-Jan-21	Temperature (°C)			22.85	23.99	22.05	23.79									18.05		
6-Jan-21	Temperature (°C)							23.75	23.56	23.79	23.94	23.1	24.08	24.31			20.68	19.97
11-Jan-21	Temperature (°C)		18.1												16.9			
12-Jan-21	Temperature (°C)			21.87	23.34	23.55	23.34									16.02		
13-Jan-21	Temperature (°C)							23.24	23.27	22.6	22.7	22.05	22.14	22.52			18.98	16.98
19-Jan-21	Temperature (°C)			22.89	23.38	23.32	23.12									18.39		
20-Jan-21	Temperature (°C)							22.88	22.94	22.93	23	22.92	23.08	23.12			22.56	21.24
25-Jan-21	Temperature (°C)		22.1												23.5			
26-Jan-21	Temperature (°C)			24.13	23.77	23.6	23.55	24.52								19.86		
27-Jan-21	Temperature (°C)								23.02	23.81	23.18	23.44	24.4	24.88			25	23.99
2-Feb-21	Temperature (°C)			25.38	24.17	24.06	23.62									19.92		
3-Feb-21	Temperature (°C)							23.5	22.94	23.03	23.24	25.53	24.04	24.31			25.56	23.49
8-Feb-21	Temperature (°C)		25												20.8			
9-Feb-21	Temperature (°C)			24.11	24.06	24.3	24.02									18.59		

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
10-Feb-21	Temperature (°C)							23.25	22.92	22.9	23.49	23.32	24.03	24.16			21.8	21.17
16-Feb-21	Temperature (°C)			26.19	25.3	24.99	24.35									20.44		
17-Feb-21	Temperature (°C)							24.17	22.92	23.02	23.5	23.49	24.31	24.5			24.64	22.62
22-Feb-21	Temperature (°C)		25.1												21.7			
23-Feb-21	Temperature (°C)			27.33	25.25	25.2	24.67									21.85		
24-Feb-21	Temperature (°C)							24.19	23.34	24.44	24.06	24.02	25.36	26.81			26.13	23.22
2-Mar-21	Temperature (°C)			27.32	26.55	26.01	25.69									22.81		
3-Mar-21	Temperature (°C)							25.12	22.87	23.01	23.01	23.32	23.58	23.92			26.25	24.62
8-Mar-21	Temperature (°C)		26												21.8			
9-Mar-21	Temperature (°C)			29.88	28.72	27	26.37									23.81		
10-Mar-21	Temperature (°C)							25.6	22.9	24.49	23.65	24.05	24.94	25.33			27.86	24.2
16-Mar-21	Temperature (°C)						26.91	26.37										
17-Mar-21	Temperature (°C)								22.9	23.22	23.24	23.69	24.46	25.16			26.98	25.26
22-Mar-21	Temperature (°C)		24.4												22.98			
23-Mar-21	Temperature (°C)						26.59	26.5										
24-Mar-21	Temperature (°C)								22.91	22.93	23.23	23.31	23.87	24.32			24.64	24.2
30-Mar-21	Temperature (°C)						27.99	28.08										
31-Mar-21	Temperature (°C)								22.96	22.94	23.17	23.5	24.48	24.78			26.84	26.29

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
5-Jan-21	Turbidity (NTU)			2.7	1.4	1.6	1.77									1.43		
6-Jan-21	Turbidity (NTU)							1.51	2.3	2.43	2.7	3.04	3.83	8.23			3.75	3.53
11-Jan-21	Turbidity (NTU)		2.99												2.69			
12-Jan-21	Turbidity (NTU)			2.6	1.47	1.64	2.51									3.14		
13-Jan-21	Turbidity (NTU)							2.2	3.75	3.53	4.29	3.94	3.11	3.5			3.68	3.01
19-Jan-21	Turbidity (NTU)			2.59	1.75	1.9	3.31									2.22		
20-Jan-21	Turbidity (NTU)							4.22	4.55	8.79	8.17	8.38	6.26	5.77			4.73	6.54
25-Jan-21	Turbidity (NTU)		2.79												2.24			
26-Jan-21	Turbidity (NTU)			2.51	1.44	1.27	1.84	2.66								2.01		
27-Jan-21	Turbidity (NTU)								6.65	10.23	6.41	11.86	5.43	5.25			5.89	5.94
2-Feb-21	Turbidity (NTU)			3.12	2.32	2.34	2.43									2.88		
3-Feb-21	Turbidity (NTU)							2.69	4.19	5.16	4.74	7.5	5.27	6.15			3.68	4.82
8-Feb-21	Turbidity (NTU)		4.35												3.21			
9-Feb-21	Turbidity (NTU)			6.34	2.68	4.03	2.86									28.4		
10-Feb-21	Turbidity (NTU)							3.38	5.21	5.87	4.34	5.04	4.4	5.31			8.22	16.8
16-Feb-21	Turbidity (NTU)			3.71	2.29	2.52	2.39									2.86		
17-Feb-21	Turbidity (NTU)							2	2.89	3.98	4.95	5.46	4.53	6.23			4.32	3.68
22-Feb-21	Turbidity (NTU)		2.52												3.6			

