




Nam Ngiep 1 Hydropower Project

Quarterly Environment Monitoring Report Third Quarter of 2021

July to September 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
OAA	Other aquatic animals
OC	Obayashi Corporation
ONC	Observation of Non-Compliance
OSOV	Owners' Site Office and Village
PAFO	Provincial Department of Agriculture and Forestry
PONRE	Provincial Department of Natural Resource and Environment, MONRE
RCC	Roller Compacted Concrete
SIR	Site Inspection Report
SMO	Social Management Office of ESD within NNP1PC
SMART	Spatial Monitoring and Reporting Tool
SOP	Standard Operating Procedure
SS-ESMMP	Site Specific Environmental and Social Monitoring and Management Plan
TOR	Terms of Reference
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 Q3 2021, NNP1PC established an Internal Audit Team comprising 22 Internal Auditors who were assigned by the top management. A kick-off meeting for the ISO14001:2015 Internal Audit was held on 28 July 2021. The ISO14001:2015 Internal Audit for all 38 work areas has been accomplished and the preparation of the audit reports and summaries of results are in progress. The organization's context, the needs and expectation of interested parties, the evaluation of environmental obligations, the environmental aspects identification and assessment, and the risks and opportunities assessment according to the ISO14001:2015 requirements have been prepared, reviewed and finalized. Two Environmental Objectives and their action plans have been approved by the Managing Director, and two Management Review Meetings were organized on 01 September and 14 September 2021 respectively with the purpose of evaluating the suitability, adequacy and effectiveness of the Environmental Management System (EMS). The Stage 1 Audit of ISO14001:2015 Certification by an accreditation company, SGS (Lao) Sole Co., Ltd., was conducted remotely on 07 September 2021, no critical audit findings were raised, and six non-critical audit findings were noted. It was agreed to conduct the Stage 2 Certification Audit in early December 2021.

EMO received two Detailed Work Program (DWP) & Site Specific Environmental and Social Management and Monitoring Plans (SS-ESMMP), and one Environmental Pre-Construction Checklist. Six Observations of Non-Compliance (ONCs) are active (newly opened) during the reporting period of Q3 2021.

The construction of the wastewater treatment system modification and improvement at OSOV1 and OSOV2 were completed by the Soulignet Choummanitham Construction Sole Co., Ltd. (SCC). On 09 September 2021, a joint site inspection was conducted for the 100% work completion of the WWTS improvement and modification works.

During Q3 2021, EMO continued to monitor the progress of revegetation at two sites including the former LILAMA10 camp and the Phouhomxay village's irrigation canal spoil disposal that the EMU did not accept during their site visited in January 2021. A quarterly inspection was also conducted at the other 30 rehabilitated sites that were initially accepted by the GOL-EMU. Additional topsoil was placed on some part of the former LILAMA10 camp by NNP1PC to promote revegetation. The overall percentage of vegetation cover on all 32 sites have increased compared to the previous quarter.

A total of 94.1 m³ solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, an increase of 30.1 m³ compared with Q2 2021. A total of 113.1 m³ solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed of at the Houay Soup Landfill,

an increase of 37.5 m³ compared with Q2 2021. There remains 2,519 kg recyclable waste at the Community Waste Bank with no recyclables received in Q3 2021.

The environmental flow requirements have been monitored in accordance with the ESMMP-OP and the results show full compliance with the requirements, except for the thalweg water depth measurements that indicated 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 m³/s.

During Q3 2021, water quality monitoring was not carried out at upper Main Reservoir (R01, R02 and R03) and Nam Phouan (NPH01) due to security concerns.

The concentration of dissolved oxygen (DO) at the surface level in R05 (Main Reservoir immediately upstream of the main dam) ranged between 6 mg/L and 8 mg/L, Nam Ngiep Upstream station (NNG01) and Nam Chian (NCH01) had DO levels above 6 mg/L. In addition, the DO concentrations in Nam Xao (except on 29 July and 11 August 2021) and Nam Houay Soup (except on 29 July and 25 August 2021) were above 6 mg/L.

The DO concentrations at the surface level in the re-regulation reservoir (R07) were between 1.13 and 4.66 mg/L.

The DO levels in Nam Ngiep downstream the re-regulation dam during the turbine discharge only or the combination with the gate discharges were between 2.6 mg/L and 5.1 mg/L for the first few kilometres gradually increasing to about 4 mg/L or just above 6 mg/L over the following 25 km.

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

The management activities as per the approved Watershed Management 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.

2 INTRODUCTION

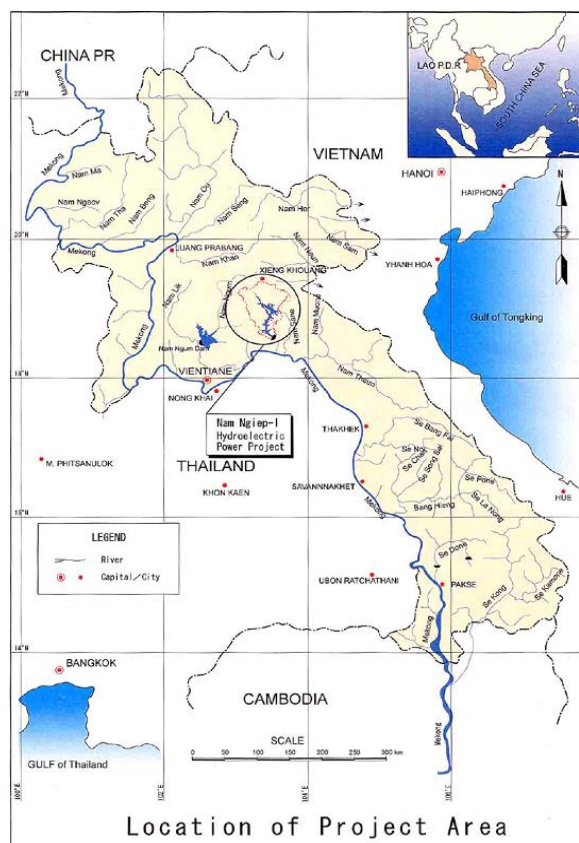
The Nam Ngiep originates in the mountains of Xiengkhuang Province, flowing through Khoun District into Thathom District of Xaysomboun Province, through Hom District and into Bolikhamxay Province. The Nam Ngiep meets the Mekong River just upstream from Pakxan in Bolikhamxay Province.

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

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

This Quarterly Environment Report provides a summary of environmental monitoring activities and mitigation actions during **Q3 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 Q3 2021.

3.1 ENVIRONMENTAL MANAGEMENT SYSTEM (EMS)

During Q3 2021, NNP1PC established an Internal Audit Team comprising 22 Internal Auditors who were assigned by the top management. A kick-off meeting for the ISO14001:2015 Internal Audit was held on 28 July 2021. The ISO14001:2015 Internal Audit for all 38 work areas has been accomplished and the preparation of the audit reports and summaries of results are in progress.

The organization's context, the needs and expectation of interested parties, the evaluation of environmental obligations, the environmental aspects identification and assessment, and the risks and opportunities assessment according to the ISO14001:2015 requirements have been prepared, reviewed and finalized. Two Environmental Objectives and their action plans have been approved by the Managing Director, and two Management Review Meetings were organized on 01 September and 14 September 2021 respectively with the purpose of evaluating

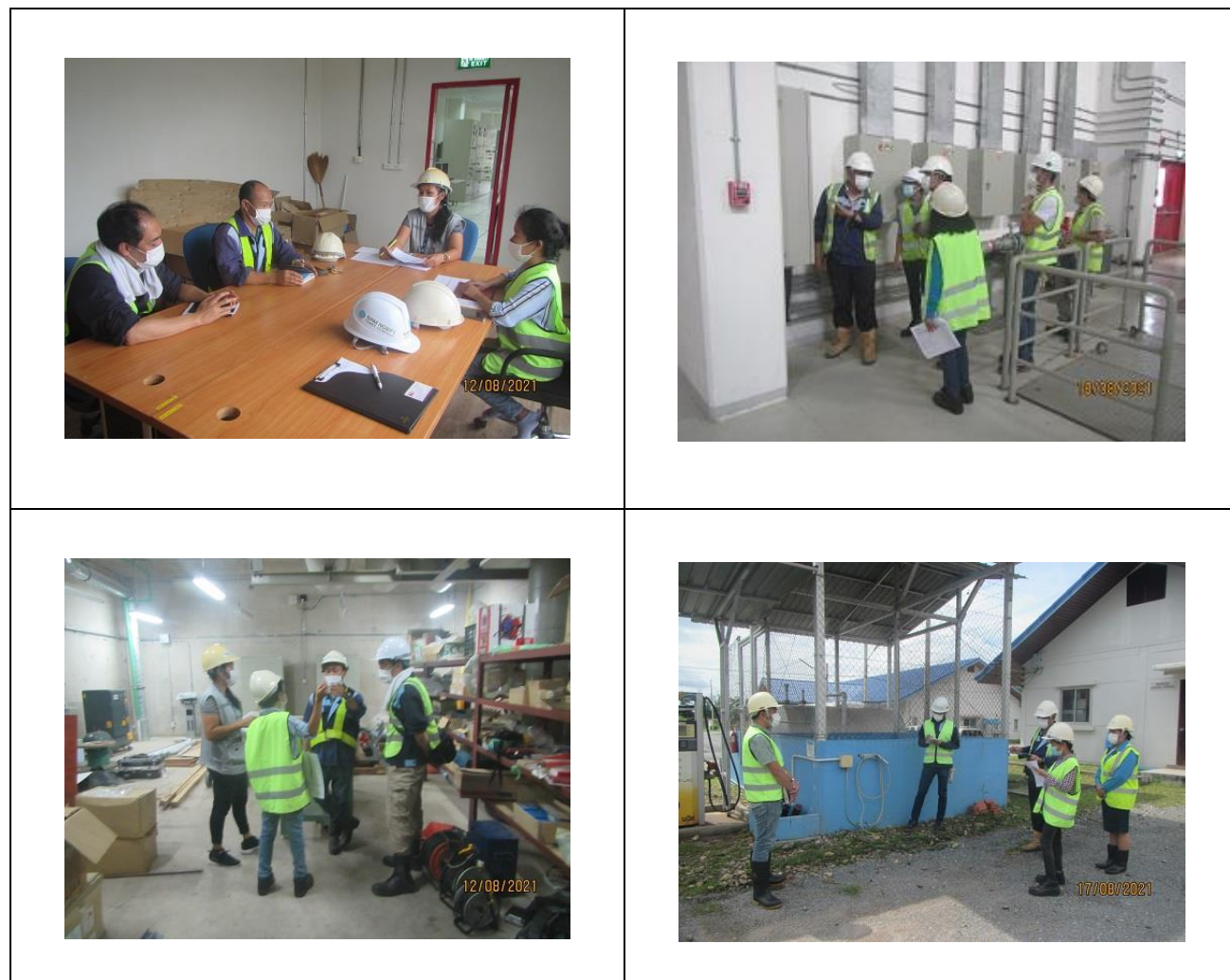
the suitability, adequacy and effectiveness of the Environmental Management System (EMS). The Stage 1 Audit of ISO14001:2015 Certification by an accreditation company, SGS (Lao) Sole Co., Ltd., was conducted remotely on 07 September 2021, no critical audit findings were raised, and six non-critical audit findings were noted. It was agreed to conduct the Stage 2 Certification Audit in early December 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 (8 Standard Operating Procedures are completed)						
2	NNP1PC Environmental Policy announcement						
3	NNP1PC ISO Committee establishment						
4	Training relevant staff on: <ul style="list-style-type: none"> - 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 1 st 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 2 nd Stage Audit						
13	Certify of ISO14001:2015 upon successful completion of the audit						

	Completed activities
	Delayed activities and re-scheduled
	Original plan activities

FIGURE 3-1: NNP1 ISO14001:2015 INTERNAL AUDIT ACTIVITIES

3.2 CONTRACTOR SS-ESMMPs

During Q3 2021, the Environmental Management Office (EMO) of NNP1PC received two Detailed Work Program (DWP) & Site Specific Environmental and Social Management and Monitoring Plans (SS-ESMMP), and one Environmental Checklist for pre-construction site for review and approval. All of these submitted documents were cleared as shown in **Table 3-2**- more details can be found in **Appendix 1**.

TABLE 3-2: DOCUMENTS REVIEWED DURING Q3 2021

Document Name	Rev. 1	Rev. 2	Rev. 3	Approved
DWP & SS-ESMMP for Remedial Grouting work at Main Dam	√	√	√	√
DWP & SS-ESMMP for the construction of Biofilm septic tanks replacement at OSOV1	√			√
Environmental Checklist for pre-construction site for the nuts and bolts welding of 230 kV transmission line	√			√

3.3 RESULTS OF COMPLIANCE INSPECTIONS AT CONSTRUCTION SITES

Due to the Covid-19 situation and the GOL's lockdown measures during Q3 2021, the regular joint site inspections were suspended at some areas such as at villages and in Zone 2UR during the reporting period. However, the Compliance team conducted joint site inspections at the construction sites for the wastewater treatment system improvement and modification at OSOV1 and OSOV2, the Main Dam's grouting work and the Powerhouses maintenance. EMO issued a Site Inspection Report (SIR) of six observations of non-compliances to the contractor and instructed the contractor to take corrective actions.

During Q3 2021, EMO conducted weekly independent site inspections and bi-weekly joint site inspections at a total of 18 sites. These included the two sites still not fully rehabilitated as previously commented by the EMU, six main operation sites, two temporary contractor camps, five construction sites, two landfills and the 230-kV Transmission Line. A decrease of 07 monitoring sites compared with Q2 2021.

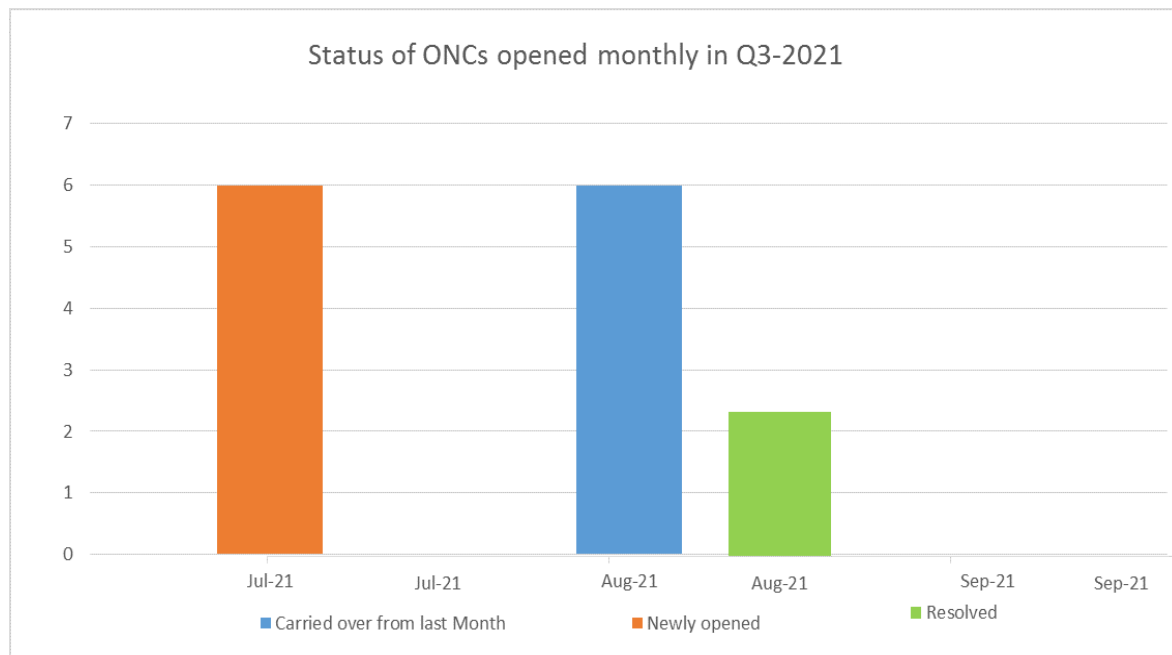
Six Observations of Non-Compliance (ONCs) were active (newly opened) during Q3 2021.