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
23-Feb-21	Turbidity (NTU)			3.33	2.36	1.6	2.28									2.38		
24-Feb-21	Turbidity (NTU)							1.41	5.51	5.16	5.22	6.17	4.29	5.5			4.77	4.1
2-Mar-21	Turbidity (NTU)			2.41	1.91	1.62	1.88									2.53		
3-Mar-21	Turbidity (NTU)							1.34	1.56	4.02	4.69	5.19	6.13	5.59			3.22	2.91
8-Mar-21	Turbidity (NTU)		632												3.46			
9-Mar-21	Turbidity (NTU)			12.77	1.74	2.85	2.78									3.05		
10-Mar-21	Turbidity (NTU)							2.4	1.92	4.96	3.94	4.08	4.19	5.6			2.64	2.71
16-Mar-21	Turbidity (NTU)						2.06	2.37										
17-Mar-21	Turbidity (NTU)								2.09	4.49	4.72	4.31	3.68	4.83			3.08	3.06
22-Mar-21	Turbidity (NTU)		6.38												2.55			
23-Mar-21	Turbidity (NTU)						2.56	2.94										
24-Mar-21	Turbidity (NTU)								2.34	2.61	2.77	9.67	3.78	5.53			9.23	8.19
30-Mar-21	Turbidity (NTU)						2.1	2.18										
31-Mar-21	Turbidity (NTU)								1.63	2.81	2.54	2.7	6.63	6.79			3.22	3.27
11-Jan-21	TSS (mg/L)		<5												<5			
12-Jan-21	TSS (mg/L)			<5		<5	<5									<5		
13-Jan-21	TSS (mg/L)							<5	9.36	<5	<5	<5	<5	<5			<5	<5
8-Feb-21	TSS (mg/L)		<5												<5			

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
9-Feb-21	TSS (mg/L)			5.12		<5	<5									144		
10-Feb-21	TSS (mg/L)							<5	<5	<5	<5	<5	<5	7.7			10.56	20.6
8-Mar-21	TSS (mg/L)		350												<5			
9-Mar-21	TSS (mg/L)																	
10-Mar-21	TSS (mg/L)																	
11-Jan-21	BOD_5 (mg/L)	<1.5	<1												<1			
12-Jan-21	BOD_5 (mg/L)	<1.5		1.21		<1	<1									<1		
13-Jan-21	BOD_5 (mg/L)	<1.5						1.95	3.96	3.33	<1	<1	<1	<1			<1	<1
8-Feb-21	BOD_5 (mg/L)	<1.5	<1												<1			
9-Feb-21	BOD_5 (mg/L)	<1.5		<1		<1	<1									3.3		
10-Feb-21	BOD_5 (mg/L)	<1.5						<1	3.06	2.56	<1	<1	<1	<1			1.26	2.28
8-Mar-21	BOD_5 (mg/L)	<1.5	<1												<1			
9-Mar-21	BOD_5 (mg/L)	<1.5		1.48		<1	<1									<1		
10-Mar-21	BOD_5 (mg/L)	<1.5						1.29	2.84	1.51	2.47	1.72	<1	<1			<1	<1
11-Jan-21	COD (mg/L)	<5.0	15.1												12.1			
12-Jan-21	COD (mg/L)	<5.0														9.5		
13-Jan-21	COD (mg/L)	<5.0							7.6	7.1	6	5.4	6.7	8.3			8.1	8.3
8-Feb-21	COD (mg/L)	<5.0	<5												<5			

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
9-Feb-21	COD (mg/L)	<5.0														<5		
10-Feb-21	COD (mg/L)	<5.0							<5	<5	<5	<5	<5	7.9			6.8	16.2
8-Mar-21	COD (mg/L)	<5.0	<5												6.7			
9-Mar-21	COD (mg/L)	<5.0														9.8		
10-Mar-21	COD (mg/L)	<5.0							<5	<5	17.5	15.8	9.3	15			10.2	6.7
11-Jan-21	NH_3-N (mg/L)	<0.2	<0.2												<0.2			
12-Jan-21	NH_3-N (mg/L)	<0.2		<0.2		<0.2	<0.2									<0.2		
13-Jan-21	NH_3-N (mg/L)	<0.2						<0.2										
9-Feb-21	NH_3-N (mg/L)	<0.2		<0.2		<0.2	<0.2								<0.2			
10-Feb-21	NH_3-N (mg/L)	<0.2						<0.2	<0.2	<0.2						<0.2		
8-Mar-21	NH_3-N (mg/L)	<0.2	<0.2												<0.2			
9-Mar-21	NH_3-N (mg/L)	<0.2		<0.2		<0.2	<0.2									<0.2		
10-Mar-21	NH_3-N (mg/L)	<0.2						<0.2										
11-Jan-21	NO_3-N (mg/L)	<5.0	<0.02												<0.02			
12-Jan-21	NO_3-N (mg/L)	<5.0		<0.02		<0.02	<0.02									<0.02		
13-Jan-21	NO_3-N (mg/L)	<5.0						<0.02										
8-Feb-21	NO_3-N (mg/L)	<5.0	<0.02												0.08			
9-Feb-21	NO_3-N (mg/L)	<5.0		<0.02		<0.02	0.07									0.49		