The status of the ONCs is summarized in **Table 3-3**, and **Figure 3-2**. The progress of corrective actions is presented in **Appendix 2**.

TABLE 3-3: STATUS OF NON-COMPLIANCE REPORT DURING Q3 2021

Status	ONC	NCR-Level 1	NCR-Level 2	NCR-Level 3	Incident Report
Carried over ONC/NCR from the previous quarter	0	0	0	0	0
Newly opened ONC/NCR	6	0	0	0	0
Total No. of ONC/NCR	6	0	0	0	0
Resolved ONC/NCR	2	0	0	0	0
Unresolved ONC/NCR carried forward to the next quarter	4	0	0	0	0

FIGURE 3-2: STATUS OF ONCs DURING Q3 2021



PHOTOGRAPH 1: JOINT SITE INSPECTION WITH SCC CONTRACTOR FOR THE WWTS IMPROVEMENT AND MODIFICATION AT OSOV1, OSOV2 AND MAIN POWERHOUSE ON 05-JUL-2021

OSOV2



Main Powerhouse



OSOV1



PHOTOGRAPH 2: SITE INSPECTION AT RE-REGULATION POWERHOUSE'S TEMPORARY STORAGE AREA



PHOTOGRAPH 3: SITE INSPECTION AT MAIN DAM GROUTING AREA



PHOTOGRAPH 4: SITE INSPECTION AT ALONG THE TL 230 KV (TOWER 01 – 10)



3.4 RESULTS OF SITE DECOMMISSIONING AND REHABILITATION

During Q3 2021, EMO continued to monitor the progress of rehabilitation at two sites, the former LILAMA10 camp and the Phouhomxay village's irrigation canal spoil disposal that the EMU did not accept during their site visit in January 2021 due to the low percentage of vegetation cover and EMU requested additional measures to be carried out. In Q3 2021, additional topsoil was placed on some part of the former LILAMA10 camp by NNP1PC to promote revegetation of the area. EMO conducted site inspection and visually evaluated that the percentage of vegetation cover in September 2021 (late wet season of 2021) have increased compared to Q2 2021.

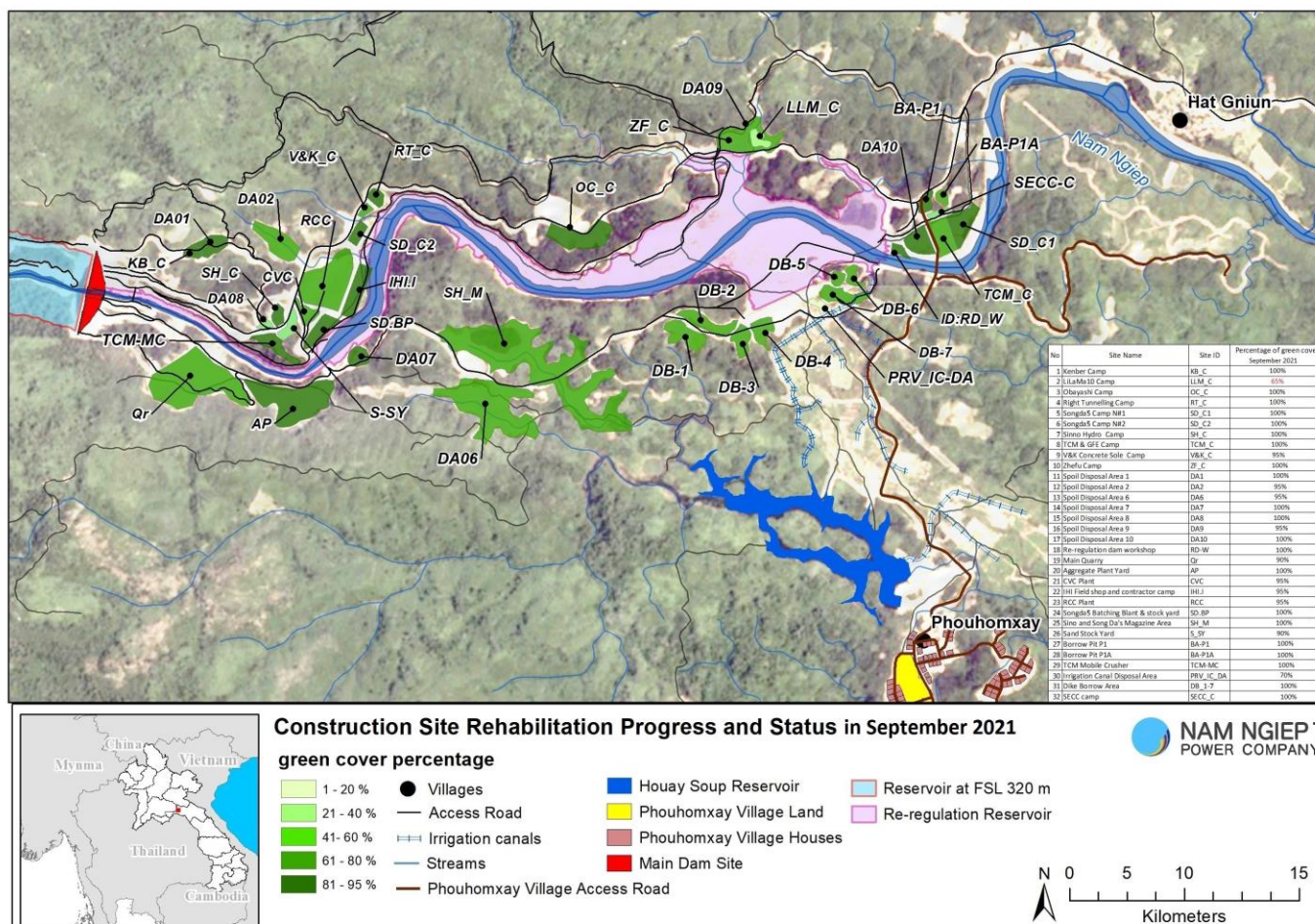
The status of site rehabilitation and revegetation is summarized in **Table 3-4** and the revegetated sites are shown in **Figure 3-3** with the relevant photographs.

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







No	Site Name	Status of Decommissioning	Percentage of Vegetation Cover Evaluation					
			Jun-2020	Sep-2020	Dec-2020	Mar-2021	Jun-2021	Sep-2021
01	TCM & GFE Camp	Completed	70%	90%	90%	90%	100%	100%
02	Spoil Disposal Area 7	Completed	-	98%	98%	98%	100%	100%
03	Spoil Disposal Area 9	Completed	-	75%	75%	75%	90%	95%
04	Spoil Disposal Area 10	Completed	80%	95%	95%	95%	100%	100%
05	Borrow Pit P1	No need for decommissioning	-	95%	95%	95%	100%	100%
06	Borrow Pit P1A	No need for decommissioning	-	80%	80%	80%	95%	100%
07	TCM Mobile Crusher	Completed	-	90%	90%	90%	100%	100%
08	Dike Borrow Areas	No need for decommissioning	-	75%	75%	75%	85%	90%
09	SECC camp	Completed	-	90%	90%	90%	100%	100%
10	KENBER Camp	Completed	80%	95%	95%	95%	100%	100%
11	LILAMA10 Camp	Completed	5%	20%	40%	45%	50%	65%
12	Obayashi Camp	Completed	80%	90%	90%	90%	95	100%
13	Right Tunnelling Camp	Completed	70%	90%	90%	90%	95	100%
14	Songda5 Camp N#1	Completed	90%	98%	98%	98%	100%	100%
15	Songda5 Camp N#2	Completed	80%	95%	95%	95%	100%	100%
16	Sino Hydro Camp	Completed	80%	95%	95%	95%	100%	100%

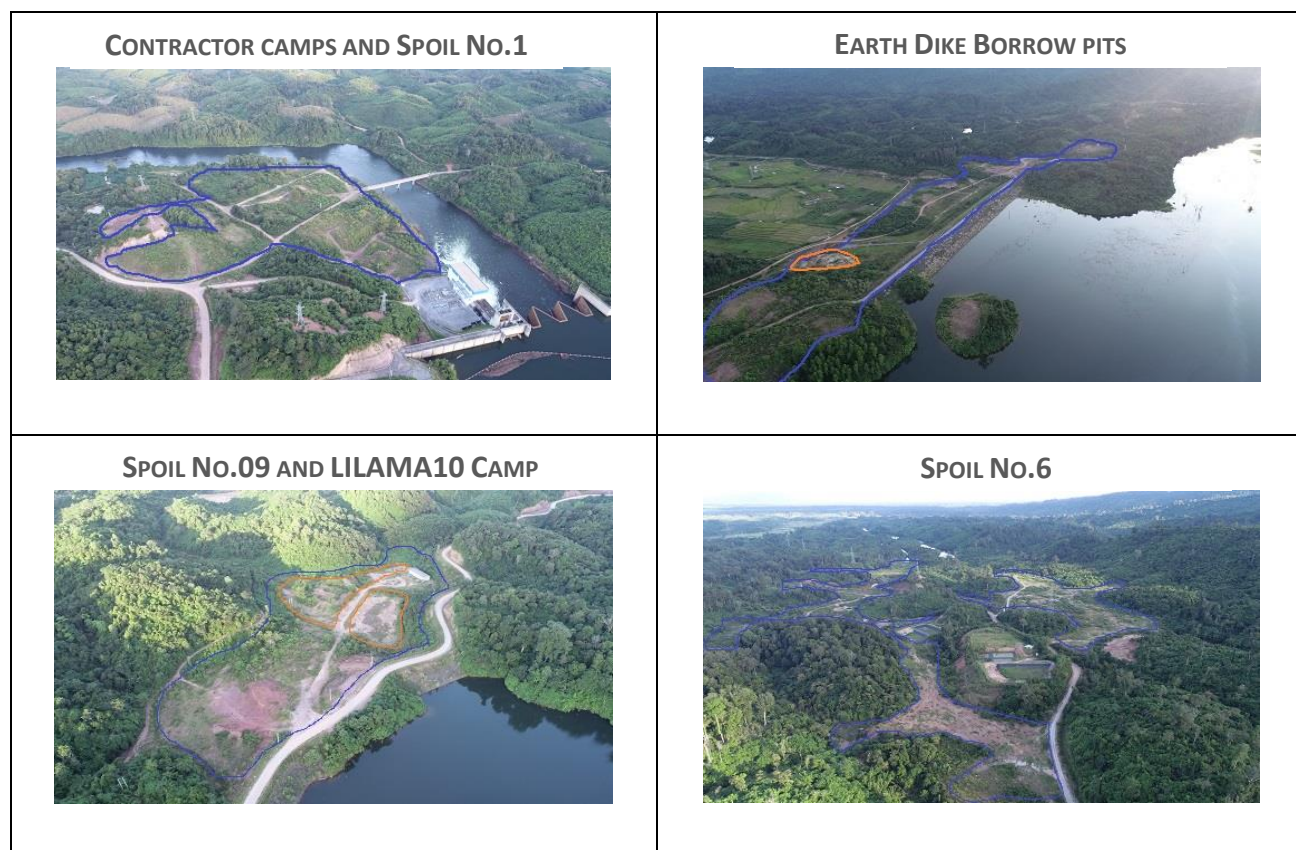
No	Site Name	Status of Decommissioning	Percentage of Vegetation Cover Evaluation					
			Jun-2020	Sep-2020	Dec-2020	Mar-2021	Jun-2021	Sep-2021
17	V&K Concrete Sole Camp	Completed	50%	70%	70%	70%	85%	95%
18	Zhefu Camp	Completed	60%	75%	75%	75%	100%	100%
19	Spoil Disposal Area 1	Completed	80%	90%	90%	90%	100%	100%
20	Spoil Disposal Area 2 & main dam workshop	Completed	60%	75%	75%	75%	90%	95%
21	Spoil Disposal Area 6	Completed	70%	75%	75%	75%	90%	95%
22	Spoil Disposal Area 8	No need for decommissioning	40%	60%	60%	60%	100%	100%
23	Re-regulation dam workshop	Completed	80%	85%	85%	85%	95%	100%
24	Main Quarry	Completed	50%	70%	70%	70%	85%	90%
25	Aggregate Plant Yard	Completed	80%	85%	85%	85%	95%	100%
26	CVC Plant	Completed	60%	70%	70%	70%	85%	95%
27	IHI Field shop and contractor camp	Completed	70%	85%	85%	85%	95%	95%
28	RCC Plant	Completed	50%	70%	70%	70%	80%	95%
29	Songda5 Batching Plant & Stock yard	Completed	80%	95%	95%	95%	100%	100%
30	Sino and Song Da's Magazine Area	Completed	70%	80%	80%	80%	95%	100%
31	Sand Stock Yard	No need for decommissioning	-	60%	60%	60%	75%	90%
32	Irrigation Canal Spoil Disposal Area <i>Phouhomxay Village</i>	No need for decommissioning	-	5%	10%	15%	20%	70%

FIGURE 3-3: REVEGETATION SITES MAP DURING Q3 2021



The photos below present the vegetation cover of two sites (the former LILAMA10 camp and the Irrigation rock disposal area), and the aerial photos provide an overview of the rehabilitated construction areas.

PHOTO OF THE LILAMA10 CAMP	
<p>PHOTOGRAPH 1: Q2 2021</p> 	<p>PHOTOGRAPH 2: Q3 2021</p> 
AERIAL PHOTO OF THE MAIN REHABILITATED ZONE (INDUSTRIALS, CAMPS AND SPOIL DISPOSAL AREAS)	
<p>AGGREGATE PLANT YARD</p> 	<p>QUARRY</p> 
<p>OBAYASHI CAMP</p> 	<p>PLANT YARD (CVC, RCC)</p> 



3.5 WASTE MANAGEMENT AT THE CONSTRUCTION SITES

3.5.1 General Waste Management

A total of 94.1 m³ solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, an increase of 30.1 m³ compared with Q2 2021.

During the Q3 2021, the new local waste collection contractor carried out landfill operation and maintenance which included daily and weekly waste cover, repairing the damaged perimeter fence at the landfills, grass mowing, storage cleaning and clean-up of sediment in the open ditches around the leachate ponds.

The authorized recycle waste company (Panitha Export-Import Sole Co., Ltd.) came to site and traded the recycle waste for recycling. The amount of recyclable waste managed on site during the reporting period is shown in **Table 3-5**.

TABLE 3-5: AMOUNTS OF RECYCLABLE WASTE DURING Q3 2021

Source and Type of Recyclables		Unit	Total in Q3 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	97	79	18

Source and Type of Recyclables		Unit	Total in Q3 2021 (A)	Sold (B)	Remaining Amount (A - B)
3	Aluminium	kg	69	56	13
4	Paper/Cardboard	kg	173	169	4
5	Glass	kg	219	205	14
Sub-Total 2		kg	714	665	49
Grand Total 1+2		kg	714	665	49

3.5.2 Hazardous Waste Management

The authorized recycle waste company (Panitha Export-Import Sole Co., Ltd.) came to site to trade and collect 4487.7 liters of hazardous waste (used oil) for recycling and elimination.

The amounts of hazardous waste and hazardous materials that were collected, stored and disposed of during Q3 2021 are shown in **Table 3-6**. No disposal of hazardous waste during the reporting period. The remaining wastes are planned to be collected, treated and also disposed of by Panitha Export-Import Sole Co., Ltd. in early Q4 2021.

TABLE 3-6: HAZARDOUS MATERIAL AND HAZARDOUS WASTE RECORDED DURING Q3 2021

No.	Type of Hazardous Material	Unit	Total in Q3 2021	Used/ Disposed	Remaining
1	Diesel	Litre	13,724	12,726	998
2	Gasoline	Litre	1,070	725	345
3	Lubricant (Turbine oil)	Litre	7,836	509	7,327
4	Colour paint	Litre	248	6	242
5	Tinner	Litre	12	4	8
6	Grease oil	Litre	220	0	220
7	Gear Oil	Litre	470	2	468
8	Chlorine Liquid	Litre	363	223	140
9	Chlorine Powder	Kg	65	0	65
10	Sika	Litre	7	0	7
Type of Hazardous Waste					
11	Used Oil (Hydraulic + Engine)	Litre	4707.7	4487.7	220
12	Used oil mixed with water	Litre	4950	150	4800
13	Empty used oil drum/container (drum 200L)	Unit	22	16	6
14	Contaminated soil, sawdust and textile material	M3	3.23	2.51	0.72
15	Used tyre	Piece	18	18	0
16	Empty used chemical drum/container (drum 20L)	Unit	18	0	18
17	Lead acid batteries	Unit	7	0	7
18	Empty paint and spray cans	Can	139	139	0
19	Halogen/fluorescent bulbs	Unit	351	0	351
20	Empty cartridge (Ink)	Piece	205	195	10
21	Clinic Waste	Kg	5.5	4.5	1

3.5.3 Animal Fodder (Pig Feed) Collection Programme

During Q3 2021, local villagers collected 1,053 kg food waste from the Owner's Site Office and Village (OSO) for feeding their animals.

3.5.4 Community Solid Waste Management and Recycling Programme

The total amount of recycle waste recorded and stored in the community waste bank during the Q3 2021 is summarized in **Table 3-7**. The community waste bank did not receive any recyclables in Q3 2021.

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

Type of Waste	Unit	Remaining in Q2 2021	Purchased/Collected in Q3 2021	Sold	Disposed	Remaining in Q3 2021
Plastic bottle	kg	35	0	35	0	0
Aluminum	kg	0	0	0	0	0
Paper/Cardboard	kg	126	0	0	126	0
Glass	kg	2,358	0	2358	0	0
Scrap metal	kg	0	0	0	0	0
Total	kg	2,519	0	2,393	126	0

3.5.5 Houay Soup Landfill

During Q3 2021, a total of 113.1 m³ solid waste from Phouhomxay, Thahuea and Hat Gniun villages was disposed of at the Houay Soup Landfill, an increase of 37.5 m³ compared with Q2 2021. Basic landfill maintenance was carried out which included fixing the fence, cleaning up the open ditches and mowing grass.

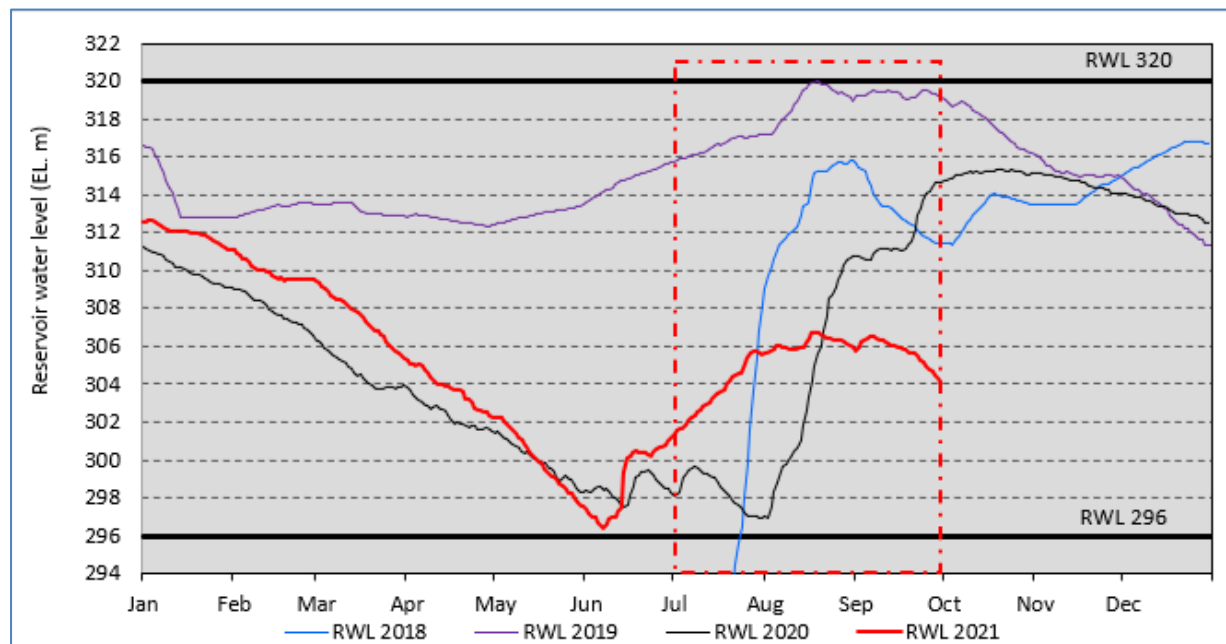
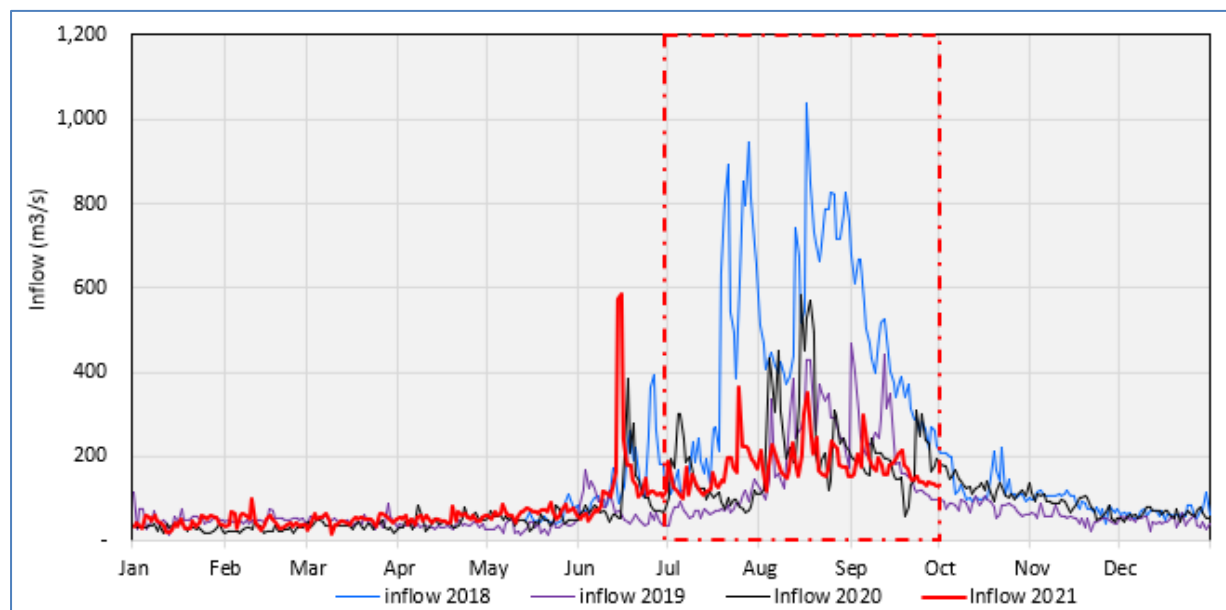
3.6 RESERVOIR OPERATIONS

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** and **Figure 3-5**.

During Q3 2021, the mean daily inflow to the main reservoir was 176 m³/s. The minimum daily inflow was 99 m³/s, maximum daily inflow was recorded at 367 m³/s, and 25th percentile of 143 m³/s and 75th percentile of 197 m³/s.

The water level in the main reservoir increased with 5.36 m from El. 301.39 m asl. on 01 July 2021 to El. 306.75 m asl. on 18 August 2021, whereafter the water level decreased to El. 303.96 m asl. on 30 September 2021.

FIGURE 3-4: WATER LEVEL OF THE MAIN RESERVOIR**FIGURE 3-5: INFLOW TO 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 Q3 2021 are summarized in **Table 3-8**.

TABLE 3-8: SUMMARY OF EFRs COMPLIANCE MONITORING IN Q3 2021

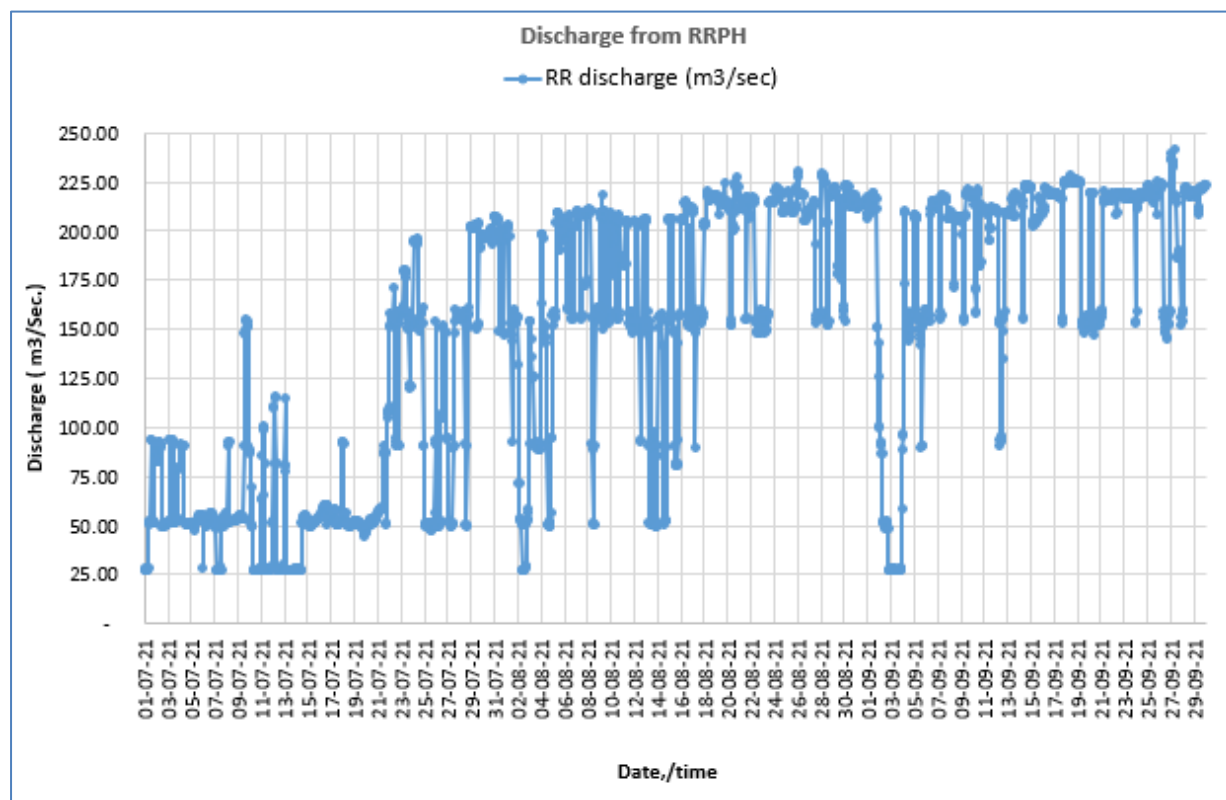
No	EFRs in the Downstream of the Re-regulation dam	EFRs compliance
1	Min flow 27 m ³ /s at all times	100% of observations comply
2	Thalweg water depth at least 0.5 m in the entire reach from immediately downstream of the Re-regulation dam until 4.3 km downstream the dam (measured at cross-sections where visual observations or boat navigation indicate shallow waters)	Two measurements 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 Q3 2021 indicates that the minimum flow requirement of 27 m³/s has been met at all times. The Re-regulation Dam discharge graph can be found in **Figure 3-6**.

During Q3 2021, the mean discharge from the re-regulation dam was about 77 m³/s in July 2021 and about 177 m³/s and 192 m³/s in August and September 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 were no complaints related to the flow discharges or fluctuation levels downstream the Re-regulation dam during the reporting period.

FIGURE 3-6: DISCHARGE FROM THE RE-REGULATION DAM DURING Q3 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 3-7**. 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.