		River Name	Nam Ngiep											Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites											Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream					Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
10-Feb-21	NO_3-N (mg/L)	<5.0						0.07										
8-Mar-21	NO_3-N (mg/L)	<5.0	<0.02												<0.02			
9-Mar-21	NO_3-N (mg/L)	<5.0		<0.02		<0.02	<0.02									<0.02		
10-Mar-21	NO_3-N (mg/L)	<5.0						<0.02										
11-Jan-21	Faecal coliform (MPN/100 mL)	<1,000	430												13			
12-Jan-21	Faecal coliform (MPN/100 mL)	<1,000		4		0	0									34		
13-Jan-21	Faecal coliform (MPN/100 mL)	<1,000						0	0	0	8	11	8	11			49	110
8-Feb-21	Faecal coliform (MPN/100 mL)	<1,000	350												79			
9-Feb-21	Faecal coliform (MPN/100 mL)	<1,000		130		0	0									1,600		
10-Feb-21	Faecal coliform (MPN/100 mL)	<1,000						0	2	0	22	27	79	79			1,600	1,600
8-Mar-21	Faecal coliform (MPN/100 mL)	<1,000	540												170			
9-Mar-21	Faecal coliform (MPN/100 mL)	<1,000		11		0	0									79		
10-Mar-21	Faecal coliform (MPN/100 mL)	<1,000						0	2	11	7	11	17	170			26	34
11-Jan-21	Total Coliform (MPN/100 mL)	<5,000	1,600												33			
12-Jan-21	Total Coliform (MPN/100 mL)	<5,000		540		2	8									240		
13-Jan-21	Total Coliform (MPN/100 mL)	<5,000						13	79	23	23	130	49	49			110	170
8-Feb-21	Total Coliform (MPN/100 mL)	<5,000	1,600												130			
9-Feb-21	Total Coliform (MPN/100 mL)	<5,000		240		33	33									1,600		

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
10-Feb-21	Total Coliform (MPN/100 mL)	<5,000						2	33	130	350	920	540	920			1,600	1,600
8-Mar-21	Total Coliform (MPN/100 mL)	<5,000	1,600												540			
9-Mar-21	Total Coliform (MPN/100 mL)	<5,000		49		0	0									920		
10-Mar-21	Total Coliform (MPN/100 mL)	<5,000						0	17	17	26	22	130	350			40	170
11-Jan-21	TKN		<1.5												<1.5			
12-Jan-21	TKN			<1.5		<1.5	<1.5									<1.5		
13-Jan-21	TKN							<1.5										
8-Feb-21	TKN		<1.5												<1.5			
9-Feb-21	TKN			<1.5		<1.5	<1.5									<1.5		
10-Feb-21	TKN							<1.5								<1.5		
8-Mar-21	TKN		<1.5												<1.5			
9-Mar-21	TKN			<1.5		<1.5	<1.5									<1.5		
10-Mar-21	TKN							<1.5										
11-Jan-21	TOC (mg/L)		0.72												1.21			
12-Jan-21	TOC (mg/L)															0.94		
13-Jan-21	TOC (mg/L)								1.4	1.66	1.42	1.61	1.57	1.57			1.54	1.2
8-Feb-21	TOC (mg/L)		0.85												0.66			
9-Feb-21	TOC (mg/L)															14.37		

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
10-Feb-21	TOC (mg/L)								1.36	1.3	1.53	1.64	1.48	1.46			3.23	6.58
8-Mar-21	TOC (mg/L)		4.83												1.35			
9-Mar-21	TOC (mg/L)															1.19		
10-Mar-21	TOC (mg/L)								1.68	1.8	1.34	1.33	1.35	1.44			2.28	1.64
12-Jan-21	Phytoplankton Biomass (g dry wt/m³)			4		0..0	0.8											
13-Jan-21	Phytoplankton Biomass (g dry wt/m³)							1										
9-Feb-21	Phytoplankton Biomass (g dry wt/m³)			6.8		1.8	1.2											
10-Feb-21	Phytoplankton Biomass (g dry wt/m³)							1.2										
9-Mar-21	Phytoplankton Biomass (g dry wt/m³)			16.6		0.6	1.6											
10-Mar-21	Phytoplankton Biomass (g dry wt/m³)							0.8										
11-Jan-21	Total Phosphorus (mg/L)		<0.01												<0.01			
12-Jan-21	Total Phosphorus (mg/L)			<0.01		<0.01	<0.01									<0.01		
13-Jan-21	Total Phosphorus (mg/L)							<0.01										
8-Feb-21	Total Phosphorus (mg/L)		<0.01												<0.01			
9-Feb-21	Total Phosphorus (mg/L)			<0.01		<0.01	<0.01									<0.01		
10-Feb-21	Total Phosphorus (mg/L)							<0.01										
8-Mar-21	Total Phosphorus (mg/L)		<0.01												<0.01			