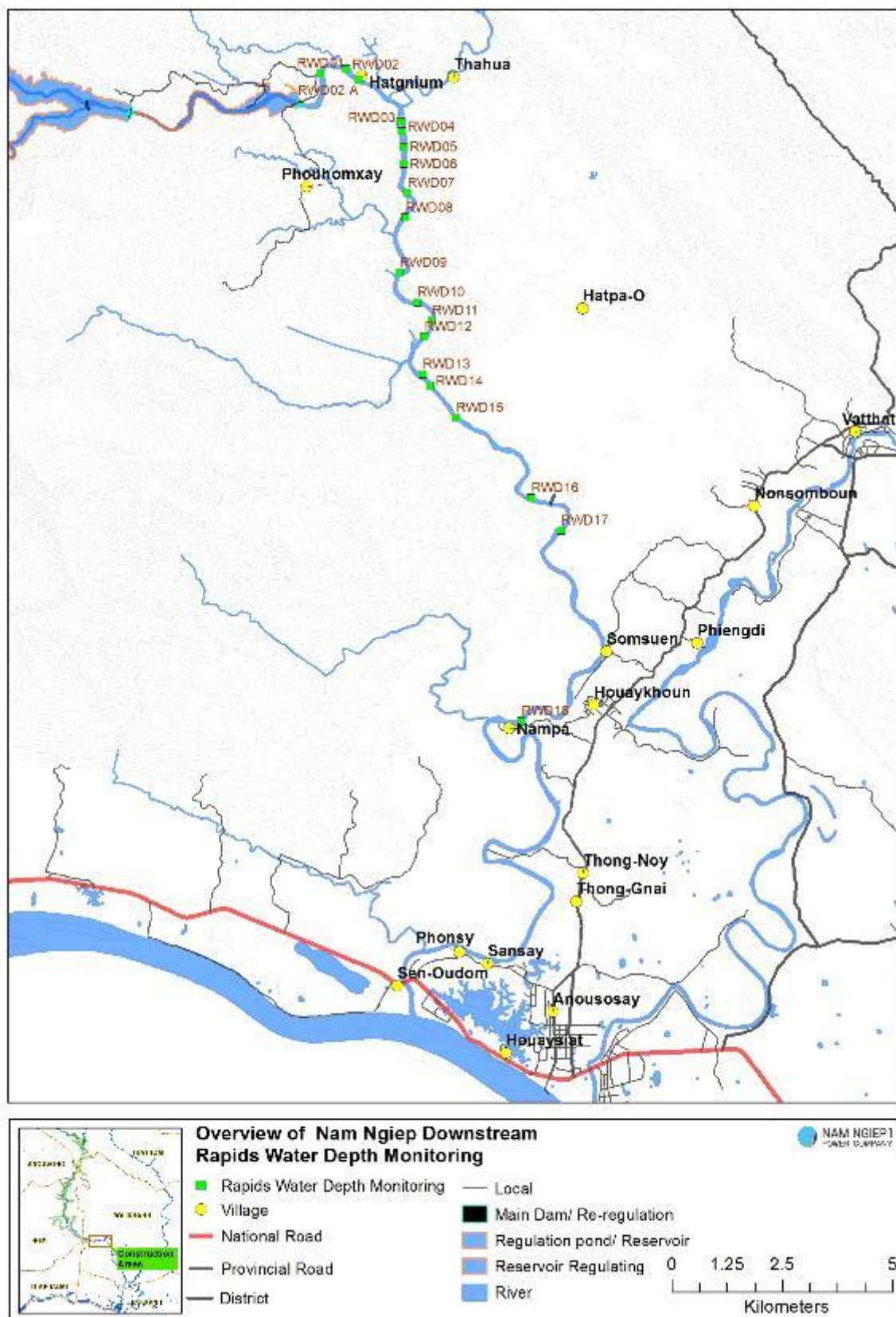
The results of the monitoring are presented in **Table 3-9**. During Q3 2021, during two monitoring missions, three measuring points located within 5.7 km downstream of the re-regulation dam had a depth of less than 0.5 m but none of them were found to be difficult to navigate. These two missions were carried out during times when the Re-regulation Dam discharge was less than 30 m³/s. All other missions were carried out during times with discharge above 30 m³/s. There were no complaints related to the water depth less than 0.5 m downstream the Re-regulation dam during the reporting period.

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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)
7-Jul-21	27.8	0.52	0.47	0.55	0.63	0.69	0.48	0.72	0.75	0.88	0.77	0.8	0.93	0.86	1.04	1.2	1.4	1.45	1.5	1.07
14-Jul-21	27.8	0.44	0.42	0.52	0.6	0.66	0.45	0.69	0.71	0.8	0.69	0.73	0.85	0.78	0.95	1.1	1.31	1.37	1.48	1.05
21-Jul-21	58.6	0.65	0.6	0.7	0.66	0.8	0.53	0.85	0.95	0.97	0.93	0.95	1.05	1	1.38	1.5	1.7	1.82	2.1	1.68
29-Jul-21	203	1.75	1.7	1.8	1.76	1.9	1.63	1.95	2.05	2.1	2.07	2.13	2.2	2.15	2.52	2.65	2.85	3	3.2	2.88
4-Aug-21	146.5	1.5	1.45	1.55	1.51	1.65	1.58	1.7	1.8	1.85	1.82	1.88	1.95	1.9	2.28	2.4	2.65	2.75	2.95	2.6
11-Aug-21	203	1.76	1.72	1.82	1.78	1.95	1.68	2	2.1	2.15	2.13	2.2	2.28	2.24	2.72	2.85	3.05	3.2	3.4	3.03
18-Aug-21	215	1.87	1.83	1.93	1.89	2.07	1.8	2.12	2.22	2.27	2.26	2.35	2.43	2.4	2.88	3.02	3.22	3.38	3.6	3.2
25-Aug-21	219	1.89	1.85	1.95	1.91	2.09	1.82	2.14	2.24	2.29	2.29	2.38	2.46	2.43	2.9	3.05	3.25	3.41	3.63	3.23
2-Sep-21	49.4	0.6	0.56	0.66	0.63	0.77	0.5	0.82	0.92	0.95	0.96	1	1.1	1.08	1.5	1.62	1.84	1.95	2.25	1.82
8-Sep-21	173.1	1.55	1.52	1.63	1.6	1.74	1.47	1.8	1.9	1.93	1.94	1.98	2.08	2.06	2.48	2.6	2.82	2.93	3.23	2.8
15-Sep-21	205.8	1.77	1.72	1.82	1.78	1.92	1.65	1.97	2.07	2.12	2.1	2.16	2.23	2.18	2.55	2.68	2.88	3.03	3.25	2.93

FIGURE 3-7: 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:

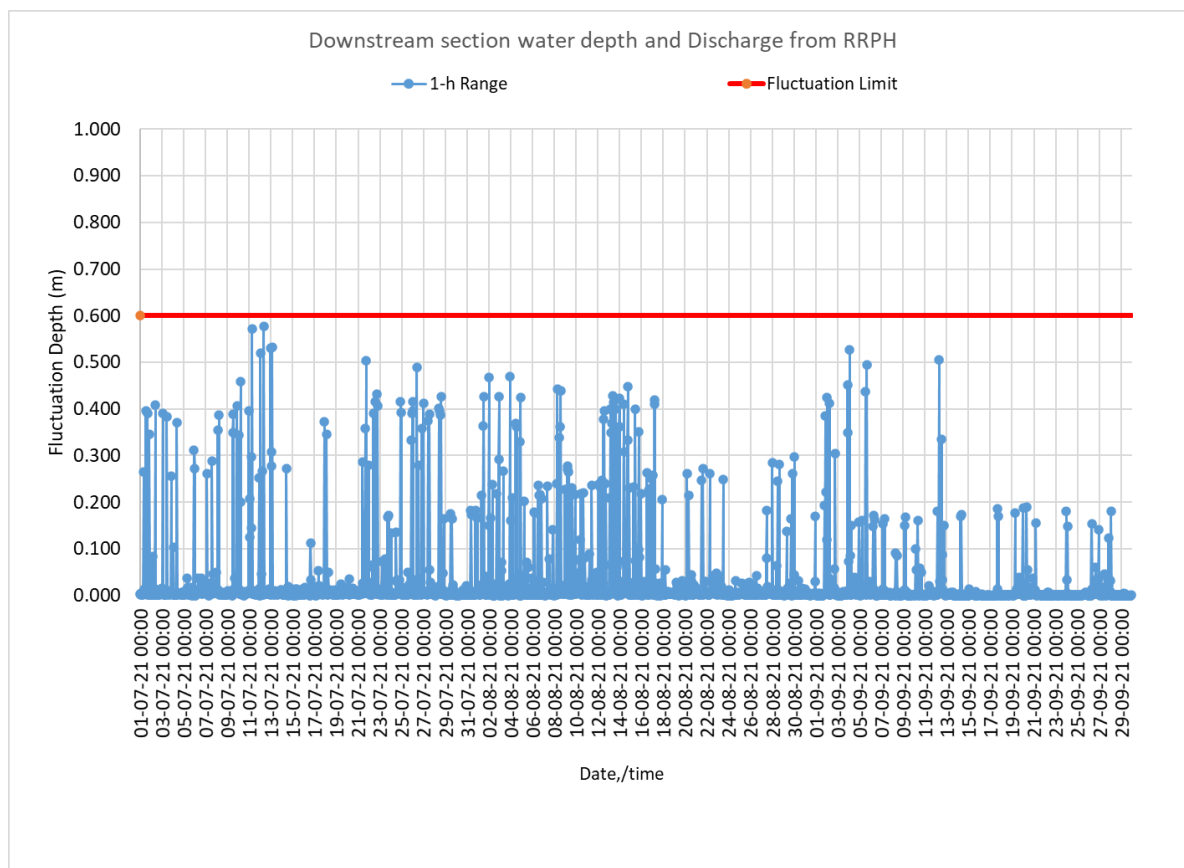
1. A requirement on the rate of change which is set at 0.6 m per hour.
2. Requirements on the range in fluctuations over 24-hour periods and 7-day periods respectively, which is set at a maximum of 1.7 m for both periods. In other words, the range requirements determine the maximum difference in stage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

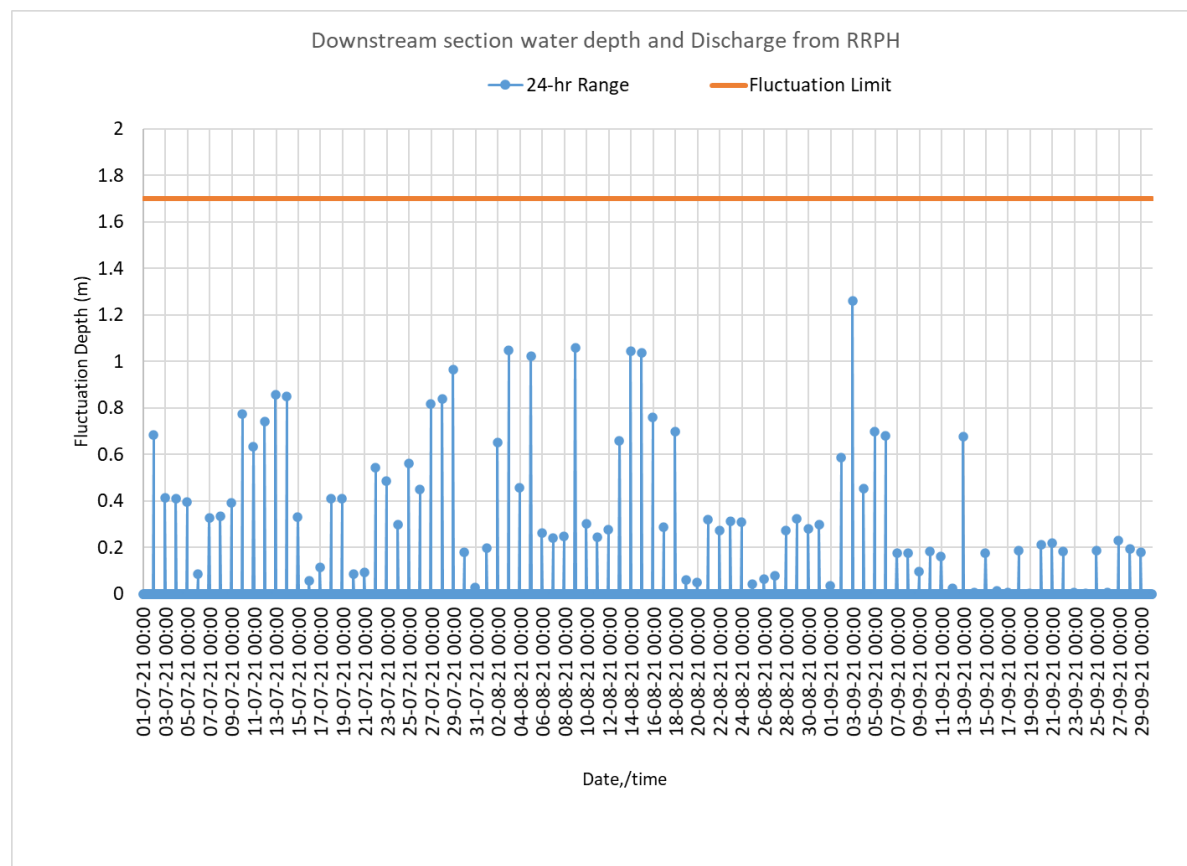
In practice, meeting stage height fluctuation EFRs are managed through controlling the rate of change in discharge from the re-regulation dam/powerhouse. This is done using established rating relationships between stage height and discharge, as set out in the Re-regulation dam operation manual. These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

During Q3 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 3-8**.

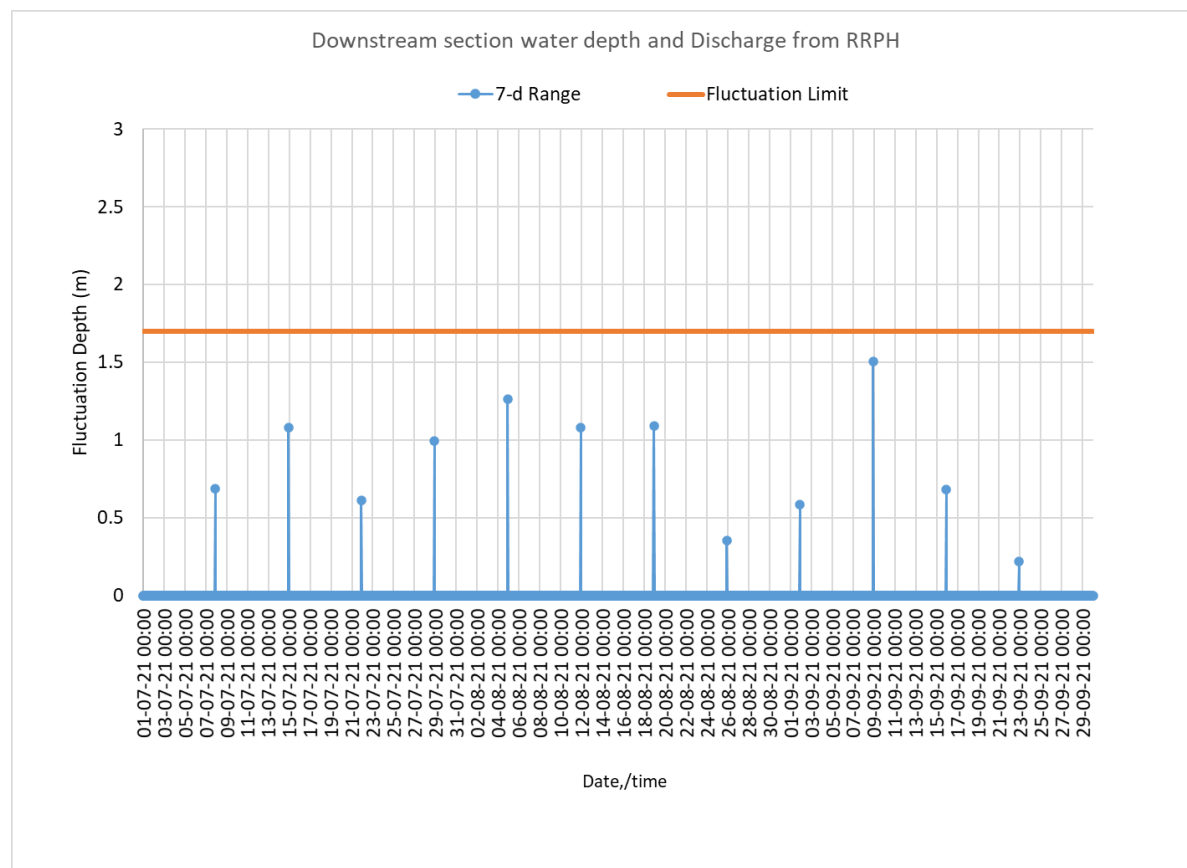
FIGURE 3-8: HOURLY STAGE HEIGHT FLUCTUATIONS DURING Q3 2021

During Q3 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 3-9**.

FIGURE 3-9: 24-HOUR STAGE HEIGHT DIFFERENCE (M) DURING Q3 2021

During Q3 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 3-10: 7-day Stage Height Difference (M) during Q3 2021**

FIGURE 3-10: 7-DAY STAGE HEIGHT DIFFERENCE (M) DURING Q3 2021

3.7 WATER QUALITY MONITORING

3.7.1 Surface Water (River) and Depth Profile Water Quality

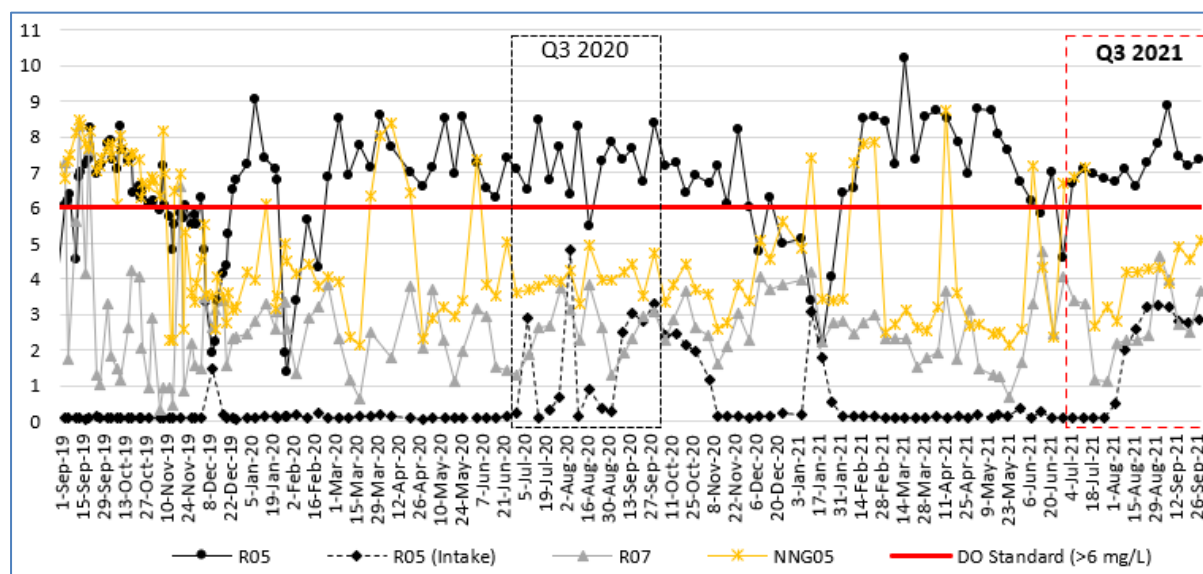
Descriptions of each monitoring station, surface water and depth profile water quality monitoring parameters, and the location of sampling map can be found in **Appendix 3** and all surface water quality data for Q3 2021 are listed in **Appendix 5.1**

Dissolved Oxygen (DO)

The results of DO measurements for the station immediately upstream of the main dam (R05 – surface and intake at 280 m asl.) and station R07 in the re-regulation dam (surface) and immediately downstream of the re-regulation dam (NNG05) are presented in **Figure 3-11**, and the full set of DO surface water quality data are shown in

Table 3-10. During the period from 01 July 2021 to 18 August 2021 Q3 2021, the thickness of the water column above the intake increased from about 25 m to 31 m, and then decreased to about [***] m at the end of the quarter.

The water temperature and DO depth profiles in the main reservoir at R05 during Q3 2020, Q2 2021 and Q3 2021 are presented in **Figure 3-12** to **Figure 3-14**.

FIGURE 3-11: DISSOLVED OXYGEN IMMEDIATELY UPSTREAM AND DOWNSTREAM OF THE MAIN DAM

Main Reservoir

Due to security concerns, water quality monitoring was suspended in upper reservoir (R01, R02 and R03) during Q3 2021.

Figure 3-14 presents the DO and water temperature depth profile timeseries in the Main Reservoir (R04 and R05) from September 2018 to September 2021, the graphs clearly show seasonal variations in water temperatures and a deepening of the thermocline during periods with cooler water leading to a corresponding deepening of the oxycline.

The depth profile monitoring during Q3 2021 indicates formation of oxyclines in the main reservoir at the monitored stations at varying depths.

When comparing Q3 2021 with Q3 2020, overall, Q3 2021 shows a slightly deeper thermocline and a corresponding deeper oxycline. The mean DO concentration in the upper 8 m was about 6.8 mg/L slightly higher than Q3 2020 but lower than Q2 2021.

At R05 (the station closest to the main dam), the mean DO concentration was 7.1 mg/L in the upper 7.0 m and generally varied between 6.0 mg/L to 8.9 mg/L. DO concentrations below 2 mg/L were measured at depths starting from 8.5 m to 13 m, but during the second half of the quarter the measurements indicate a characteristic zone at a depth interval from 15 m to 30 m with DO concentrations between 2 mg/L and 4 mg/L, which at the intake level had monthly mean DO concentrations that increased from 0.5 mg/L in July 2021, to 2.5 mg/L in August 2021 and 2.9 mg/L in September 2021. Anoxic levels were deepened from 15 m in July 2021 to 36 m in September 2021 corresponding to 11 m above the centre line of the intake in early July 2021 to 7 m below the centre line by the end of September 2021.

R04 showed a similar pattern of deepening of the thermocline as R05.

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 increased over the course of the quarter from a monthly average over the entire water column of 1.4 mg/L in July, 2.1 mg/L in August to 2.6 mg/L in September 2021. A similar pattern was found at R07. This corresponds well with the increase in DO concentrations at the intake level in the main reservoir although the DO concentrations in R06 and R07 occasionally were slightly higher than the corresponding DO concentrations at or near the intake level in R05. However, it should be noted that the actual flow patterns and movements of water from R05 to the intake is not known and is likely rather complex with circulation patterns or other complex water movements near the intake, which adds uncertainties to correlating water quality data at or near the intake depth at R05 in the main reservoir with water quality data in the Re-regulation Reservoir.

Nam Ngiep Upstream and Tributaries

The Nam Ngiep Upstream station, NNG01 and the reservoir tributaries Nam Chian (NCH01) had DO concentrations above 6 mg/L.

Downstream Stations

During Q3 2021, the discharge from the re-regulation dam mainly went through the turbine and occasionally through the gate (on 07 and 14 July 2021) or a combination of gate and turbine.

During 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.

At NNG05 about 1.8 km from the re-regulation dam, during periods only with turbine discharge, the DO concentrations increased from about 2.7 mg/L in July 2021 to about 4 mg/L by the end of September 2021. During periods with combined turbine and gate discharge, the DO concentrations varied between 3.2 mg/L and 5 mg/L - also with an increasing tendency over the period. During periods only with gate discharge, the DO concentrations at NNG05 were above 6 mg/L. Further downstream from the dam, the DO concentrations generally increased reaching about 5.2 mg/L at NNG07 located 25 km from the dam (not considering measurements during periods only with gate discharge).

No dead fish was observed in Nam Ngiep downstream during Q3 2021.

NNP1PC is in the process of compiling all monitoring information for the design of additional aeration system to improve the DO levels in Nam Ngiep River downstream the Re-regulation dam.

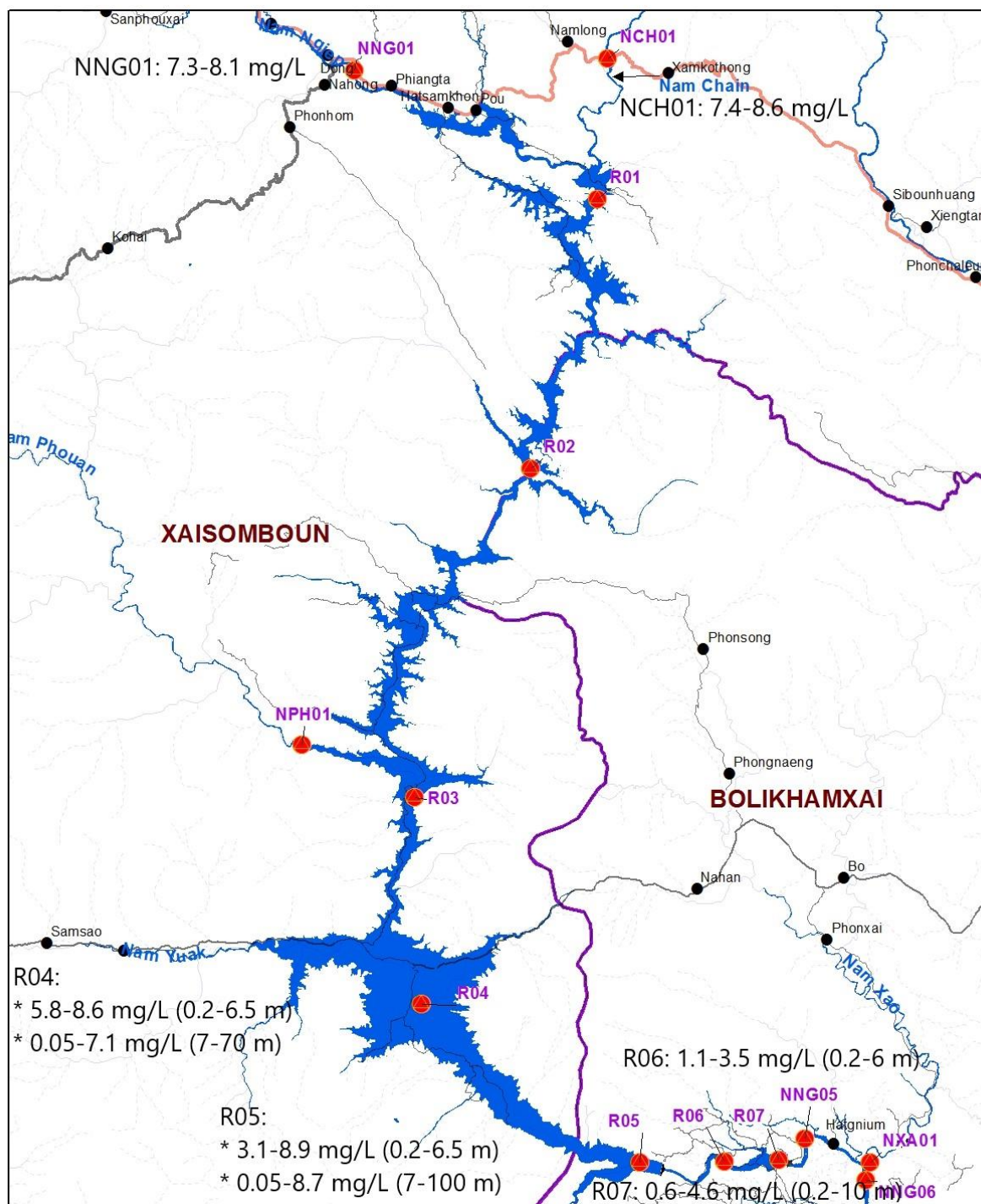
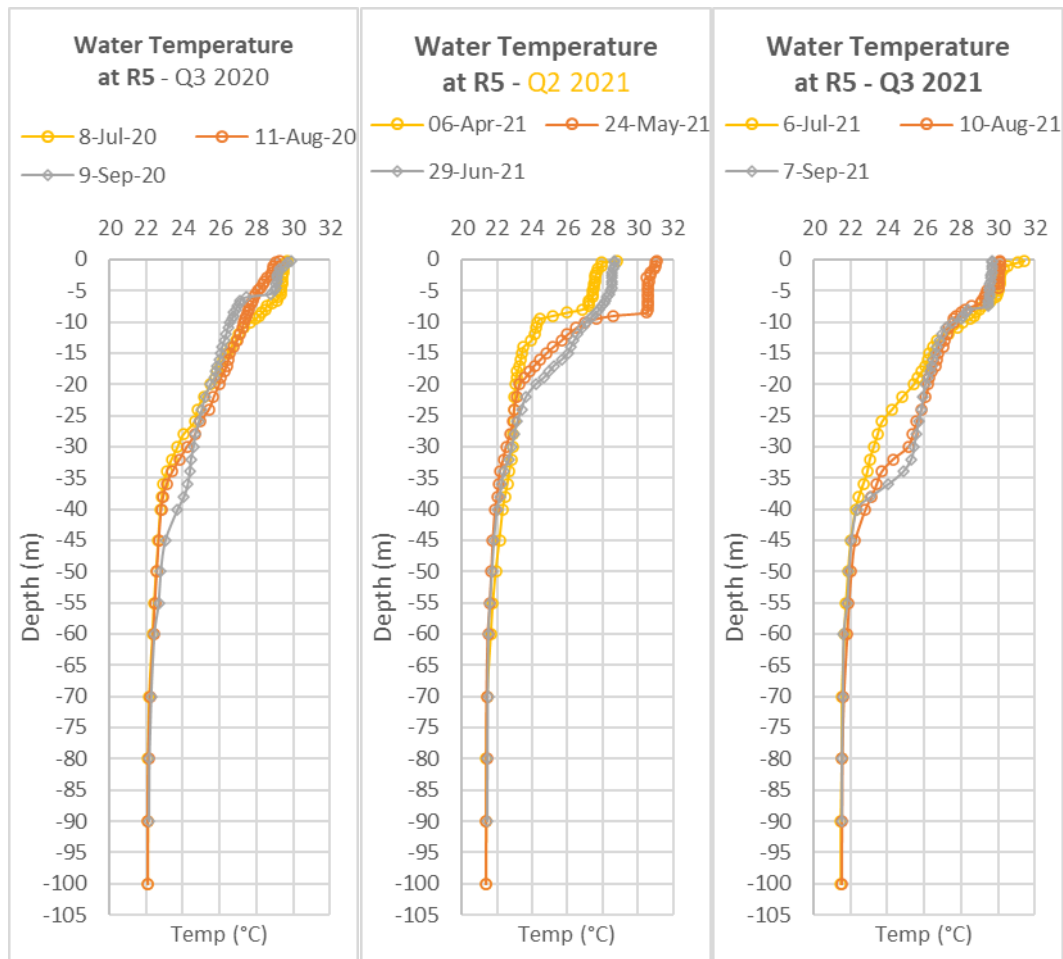
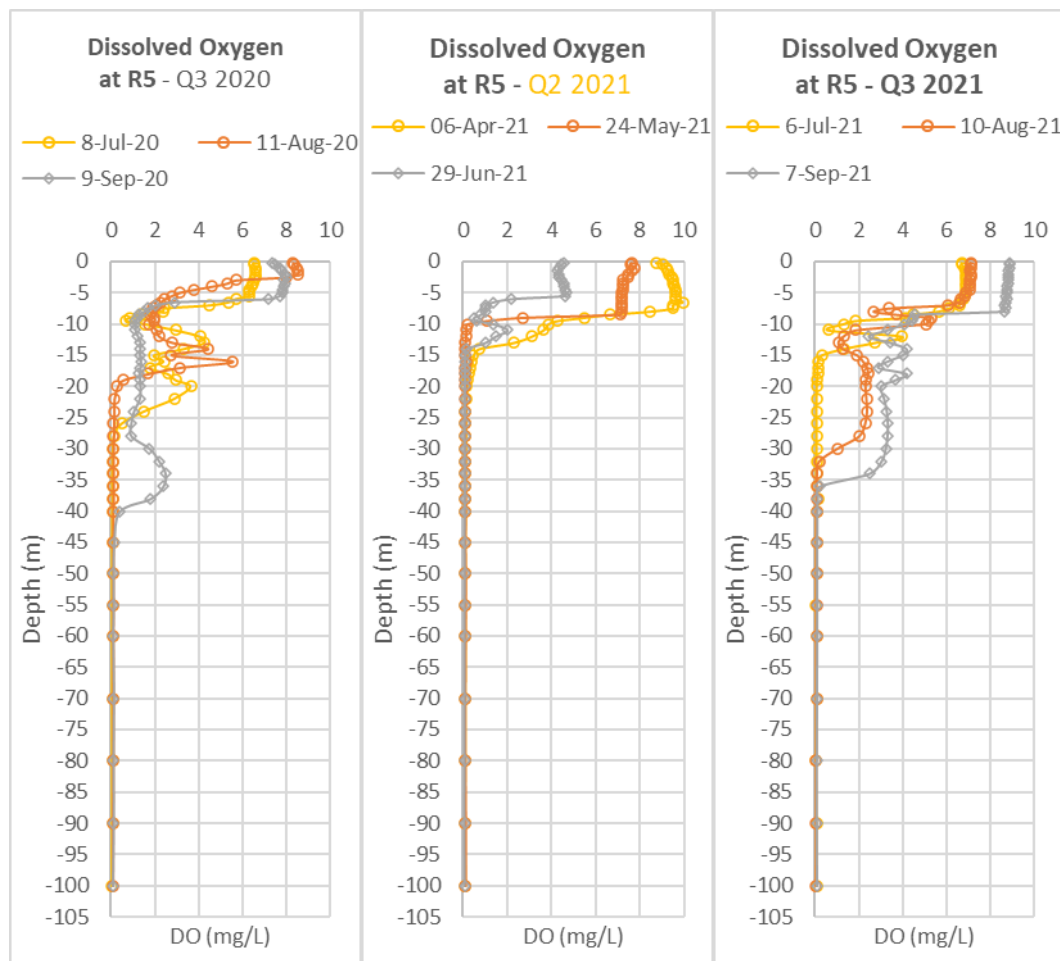
FIGURE 3-12: MAIN RESERVOIR DISSOLVED OXYGEN AT THE END OF Q3 2021