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
9-Mar-21	Total Phosphorus (mg/L)			<0.01		0.02	<0.01									<0.01		
10-Mar-21	Total Phosphorus (mg/L)							<0.01										
11-Jan-21	Total Dissolved Phosphorus (mg/L)		<0.01												<0.01			
12-Jan-21	Total Dissolved Phosphorus (mg/L)			<0.01		<0.01	<0.01									<0.01		
13-Jan-21	Total Dissolved Phosphorus (mg/L)							<0.01										
8-Feb-21	Total Dissolved Phosphorus (mg/L)		<0.01												<0.01			
9-Feb-21	Total Dissolved Phosphorus (mg/L)			<0.01		<0.01	<0.01									<0.01		
10-Feb-21	Total Dissolved Phosphorus (mg/L)							<0.01										
8-Mar-21	Total Dissolved Phosphorus (mg/L)		<0.01												<0.01			
9-Mar-21	Total Dissolved Phosphorus (mg/L)			<0.01		<0.01	<0.01									<0.01		
10-Mar-21	Total Dissolved Phosphorus (mg/L)							<0.01										
12-Jan-21	Hydrogen Sulfide (mg/L)			<0.02		<0.02	<0.02											
13-Jan-21	Hydrogen Sulfide (mg/L)							<0.02										
9-Feb-21	Hydrogen Sulfide (mg/L)			<0.02		<0.02	<0.02											
10-Feb-21	Hydrogen Sulfide (mg/L)							<0.02										
9-Mar-21	Hydrogen Sulfide (mg/L)			0.05		<0.02	<0.02											

		River Name	Nam Ngiep											Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites											Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
10-Mar-21	Hydrogen Sulfide (mg/L)							<0.05										
12-Jan-21	Turbidity (NTU)-bottom					2.32	3.32											
13-Jan-21	Turbidity (NTU)-bottom							4.68										
9-Feb-21	Turbidity (NTU)-bottom					3.63	3.76											
10-Feb-21	Turbidity (NTU)-bottom							3.61										
9-Mar-21	Turbidity (NTU)-bottom					3.92	5.29											
10-Mar-21	Turbidity (NTU)-bottom							2.8										
12-Jan-21	TSS (mg/L)-bottom					<5	<5											
13-Jan-21	TSS (mg/L)-bottom							<5										
9-Feb-21	TSS (mg/L)-bottom					<5	<5											
10-Feb-21	TSS (mg/L)-bottom							<5										
9-Mar-21	TSS (mg/L)-bottom					<5	<5											
10-Mar-21	TSS (mg/L)-bottom							<5										
12-Jan-21	BOD_5 (mg/L)-bottom					<1	2.37											
13-Jan-21	BOD_5 (mg/L)-bottom							3.15										
9-Feb-21	BOD_5 (mg/L)-bottom					<1	<1											
10-Feb-21	BOD_5 (mg/L)-bottom							2.92										
9-Mar-21	BOD_5 (mg/L)-bottom					<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						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	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
10-Mar-21	BOD_5 (mg/L)-bottom							1.29										
12-Jan-21	Total Coliform (MPN/100 mL)-bottom					0	0											
13-Jan-21	Total Coliform (MPN/100 mL)-bottom							23										
9-Feb-21	Total Coliform (MPN/100 mL)-bottom					11	13											
10-Feb-21	Total Coliform (MPN/100 mL)-bottom							4										
9-Mar-21	Total Coliform (MPN/100 mL)-bottom					0	0											
10-Mar-21	Total Coliform (MPN/100 mL)-bottom							6.8										
12-Jan-21	Faecal coliform (MPN/100 mL)-bottom					0	0											
13-Jan-21	Faecal coliform (MPN/100 mL)-bottom							2										
9-Feb-21	Faecal coliform (MPN/100 mL)-bottom					0	0											
10-Feb-21	Faecal coliform (MPN/100 mL)-bottom							1.8										
9-Mar-21	Faecal coliform (MPN/100 mL)-bottom					0	0											
10-Mar-21	Faecal coliform (MPN/100 mL)-bottom							0										
12-Jan-21	NH_3-N (mg/L)-bottom					<0.2	<0.2											
13-Jan-21	NH_3-N (mg/L)-bottom							<0.2										

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
9-Feb-21	NH_3-N (mg/L)-bottom					<0.2	<0.2											
10-Feb-21	NH_3-N (mg/L)-bottom							0.74										
9-Mar-21	NH_3-N (mg/L)-bottom					<0.2	<0.2											
10-Mar-21	NH_3-N (mg/L)-bottom							<0.2										
12-Jan-21	NO_3-N (mg/L)-bottom					<0.02	<0.02											
13-Jan-21	NO_3-N (mg/L)-bottom							<0.02										
9-Feb-21	NO_3-N (mg/L)-bottom					0.08	<0.02											
10-Feb-21	NO_3-N (mg/L)-bottom							0.14										
9-Mar-21	NO_3-N (mg/L)-bottom					<0.02	<0.02											
10-Mar-21	NO_3-N (mg/L)-bottom							<0.02										
12-Jan-21	TKN-bottom					<1.5	<1.5											
13-Jan-21	TKN-bottom							<1.5										
9-Feb-21	TKN-bottom					<1.5	<1.5											
10-Feb-21	TKN-bottom							<1.5										
9-Mar-21	TKN-bottom					<1.5	<1.5											
10-Mar-21	TKN-bottom							<1.5										
12-Jan-21	Total Dissolved Phosphorus (mg/L)-bottom					<0.01	<0.01											
13-Jan-21	Total Dissolved Phosphorus (mg/L)-bottom							<0.01										

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
9-Feb-21	Total Dissolved Phosphorus (mg/L)-bottom					<0.01	<0.01											
10-Feb-21	Total Dissolved Phosphorus (mg/L)-bottom							<0.01										
9-Mar-21	Total Dissolved Phosphorus (mg/L)-bottom					<0.01	0.02											
10-Mar-21	Total Dissolved Phosphorus (mg/L)-bottom							<0.01										
12-Jan-21	Total Phosphorus (mg/L)-bottom					<0.01	<0.01											
13-Jan-21	Total Phosphorus (mg/L)-bottom							<0.01										
9-Feb-21	Total Phosphorus (mg/L)-bottom					<0.01	<0.01											
10-Feb-21	Total Phosphorus (mg/L)-bottom							<0.01										
9-Mar-21	Total Phosphorus (mg/L)-bottom					<0.01	0.02											
10-Mar-21	Total Phosphorus (mg/L)-bottom							<0.01										
12-Jan-21	Hydrogen Sulfide (mg/L)-bottom					<0.02	<0.02											
13-Jan-21	Hydrogen Sulfide (mg/L)-bottom							0.02										
9-Feb-21	Hydrogen Sulfide (mg/L)-bottom					<0.02	0.05											
10-Feb-21	Hydrogen Sulfide (mg/L)-bottom							0.05										

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
9-Mar-21	Hydrogen Sulfide (mg/L)-bottom					<0.02	<0.02											
10-Mar-21	Hydrogen Sulfide (mg/L)-bottom							<0.02										
12-Jan-21	Phytoplankton Biomass (g dry wt/m³)-bottom					1.2	2											
13-Jan-21	Phytoplankton Biomass (g dry wt/m³)-bottom							11										
9-Feb-21	Phytoplankton Biomass (g dry wt/m³)-bottom					1.6	1.4											
10-Feb-21	Phytoplankton Biomass (g dry wt/m³)-bottom							0.8										
9-Mar-21	Phytoplankton Biomass (g dry wt/m³)-bottom					1.8	1.4											
10-Mar-21	Phytoplankton Biomass (g dry wt/m³)-bottom							2										

APPENDIX 5-2: EFFLUENT CAMP MONITORING RESULTS – Q1 2021

		Site Name	OSOV1	OSOV2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
04-Jan-21	pH	6.0 - 9.0	7.05	7.16	7.26
18-Jan-21	pH	6.0 - 9.0	6.89	7.13	7.24
04-Feb-21	pH	6.0 - 9.0	6.81	7.16	
15-Feb-21	pH	6.0 - 9.0	7.18	7.21	7.33
01-Mar-21	pH	6.0 - 9.0	6.94	7.01	
15-Mar-21	pH	6.0 - 9.0	6.95	7.01	7.16
04-Jan-21	Sat. DO (%)		52.7	44.4	50
18-Jan-21	Sat. DO (%)		79.2	37.4	92.7
04-Feb-21	Sat. DO (%)		48.4	60.2	
15-Feb-21	Sat. DO (%)		47.6	47.2	142.6
01-Mar-21	Sat. DO (%)		44.7	18.8	
15-Mar-21	Sat. DO (%)		46.9	58.8	64.4
04-Jan-21	DO (mg/L)		4.29	3.65	3.9
18-Jan-21	DO (mg/L)		6.59	3.16	7.35
04-Feb-21	DO (mg/L)		4.01	4.93	
15-Feb-21	DO (mg/L)		3.83	3.79	10.29
01-Mar-21	DO (mg/L)		3.48	1.42	
15-Mar-21	DO (mg/L)		3.76	4.7	4.87
04-Jan-21	Conductivity (µs/cm)		345	472	746
18-Jan-21	Conductivity (µs/cm)		360	530	782
04-Feb-21	Conductivity (µs/cm)		316	489	
15-Feb-21	Conductivity (µs/cm)		276	348	823
01-Mar-21	Conductivity (µs/cm)		327	342	
15-Mar-21	Conductivity (µs/cm)		432	861	981
04-Jan-21	Temperature (°C)		24.4	23.9	26.8
18-Jan-21	Temperature (°C)		23.4	22.6	26
04-Feb-21	Temperature (°C)		23.7	24.5	
15-Feb-21	Temperature (°C)		24.9	25.1	30.8
01-Mar-21	Temperature (°C)		26.6	28.3	
15-Mar-21	Temperature (°C)		26.62	26.74	29.71
04-Jan-21	Turbidity (NTU)		1.73	17.36	14.55
18-Jan-21	Turbidity (NTU)		1.9	20.38	9.8
04-Feb-21	Turbidity (NTU)		2.67	20.13	
15-Feb-21	Turbidity (NTU)		2.71	10.62	10.99
01-Mar-21	Turbidity (NTU)		2.04	16.35	
15-Mar-21	Turbidity (NTU)		2.56	11.58	12.32