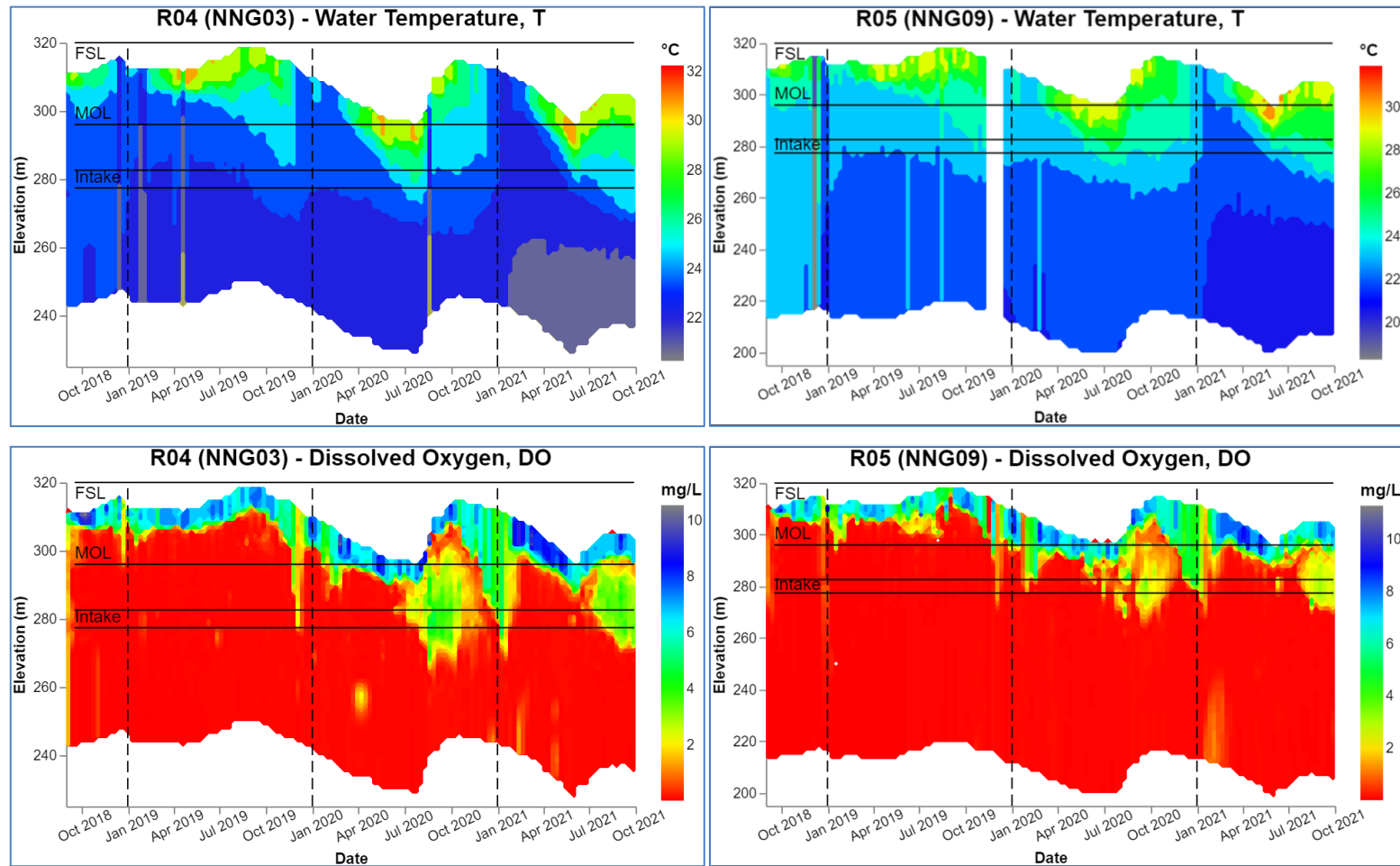
FIGURE 3-13: WATER TEMPERATURE AND DISSOLVED OXYGEN – DEPTH PROFILES IN THE MAIN RESERVOIR IMMEDIATELY UPSTREAM OF THE MAIN DAM (R05)





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



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TABLE 3-10: DO (MG/L) RESULTS OF SURFACE WATER IN MAIN RESERVOIR, RE-REGULATION RESERVOIR, NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q3 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
6-Jul-21					6.76	6.7										
7-Jul-21							1.37	3.4	6.86	6.48	5.94	6.06			6.06	6.57
12-Jul-21	7.27												7.4			
13-Jul-21					7.07	7.11										
14-Jul-21							2.38	3.28	7.14	6.62	6.68	6.45			6.21	6.69
20-Jul-21					6.94	6.96										
21-Jul-21							1.41	1.15	2.66	3.52	5.6	6.24			6.11	6.39
26-Jul-21	7.34												7.9			
27-Jul-21					7.12	6.82										
29-Jul-21							1.27	1.13	3.22	3.8	4.61	5.08			5.64	5.74
3-Aug-21					7.05	6.72										
4-Aug-21							2.26	2.17	2.81	3.83	5.28	5.8			6.21	6.52
9-Aug-21	7.66												8.08			
10-Aug-21					7.28	7.11										
11-Aug-21							1.91	2.28	4.21	4.41	6.06	5.45			5.17	6.87
17-Aug-21					6.96	6.6										
18-Aug-21							2.28	2.26	4.21	4.81	5.01	5.13			6.19	6.07
23-Aug-21	7.32												7.54			
24-Aug-21					6.92	7.25										
25-Aug-21							2.3	2.4	4.28	4.57	4.82	5.17			6.1	5.71
1-Sep-21					7.46	7.79										
2-Sep-21							3.29	4.66	4.34	4.59	5.59	5.43			6.14	6.2
6-Sep-21	7.79												8.24			
7-Sep-21					8.53	8.89										
8-Sep-21							2.51	3.98	3.87	4.06	5.03	5.52			6.17	6.08
13-Sep-21	8.07												8.61			

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Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
14-Sep-21					7.14	7.43										
15-Sep-21							2.79	2.7	4.9	5.06	6.1	6.18			7.2	7.04
21-Sep-21					6.83	7.18										
22-Sep-21							2.61	2.5	4.53							
28-Sep-21					6.85	7.34										
29-Sep-21							3.48	3.67	5.1							

Ammonia Nitrogen

Since 2014, the Ammonia Nitrogen concentrations in the Upper Nam Ngiep River and its tributaries have been below the detection limit (<0.2 mg/L). In Q3 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 Q3 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	NPH 01	NXA 01	NHS 01
12-Jul-21	<0.2												<0.2			
14-Jul-21					<0.2	<0.2										
14-Jul-21 Bottom					0.3	0.2										
13-Sep-21	<0.2												<0.2			
14-Sep-21					<0.2	<0.2										
14-Sep-21 Bottom					<0.2	<0.2										

Biochemical Oxygen Demand (BOD₅)

Since 2014, the Biochemical Oxygen Demand (BOD₅) values in the Nam Ngiep River and its tributaries have generally been below the detection limit (< 1 mg/L) with some measurements exceeding the National Surface Water Quality Standard (< 1.5 mg/L). The results for Q3 2021 indicate that the BOD₅ levels are in compliance with the standard. In addition, NNP1PC is in the process of compiling all monitoring information for the design of additional aeration system to improve the BOD level at downstream.

TABLE 3-12: BOD₅ (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q3 2021

(NATIONAL SURFACE WATER QUALITY STANDARD FOR BOD₅: <1.5 MG/L)

Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
12-Jul-21	<1												<1			
13-Jul-21					<1	<1										
13-Jul-21 Bottom					<1	<1										
14-Jul-21							<1	<1	<1	<1	<1	<1			<1	<1
9-Aug-21	<1												<1			
10-Aug-21					<1	<1										
10-Aug-21 Bottom					<1	<1										
11-Aug-21							<1	<1	<1	<1	<1	<1			<1	<1
14-Sep-21					<1	<1										
14-Sep-21 Bottom					<1	<1										
15-Sep-21							<1	<1	<1	<1	<1	<1			<1	<1

Chemical Oxygen Demand (COD)

The COD measurements in Q3 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 Q3 2021

(NATIONAL SURFACE WATER QUALITY STANDARD FOR COD: < 5 MG/L)

Station Code	NNG 01	R0 1	R0 2	R0 3	R0 4	R0 5	R06	R0 7	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
12-Jul-21	6.9												6.1			
14-Jul-21							7.7	9.3	6.1	6.5	6.1	15.8			<5	13.4
13-Sep-21	19.3												6.9			
15-Sep-21							16.1	12.9	6.4	<5	6.4	6.8			9.6	6.4

Faecal Coliform Bacteria

The results of the faecal coliform analyses in Q3 2021 are presented in **Table 3-14**.

Faecal coliform complied with the standard in all stations during the Q3 2021, except in August 2021 at Nam Ngiep Downstream (NNG07), Nam Xao [NXA01] and Nam Houay Soup [NHS01]). However, these results are unrelated to the Project.

TABLE 3-14: FAECAL COLIFORMS (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q3 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
12-Jul-21	170												920			
13-Jul-21					0	2										
13-Jul-21 Bottom					0	2										
14-Jul-21							49	11	79	170	220	240			220	94
9-Aug-21	350												170			
10-Aug-21					2	5										
10-Aug-21 Bottom					0	2										
11-Aug-21							17	49	21	140	1,600	350			1,600	1,600
13-Sep-21	540												350			
14-Sep-21					0	2										
14-Sep-21 Bottom					0	2										
15-Sep-21							27	22	8	27	49	33			47	47

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 Q3 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	NHS 01
12-Jul-21	540												1,600			
13-Jul-21					2	2										
14-Jul-21							130	49	130	920	280	350				
9-Aug-21	1,600												920			
10-Aug-21					5	14										
11-Aug-21							79	140	26	220	1,600	540			1,600	1,600
13-Sep-21	1,600												1,600			
14-Sep-21					0	5										
15-Sep-21							110	140	23	130	540	540			920	920

3.7.2 Compliance Monitoring of Effluents from Camps

A total of 03 sites discharged effluents in Q3 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 3-15**. Station EF14 has been connected with EF13 and treated as EF13.

Due to the COVID-19 preventive measures and country lockdown by the GOL and Thailand, water samples could not be transported to the laboratory in Thailand which means that analyses for COD, total nitrogen, ammonia-nitrogen, total phosphorus and oil & grease have not been carried out during the period from mid-July to end of August 2021.