		Site Name	OSOV1	OSOV2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
04-Jan-21	TSS (mg/L)	<50	<5	10.6	33.3
18-Jan-21	TSS (mg/L)	<50	<5	40.2	29.2
04-Feb-21	TSS (mg/L)	<50	<5	38.8	
15-Feb-21	TSS (mg/L)	<50	<5	11.3	29.5
01-Mar-21	TSS (mg/L)	<50	<5	32.4	
15-Mar-21	TSS (mg/L)	<50	<5	16	43
04-Jan-21	BOD_5 (mg/L)	<30	<6	<6	<6
18-Jan-21	BOD_5 (mg/L)	<30	<6	<6	<6
04-Feb-21	BOD_5 (mg/L)	<30	<6	<6	
15-Feb-21	BOD_5 (mg/L)	<30	<6	<6	<6
01-Mar-21	BOD_5 (mg/L)	<30	<6	<6	
15-Mar-21	BOD_5 (mg/L)	<30	<6	<6	8.52
04-Jan-21	COD (mg/L)	<125	<25	62	70.8
18-Jan-21	COD (mg/L)	<125	<25	70	56.8
04-Feb-21	COD (mg/L)	<125	<25	75	
15-Feb-21	COD (mg/L)	<125	<25	69	33.8
01-Mar-21	COD (mg/L)	<125	<25	46	
15-Mar-21	COD (mg/L)	<125	<25	142	124
04-Jan-21	NH_3-N (mg/L)	<10.0	<2	27.2	26.7
18-Jan-21	NH_3-N (mg/L)	<10.0	<2	22.2	29.3
04-Feb-21	NH_3-N (mg/L)	<10.0	3	25	
15-Feb-21	NH_3-N (mg/L)	<10.0	6	8.9	9.4
01-Mar-21	NH_3-N (mg/L)	<10.0	12	15.1	
15-Mar-21	NH_3-N (mg/L)	<10.0	8	15.4	42.3
04-Jan-21	Total Nitrogen (mg/L)	<10.0	8.11	29.6	30.6
18-Jan-21	Total Nitrogen (mg/L)	<10.0	1.02	29	35.6
04-Feb-21	Total Nitrogen (mg/L)	<10.0	11	35	
15-Feb-21	Total Nitrogen (mg/L)	<10.0	10.7	12.7	13.7
01-Mar-21	Total Nitrogen (mg/L)	<10.0	27	17.7	
15-Mar-21	Total Nitrogen (mg/L)	<10.0	13	21.3	62.8
04-Jan-21	Total Phosphorus (mg/L)	<2	1	2.23	6
18-Jan-21	Total Phosphorus (mg/L)	<2	1	6.18	1.97
04-Feb-21	Total Phosphorus (mg/L)	<2	1	1.88	
15-Feb-21	Total Phosphorus (mg/L)	<2	2	1.18	3.8
01-Mar-21	Total Phosphorus (mg/L)	<2	1.91	2.37	
15-Mar-21	Total Phosphorus (mg/L)	<2	1.83	1.25	8.69
04-Jan-21	Faecal Coliform (MPN/100 mL)	<400	23	1	1
18-Jan-21	Faecal Coliform (MPN/100 mL)	<400	14	1	1

		Site Name	OSOV1	OSOV2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
04-Feb-21	Faecal Coliform (MPN/100 mL)	<400	5	1	
15-Feb-21	Faecal Coliform (MPN/100 mL)	<400	240	1	1
01-Mar-21	Faecal Coliform (MPN/100 mL)	<400	14	1	
15-Mar-21	Faecal Coliform (MPN/100 mL)	<400	5	1	1
04-Jan-21	Total coliform (MPN/100 mL)	<400	130	1	1
18-Jan-21	Total coliform (MPN/100 mL)	<400	79	1	1
04-Feb-21	Total coliform (MPN/100 mL)	<400	540	1	
15-Feb-21	Total coliform (MPN/100 mL)	<400	240	1	1
01-Mar-21	Total coliform (MPN/100 mL)	<400	27	1	
15-Mar-21	Total coliform (MPN/100 mL)	<400	17	1	1
04-Jan-21	Oil & Grease (mg/L)	<10	<1	<1	<1
18-Jan-21	Oil & Grease (mg/L)	<10			
04-Feb-21	Oil & Grease (mg/L)	<10	<1	<1	
15-Feb-21	Oil & Grease (mg/L)	<10			
01-Mar-21	Oil & Grease (mg/L)	<10	<1	3	
15-Mar-21	Oil & Grease (mg/L)	<10			
04-Jan-21	Residual Chlorine (mg/L)	<1.0		0.53	0.91
18-Jan-21	Residual Chlorine (mg/L)	<1.0		1.28	0.65
04-Feb-21	Residual Chlorine (mg/L)	<1.0		1.09	
15-Feb-21	Residual Chlorine (mg/L)	<1.0		0.57	1.52
01-Mar-21	Residual Chlorine (mg/L)	<1.0		0.23	
15-Mar-21	Residual Chlorine (mg/L)	<1.0		0.72	1.41
04-Jan-21	Chlorination Dosing Rate (mL/mn)			38	380
18-Jan-21	Chlorination Dosing Rate (mL/mn)			30	520
04-Feb-21	Chlorination Dosing Rate (mL/mn)			0.3	
15-Feb-21	Chlorination Dosing Rate (mL/mn)			0.3	50
01-Mar-21	Chlorination Dosing Rate (mL/mn)			28	
15-Mar-21	Chlorination Dosing Rate (mL/mn)			28	300
04-Jan-21	Effluent Discharge Volume (L/mn)			4	1520
18-Jan-21	Effluent Discharge Volume (L/mn)		4	2	2100
04-Feb-21	Effluent Discharge Volume (L/mn)		6	4	
15-Feb-21	Effluent Discharge Volume (L/mn)		7.5	6	2000
01-Mar-21	Effluent Discharge Volume (L/mn)		7.5	4.6	
15-Mar-21	Effluent Discharge Volume (L/mn)		3	4	1200

APPENDIX 5-3: GROUNDWATER QUALITY MONITORING RESULTS – Q1 2021

Month Year	Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	Nampa Village	ThongNoy Village	Pou Village
		Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01
		Guideline						
11-Jan-21	pH	6.5 - 9.2						7.68
22-Jan-21	pH	6.5 - 9.2	7.43	7.18	6.87	6.79	7.3	
05-Feb-21	pH	6.5 - 9.2	6.85	6.99				
12-Feb-21	pH	6.5 - 9.2	6.13	6	6.11	6.24	6.37	
08-Mar-21	pH	6.5 - 9.2						7.42
19-Mar-21	pH	6.5 - 9.2	6.83	6.5	6.75	6.83	7.19	
11-Jan-21	Sat. DO (%)							90.9
22-Jan-21	Sat. DO (%)		35.3	28.7	81.5	94.9	68.1	
05-Feb-21	Sat. DO (%)		44.8	39.7				
12-Feb-21	Sat. DO (%)		45.9	52	66.8	86.4	80	
08-Mar-21	Sat. DO (%)							84.4
19-Mar-21	Sat. DO (%)		34.3	45.2	48.2	97.8	68.7	
11-Jan-21	DO (mg/l)							7.76
22-Jan-21	DO (mg/l)		2.81	28.7	6.91	7.78	5.59	
05-Feb-21	DO (mg/l)		3.59	3.21				
12-Feb-21	DO (mg/l)		4.01	4.42	5.61	7.97	6.97	
08-Mar-21	DO (mg/l)							6.59
19-Mar-21	DO (mg/l)		2.78	3.67	3.8	7.67	5.32	
11-Jan-21	Conductivity (µS/cm)							13.87
22-Jan-21	Conductivity (µS/cm)		277	278	269	292	281	
05-Feb-21	Conductivity (µS/cm)		273	281				
12-Feb-21	Conductivity (µS/cm)		121.6	293	228	276	271	
08-Mar-21	Conductivity (µS/cm)							29
19-Mar-21	Conductivity (µS/cm)		188	429	355	400	420	
11-Jan-21	Temperature (°C)							21.7
22-Jan-21	Temperature (°C)		25.6	25.4	22.6	24.4	23.4	
05-Feb-21	Temperature (°C)		25.5	25				
12-Feb-21	Temperature (°C)		20.4	22	22.5	21.9	20.5	
08-Mar-21	Temperature (°C)							25.9
19-Mar-21	Temperature (°C)		26.18	26.01	27.58	27.76	28.63	
11-Jan-21	Turbidity (NTU)	<20						1.61
22-Jan-21	Turbidity (NTU)	<20	2.15	2.45	1.77	2.22	2.37	
05-Feb-21	Turbidity (NTU)	<20	2.42	2.6				
12-Feb-21	Turbidity (NTU)	<20	6.21	3.28	3.64	3.81	3.97	
08-Mar-21	Turbidity (NTU)	<20						2.58
19-Mar-21	Turbidity (NTU)	<20	6.65	4.23	1.91	2.49	1.86	
11-Jan-21	Fecal coliform (MPN/100ml)	0						4.5