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

The status of compliance as of 30 September 2021 can be summarized as follows:

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

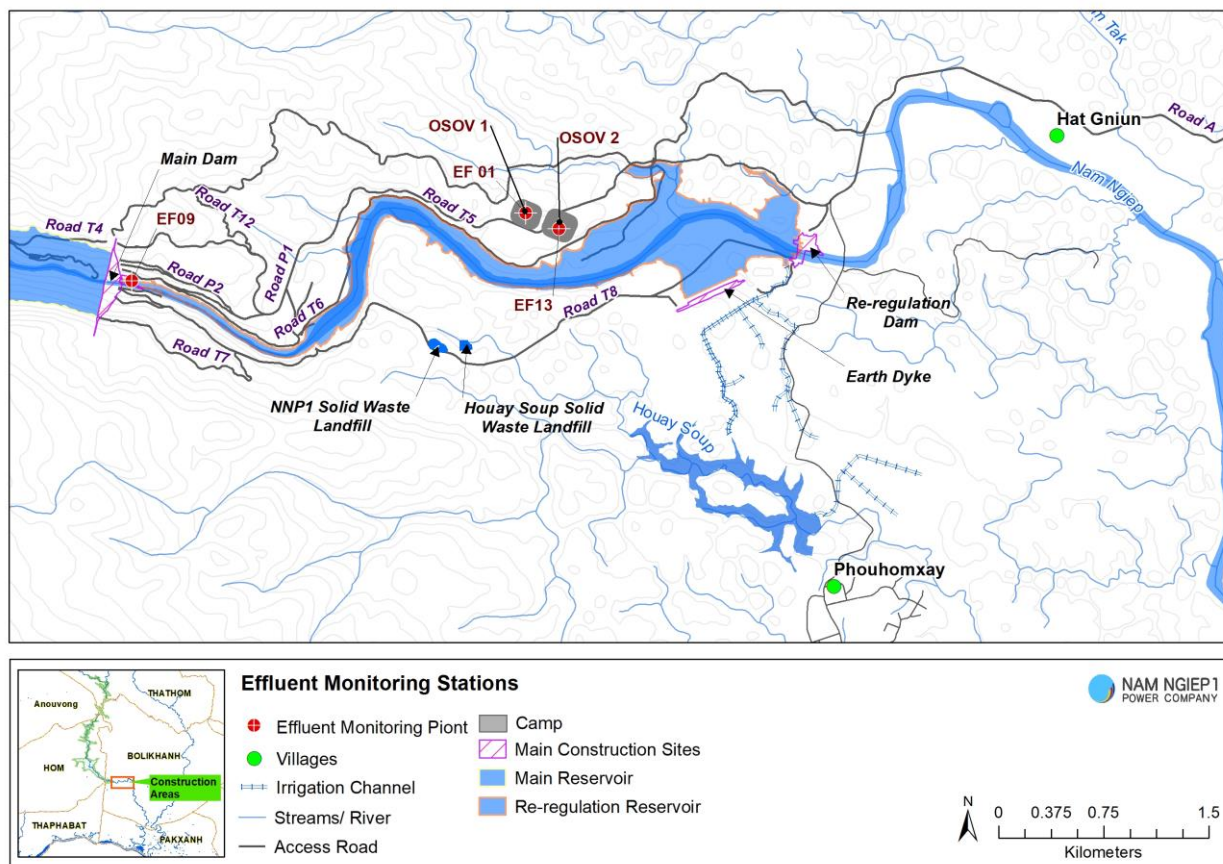
FIGURE 3-15: LOCATION OF EFFLUENT MONITORING POINTS

TABLE 3-16: RESULTS OF THE EFFLUENT WATER QUALITY MONITORING OF THE CAMPS IN Q3 2021 (NON-COMPLIANCE PARAMETERS ONLY)

		Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
08-Jul-21	TSS (mg/L)	<50	8.88	29	
22-Jul-21	TSS (mg/L)	<50	<5	41.79	58.89
02-Aug-21	TSS (mg/L)	<50	<5	137.5	58.06
16-Aug-21	TSS (mg/L)	<50	<5	13.11	15.76
10-Sep-21	TSS (mg/L)	<50	<5	7.6	10
14-Sep-21	TSS (mg/L)	<50	<5	6.8	6.02
08-Jul-21	BOD ₅ (mg/L)	<30	10.98	<6	
22-Jul-21	BOD ₅ (mg/L)	<30	<6	<6	34.92
02-Aug-21	BOD ₅ (mg/L)	<30	13.98	<6	<6
16-Aug-21	BOD ₅ (mg/L)	<30	<6	11.28	<6
10-Sep-21	BOD ₅ (mg/L)	<30	<6	9.21	<6
14-Sep-21	BOD ₅ (mg/L)	<30	<6	<6	<6
08-Jul-21	NH ₃ -N (mg/L)	<10.0	9	14.9	
22-Jul-21	NH ₃ -N (mg/L)	<10.0	n/a	n/a	n/a
02-Aug-21	NH ₃ -N (mg/L)	<10.0	n/a	n/a	n/a
16-Aug-21	NH ₃ -N (mg/L)	<10.0	n/a	n/a	n/a
10-Sep-21	NH ₃ -N (mg/L)	<10.0	<2	19.3	12.2
14-Sep-21	NH ₃ -N (mg/L)	<10.0	2.4	19	13
08-Jul-21	Total Nitrogen (mg/L)	<10.0	22.9	18.1	
22-Jul-21	Total Nitrogen (mg/L)	<10.0	n/a	n/a	n/a
02-Aug-21	Total Nitrogen (mg/L)	<10.0	n/a	n/a	n/a
16-Aug-21	Total Nitrogen (mg/L)	<10.0	n/a	n/a	n/a
10-Sep-21	Total Nitrogen (mg/L)	<10.0	0.91	20.6	13.3
14-Sep-21	Total Nitrogen (mg/L)	<10.0	3.21	20.9	13.9
08-Jul-21	Total Phosphorus (mg/L)	<2	0.8	1.28	
22-Jul-21	Total Phosphorus (mg/L)	<2	n/a	n/a	n/a
02-Aug-21	Total Phosphorus (mg/L)	<2	n/a	n/a	n/a
16-Aug-21	Total Phosphorus (mg/L)	<2	n/a	n/a	n/a
10-Sep-21	Total Phosphorus (mg/L)	<2	0.69	1.56	5.23
14-Sep-21	Total Phosphorus (mg/L)	<2	0.82	1.51	4.02
08-Jul-21	Faecal Coliform (MPN/100 mL)	<400	16000	0	
22-Jul-21	Faecal Coliform (MPN/100 mL)	<400	1600	0	0
02-Aug-21	Faecal Coliform (MPN/100 mL)	<400	1600	0	0
16-Aug-21	Faecal Coliform (MPN/100 mL)	<400	49	1400	0
10-Sep-21	Faecal Coliform (MPN/100 mL)	<400	920	9200	9200
14-Sep-21	Faecal Coliform (MPN/100 mL)	<400	210	0	0
08-Jul-21	Total coliform (MPN/100 mL)	<400	16000	0	
22-Jul-21	Total coliform (MPN/100 mL)	<400	1700	0	0
02-Aug-21	Total coliform (MPN/100 mL)	<400	1600	0	0
16-Aug-21	Total coliform (MPN/100 mL)	<400	110	2200	0
10-Sep-21	Total coliform (MPN/100 mL)	<400	1600	16000	16000
14-Sep-21	Total coliform (MPN/100 mL)	<400	3500	0	0

TABLE 3-17: COMPLIANCE STATUS OF EFFLUENT DISCHARGE FROM THE CAMPS IN Q3-2021

Site	ID	WWTS	Key Non-Compliance Issues ¹ in Q3-2021	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	<ul style="list-style-type: none"> - Total Nitrogen (<10 mg/L): Non-compliance in 1 out of 3 samplings. Q3 mean 9.0 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 4 out of 6 samplings. Q3 mean 3,396 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 5 out of 6 samplings. Q3 mean 4,085 MPN/100 mL. 	The Wastewater Treatment System Renovation was completed in end of August 2021 and now under implementation on system adjustment.
OSOV 2 (ESD Camp)	EF13	Septic tanks (kitchen and black water) and SBR with chlorination system.	<ul style="list-style-type: none"> - TSS (<50 mg/L): Non-compliance in 1 out of 6 samplings. Q3 mean 39.3 mg/L. - Ammonia-nitrogen (<10 mg/L): Non-compliance in all 3 samplings. Q3 mean 17.7 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in all 3 samplings. Q3 mean 19.8 mg/L. - Faecal coliform (<400 MPN/100 mL): Non-compliance in 2 out of 6 samplings. Q3 mean 1,766 MPN/100 mL. - Total coliform (<400 MPN/100 mL): Non-compliance in 2 out of 6 samplings. Q3 mean 3,033 MPN/100 mL. 	As above.

¹ The values in brackets indicate the applicable standard

Site	ID	WWTS	Key Non-Compliance Issues ¹ in Q3-2021	Corrective Actions
Main Powerhouse	EF19	Septic tanks (grey and black water), biofilm tank and chlorination tank.	<ul style="list-style-type: none">- TSS (<50 mg/L): Non-compliance in 2 out of 5 samplings. Q3 mean 29.7 mg/L.- BOD₅ (30 mg/L): Non-compliance in 1 out of 5 samplings. Q3 mean 11.7 mg/L.- Ammonia-nitrogen (<10 mg/L): Non-compliance in all 2 samplings. Q3 mean 12.6 mg/L.- Total nitrogen (<10 mg/L): Non-compliance in all 2 samplings. Q3 mean 13.6 mg/L.- Total Phosphorus (<2 mg/L): Non-compliance in all 2 samplings. Q3 mean 4.6 mg/L.- Faecal coliform (<400 MPN/100 mL): Non-compliance in 1 out of 5 samplings. Q3 mean 1,840 MPN/100 mL.- Total coliform (<400 MPN/100 mL): Non-compliance in 1 out of 5 samplings. Q3 mean 3,200 MPN/100 mL.	As above

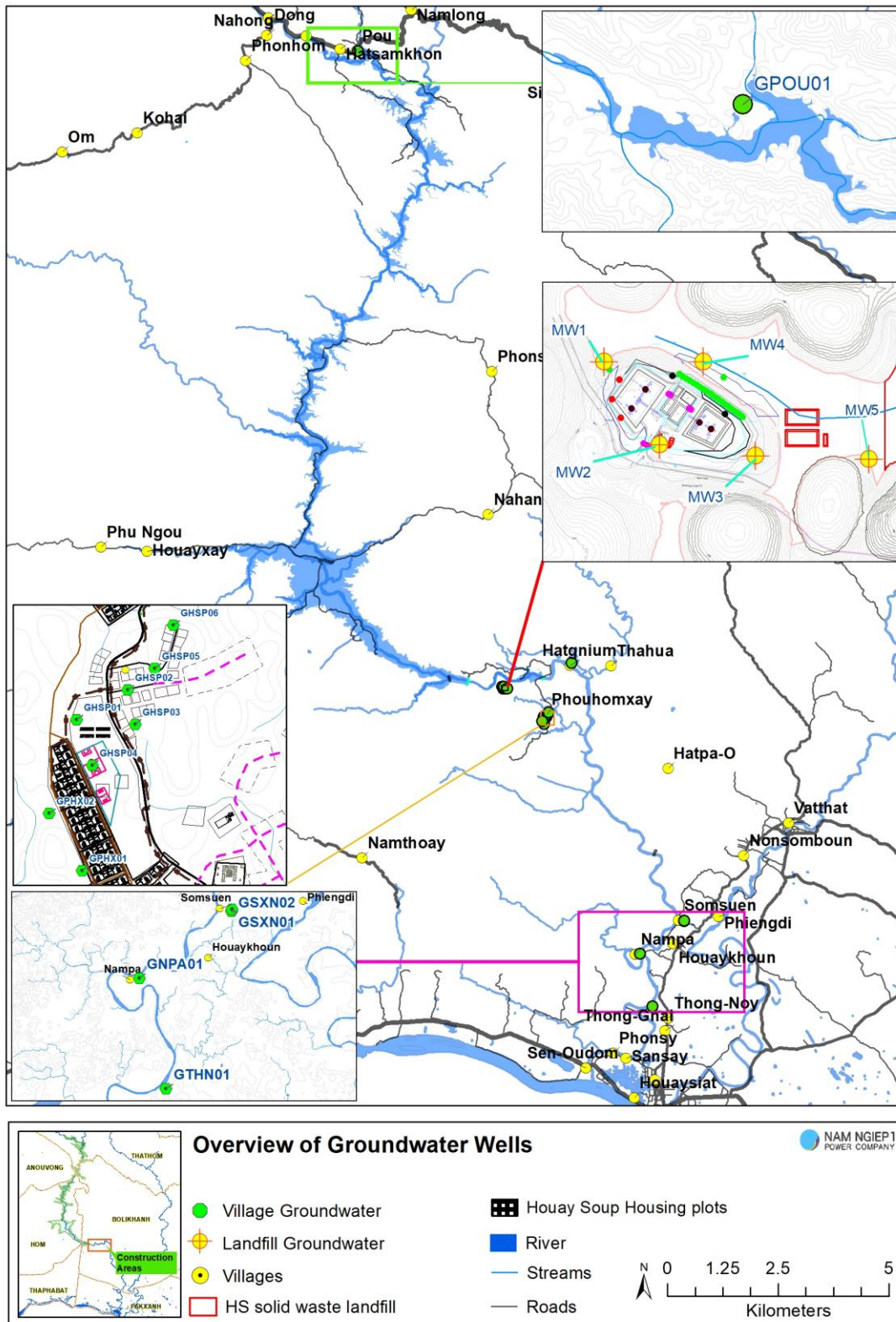
3.7.3 Groundwater Quality Monitoring

During Q3 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 ($\mu\text{S}/\text{cm}$), Temperature ($^{\circ}\text{C}$), 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 faecal coliform and *E.coli* bacteria (July and August 2021).

Somsuen Village: all monitored parameters complied with the standard.

NamPa Village: all monitored parameters complied with the standard, except faecal coliform and *E.coli* bacteria (July and August 2021).

Pou Village: all monitored parameters complied with the standard, except faecal coliform and *E.coli* in July 2021 sample, and pH (both July and August 2021 samples).

Phouhomxay Village: Non-compliance for faecal coliform and *E.coli* bacteria at GPHX01 and GPHX02 in July 2021 samples. 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.

During the Q3 2021, the landfill groundwater monitoring results were similar to the previous monitoring. The concentration of Lead (Pb) in the monitoring wells MW1, MW3, MW4 and MW5 exceeded the relevant groundwater quality standard. This is most likely the background (natural) level and is not attributed to the landfill. Lead has been detected in all wells from time to time both upstream and downstream the landfill. Furthermore, lead has not been detected in the leachate from the landfill treatment ponds and the waste pits. All ponds of both landfills are lined with a HDPE liner protecting the groundwater against infiltration of leachate; therefore, it is likely that the present of lead is due to the geology of the area. These boreholes are more than 50 m deep and not used by staff or villagers.