Month Year	Parameter (Unit)	Site Name	Phouhomxay Village		Somseun Village	Nampa Village	ThongNoy Village	Pou Village
		Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01
		Guideline						
22-Jan-21	Fecal coliform (MPN/100ml)	0	0	0	0	0	130	
05-Feb-21	Fecal coliform (MPN/100ml)	0	0	0				
12-Feb-21	Fecal coliform (MPN/100ml)	0	0	0	0	0	240	
08-Mar-21	Fecal coliform (MPN/100ml)	0						0
19-Mar-21	Fecal coliform (MPN/100ml)	0	0	0	6.1	0	23	
11-Jan-21	E.coli Bacteria (MPN/100ml)	0						4.5
22-Jan-21	E.coli Bacteria (MPN/100ml)	0	0	0	0	0	4.5	
05-Feb-21	E.coli Bacteria (MPN/100ml)	0	0	0	0			
12-Feb-21	E.coli Bacteria (MPN/100ml)	0	0	0	0	0	240	
08-Mar-21	E.coli Bacteria (MPN/100ml)	0						0
19-Mar-21	E.coli Bacteria (MPN/100ml)	0	0	0	3.7	0	23	
05-Feb-21	Arsenic (mg/)	<0.05	<0.0003	0.0005	0.0011	0.0007	0.0016	<0.0003
05-Feb-21	Cadmium (mg/l)	<0.01	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
05-Feb-21	Total Iron (mg/l)	<1	1.66	0.185	0.009	0.012	0.017	0.010
05-Feb-21	Total hardness (mg/l)	<500	91.5	232	165	179	189	15.5
05-Feb-21	Lead (mg/l)	<0.05	<0.008	<0.008	<0.008	<0.008	<0.008	<0.003

APPENDIX 5-4: GRAVITY FED WATER SUPPLY MONITORING RESULTS – Q1 2021

		Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline				
08-Jan-21	pH	6.5 - 8.5	7.87	7.71	7.92	7.74
12-Feb-21	pH	6.5 - 8.5	6.26	6.33	6.83	6.66
05-Mar-21	pH	6.5 - 8.5	7.1	7.31	8.45	8.49
08-Jan-21	Sat. DO (%)		114	103.3	92.3	93.1
12-Feb-21	Sat. DO (%)		104	103.2	94.6	93.4
08-Jan-21	DO (mg/L)		9.73	8.82	7.83	7.79
12-Feb-21	DO (mg/L)		8.84	8.35	8.54	8.46
05-Mar-21	DO (mg/L)		6.49	8.81	7.82	5.85
08-Jan-21	Conductivity (µS/cm)	<1,000	36.7	55.7	11.2	10.49
12-Feb-21	Conductivity (µS/cm)	<1,000	42.3	57.2	17.7	15.98
05-Mar-21	Conductivity (µS/cm)	<1,000	68	96	25	23
08-Jan-21	Temperature (°C)	<35	22.2	22.2	22.5	22.4
12-Feb-21	Temperature (°C)	<35	21.8	20.1	22.3	22.7
05-Mar-21	Temperature (°C)	<35	27.12	24.92	25.13	24.84
08-Jan-21	Turbidity (NTU)	<10	3.2	2.4	2.3	2.39
12-Feb-21	Turbidity (NTU)	<10	6.22	6.48	4.26	3.7
05-Mar-21	Turbidity (NTU)	<10	2.5	2.47	2.21	1.79
08-Jan-21	Faecal Coliform (MPN/100 mL)	0	70	7.8	79	350
12-Feb-21	Faecal Coliform (MPN/100 mL)	0	22	7.8	79	79
05-Mar-21	Faecal Coliform (MPN/100 mL)	0	11	170	280	110
08-Jan-21	E.coli Bacteria (MPN/100 mL)	0	33	7.8	49	170
12-Feb-21	E.coli Bacteria (MPN/100 mL)	0	22	7.8	49	23
05-Mar-21	E.coli Bacteria (MPN/100 mL)	0	11	170	280	110
12-Feb-21	Arsenic (mg/L)	<0.05	<0.0003	<0.0003	<0.0003	<0.0003
12-Feb-21	Cadmium (mg/L)	<0.003	<0.002	<0.002	<0.002	<0.002
12-Feb-21	Iron (mg/L)		0.099	0.09	0.115	0.13
12-Feb-21	Lead (mg/L)	<0.01	<0.01	<0.01	<0.01	<0.01
12-Feb-21	Total hardness (mg/L)	<300	34.3	44.1	15.5	17.1
12-Feb-21	Mercury (mg/L)	<0.001	<0.0002	<0.0002	<0.0002	<0.0002