TABLE 3-18: LANDFILL GROUNDWATER QUALITY MONITORING RESULTS IN NNP1 AND HOUAY SOUP LANDFILLS

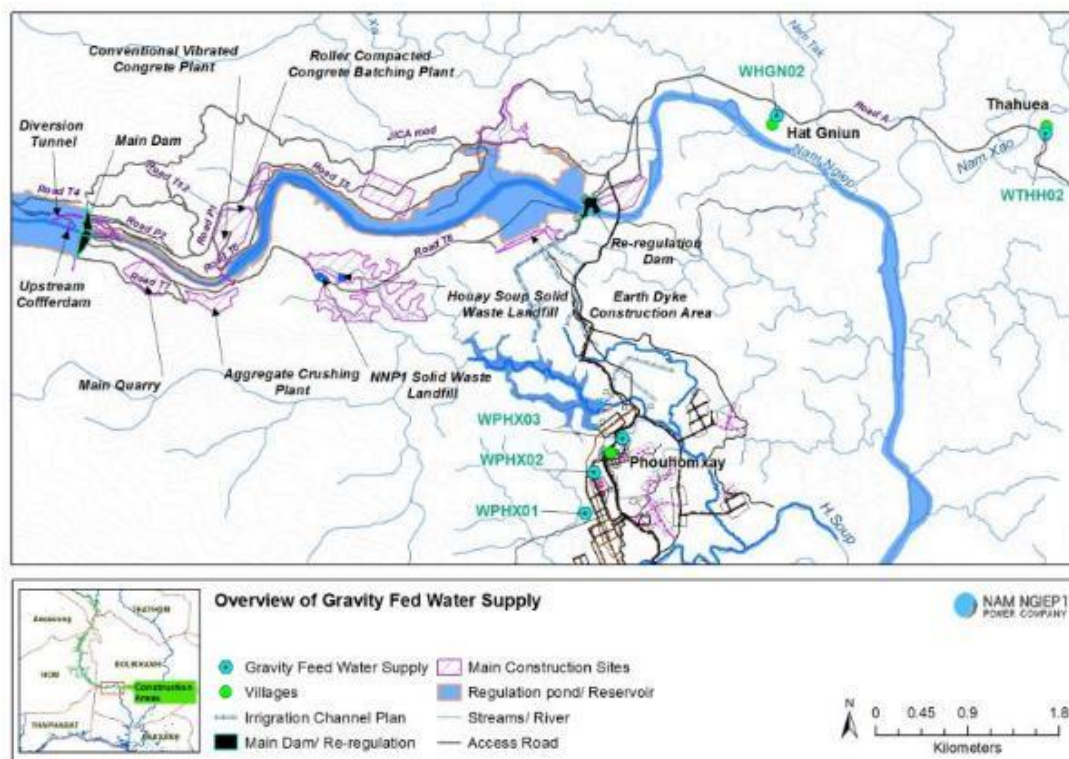
		Site Name	NNP1 Landfill			Houay Soup Landfill
		Station	MW1	MW3	MW4	MW5
Date	Parameter (Unit)	Guideline				
17-Sep-21	pH		6.1	6.23	5.47	6.02
17-Sep-21	Sat. DO (%)		40.3	13.5	17.4	22.5
17-Sep-21	DO (mg/l)		3.31	1.13	1.42	1.86
17-Sep-21	Conductivity (µS/cm)		163	199	62	86
17-Sep-21	Temperature (°C)		25.35	25.43	25.92	25.62
17-Sep-21	Lead (mg/l)	<0.01	0.03	1.07	0.346	0.178
17-Sep-21	Faecal Coliform (MPN/100ml)		540	17	920	0
17-Sep-21	<i>E.coli</i> Bacteria (MPN/100ml)		540	11	920	0
17-Sep-21	NH ₃ -N (mg/l)		<2	<2	<2	<2
17-Sep-21	Total Nitrogen (mg/l)		0.38	2.95	1.37	1.12

		Site Name	NNP1 Landfill			Houay Soup Landfill
		Station	MW1	MW3	MW4	MW5
Date	Parameter (Unit)	Guideline				
17-Sep-21	Copper (mg/l)	<1	0.004	0.008	0.007	0.003
17-Sep-21	Total Petroleum (mg/l)		<3	<3	<3	<3
17-Sep-21	Water level (m)		29.05	26.40	25.04	15.45

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 reporting period and selected results are shown in **Table 3-19**. The full set of data is presented in **Appendix 5.4**.

TABLE 3-19: THE GFWS MONITORING RESULT IN Q3 2021

Date	Parameter (Unit)	Site Name	Thaheua Village	Hatngiun Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
		Guideline				
20-Jul-21	<i>E. Coli</i> (MPN/100 mL)	0	17	26	70	79
06-Aug-21		0	79	79	49	23
20-Jul-21	Faecal coliform (MPN/100 mL)	0	17	26	70	79
06-Aug-21		0	79	79	49	33

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

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

Phouhomxay Village (WPHX02-tap water at primary school; and WPHX03-tap water at the villager's house): all parameters complied with the standard, except faecal coliform and *E.coli* in all Q3 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 treatment systems at NNP1 Project landfill and Houay Soup landfill are monitored to control the functioning of the treatment process and ensure compliance with effluent standards. The monitoring locations are presented in the **Figure 3-18**.

FIGURE 3-18: LANDFILL LEACHATE MONITORING LOCATION

The monitoring results in Q3 2021 indicate compliance with the applicable standards for monitored parameters, except pH (August 2021) and total coliform (Q3 2021) for NNP1 Project Landfill and pH (August 2021), faecal coliform (July 2021) and total coliform (Q3 2021) for Houay Soup Landfill. The monitoring data can be found in **Appendix 5.6**.

3.7.6 Compliance of water quality monitoring

During Q3 2021, the non-compliance issues relating to water quality monitoring were observed and summarized in **Table 3-20**.

TABLE 3-20: NON-COMPLIANCES RELATING TO WATER QUALITY MONITORING IN Q3 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)	<ul style="list-style-type: none"> - NNP1PC is still in the process of compiling 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. 	<ul style="list-style-type: none"> - A proper action to resolve the issue is not yet finalized. - A trial to operate the labyrinth spillway at the Re-regulation Dam will be implemented in November 2021 to see the improvement of DO values downstream and

No	Non-compliance Issues	Corrective Actions	Status
			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	<p>The systems were studied and NNP1PC management agreed on improvement and modification as follows:</p> <ul style="list-style-type: none"> - 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. 	<ul style="list-style-type: none"> - A contractor has been hired for WWTS improvement and modification. The works commenced in April 2021. - The work was completed by the end of August 2021 and the treatment system is under adjustment to ensure compliance with the effluent standards. - In Q4 2021, the monitoring frequency will be increased from fortnightly to weekly to obtain more data supporting for the system adjustment.
3	Groundwater quality monitored for the communities (Thong Noy, Somseun, and Pou Village) were not complied with the National Groundwater Quality Standard for drinking purpose on Faecal Coliform and <i>E.coli</i> parameters	<ul style="list-style-type: none"> - A full inspection of water supply systems in Somseun, 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 operation were provided to the involved parties. - The villagers were informed about the monitoring results and were advised to boil water before drinking in accordance with the Law on Hygiene, Disease Prevention and Health Promotion No 01/NA of 10 April 2001, which states that domestic water supply for daily use is not required to be readily drinkable but would 	<ul style="list-style-type: none"> - The villagers were advised/encouraged to boil water before drinking.

No	Non-compliance Issues	Corrective Actions	Status
		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 <i>E.coli</i> parameters	<ul style="list-style-type: none"> - Site observations were conducted during the routine water sampling, it was observed that livestock was roaming around the water intake areas and faeces from birds may also contribute to the presence of bacterial contamination. - The villagers were informed about the monitoring results and were advised to boil water before drinking. 	- The villagers generally use tap water for washing and cleaning, and were encouraged to boil water before drinking.
5	Non-compliance on lead parameter for landfill groundwater	<ul style="list-style-type: none"> - Lead has been detected in all wells from time to time both upstream and downstream the landfill. - Lead has not been detected in the leachate from the landfill treatment ponds and the waste pits. - The present of Lead due to the geology of the area. - These boreholes are used for landfill groundwater observation and they are not used by staff or villagers 	<ul style="list-style-type: none"> - Elevated levels of lead non-compliance with the standard. - Continue the monitoring.
6	Landfill Leachate Monitoring for NNP1 Project and Houay Soup Landfills were not complied with the Standard on total coliform parameters for Q3 2021.	<ul style="list-style-type: none"> - Site observations were conducted during the routine water sampling, it was observed that faeces of livestock inside the landfill areas and this may contribute to the presence of bacterial contamination while the faeces washed into the leachate ponds during the rains. - Regular maintenance of the fence to prevent livestock entering to the landfills. 	<ul style="list-style-type: none"> - Total coliform contamination in landfill leachate was decreased in October 2021. - Continue regular maintenance of perimeter fence to prevent livestock from entering

4 WATERSHED AND BIODIVERSITY MANAGEMENT

4.1 WATERSHED MANAGEMENT

4.1.1 Implementation of Watershed Management Plan

The construction of the sub-office for Xaysomboun Watershed and Reservoir Protection Office (WRPO) at Houay Xay Village, Hom District under the approved AIP2020 was completed in early September 2021 except for installation of the solar power system. However, Xaysomboun WRPO did not provide any update yet until end of September 2021 on the arrangement of their staffs to be based in the sub-office despite the follow-up from Environmental Management office (EMO) Team.

Xaysomboun planned to continue reservoir patrolling in September 2021, but the activity had to be postponed due to the new COVID-19 cases and enforcement of lockdown as part of COVID-19 measures.

EMO Team advised Bolikhamxay WRPO to use the remaining fund under the AIP2020 to implement activities planned under AIP2021 while waiting for the fund disbursement from Department of Forestry (DOF) of Ministry of Agriculture and Forestry (MAF). However, Bolikhamxay WRPO informed that they had no plan to implement any activities between August and September 2021.

NNP1 Environment and Social Division (ESD) management planned to organize a discussion with Xaysomboun Provincial Governor to follow up on the actions recommended during the meeting in March 2021 including the issue about fishery co-management. An official letter to request an appointment with Xaysomboun Provincial Governor was submitted to the Provincial Governor Secretary on 23 September 2021. The meeting is likely to be organized after the ease of COVID-19 lockdown in Xaysomboun Province.

EMO with assistance from a consultant finalized the assessment report on sustainable livelihood opportunities that include an action plan to strengthen local production and market access for local producers. A consultation meeting with Hom District on the action plan was organized on 25 August 2021. The meeting was chaired by Mr. Lucy Yorloryialong, Head of Xaysomboun PAFO/Vice Chairperson of Xaysomboun WRPC and co-chaired by Mr. Kongkham Southammavong, Vice District Governor of Hom/Watershed and Reservoir Protection Committee (WRPC) Member. There were 16 participants comprising representatives from Xaysomboun WRPO, Hom District Agriculture and Forestry Office (DAFO), District Commerce Office, District Lao Women Union, EMO, village authorities and representatives of local producers of Ban Phou Ngou and Houayxay. The key outcomes of the meeting include:

- The meeting participants principally agreed on the assessment and the proposed 5-year action plan. The action plan will contribute to the achievement of the district goals, objectives and plan of increasing agricultural production and the program of Hom District called “one district one product”.
- A close and regular monitoring and support from relevant offices at district level is important which will enable a smooth and effective implementation of the action plan. The meeting agreed that the implementation of the action plan shall be monitored and supervised by

WRPC and WRPO members at district level. Xaysomboun WRPO will request district authorities to appoint WRPO members at district level as a focal point.

- Land use zoning and agricultural land allocation for land access equity and land rights are essential. Improvement of the PLUP for Phou Ngou and Houayxay under the approved AIP 2020 of Xaysomboun WRPO needs to be carried out as soon as possible.

A meeting on the action plan to strengthen local production and market access for local producers in Thathom District was postponed until after the ease of COVID-19 lockdown.

NNP1 EMO had discussion with DAFO of Hom and Thathom about the agriculture extension services on 02 and 05 August 2021, respectively. The key outcomes from discussion are as follow:

- Pineapple, orange and upland rice farming are priorities for agricultural extension services in Hom district. However, Hom DAFO confirmed that they have limited resources and capacity to provide agricultural extension services to the watershed communities in Hom District;
- Thathom DAFO agreed and is willing to provide extension services in Ban Nanhong and Phonhom. The extension service will focus on: 1) improving the technical and management capacity of Kai Noi rice farmers and 2) introducing and promoting year-round organic vegetable garden in Ban Nanhong and Phonhom including improving the technical skills. Knowledge, information and farming techniques will be disseminated to all interested farmers. Thathom DAFO will prepare budget proposal for these activities and submit it to NNP1 EMO for consideration.

EMO Team have reviewed the draft plan of extension services of Thathom DAFO in September 2021. A follow-up discussion will be made during the meeting on the action plan to strengthen local production and market access for local producers in Thathom District.

EMO and the Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS) had further internal discussion on 14 September 2021 about the Term of References (TOR) for the biological monitoring surveys under the No Net Loss (NNL) program. It was concluded that there will be only camera trap survey, acoustic survey, Lao Newt and bent-toed gecko survey in the NNP1 watershed that these will be conducted in the last quarter of 2021. It was also noted that the implementation work is subject to the COVID-19 situation as well as agreement with Xaysomboun WRPO especially on the allowance for the field work that will be discussed with Xaysomboun Provincial Governor.

The training needs assessment on the capacity of WRPO and GOL staff related to land-use and forest management under component 1 of the approved WMP was postponed due to the extended COVID-19 measures.

4.1.2 Preparation of Annual Implementation Plan (AIP) 2021

The Bolikhamxay Watershed Management (WM) AIP2021 covering the implementation period from July to December 2021 was approved on 29 July 2021 and an official request for fund disbursement by DOF-MAF was submitted to NNP1PC on 10 August 2021. EMO team found that there was a miss-match between the official letter and the approved plan. The documents were further revised and re-submitted for the fund disbursement. NNP1PC transferred the Q3 2021 funds that covers the implementation activities for July-September 2021 to DOF-MAF on 13

September 2021. DOF-MAF is processing the fund transfer to Bolikhamxay WRPO account, which takes longer time due to requirement from National Treasury Department (NTD) of Ministry of Finance (MOF). Please refer to the detail on internal GOL process for fund transfer in the biodiversity section below.

Xaysomboun WRPO submitted their final plan to EMO on 30 August 2021. The plan was reviewed by EMO and the revised version was sent back to Xaysomboun WRPO for confirmation. The revised version of the plan was submitted to Asian Development Bank (ADB), Independent Advisory Panel (IAP), and Biodiversity Service Provider (BSP)- Wildlife Conservation Society (WCS) on 27 September 2021.

4.2 BIODIVERSITY OFFSET MANAGEMENT

4.2.1 Implementation of Biodiversity Offset Management Plan

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

a. Component 1 - Spatial Planning and Regulation

The site visit by the representatives of Nam Chouan-Nam Xang Biodiversity Offset Management Committee (NC-NX BOMC) and Biodiversity Offset Management Unit (BOMU) to settle the issue on the Totally Protection Zone (TPZ) boundary demarcation in the remaining village, Vangphieng Village of Viengthong district was organized from 29-31 August 2021. NC-NX BOMU is preparing the report and will share to EMO team afterwards.

The plan for reviewing and updating the land use plans of three NC-NX villages (Natan, Na Gngang, Vangphieng Villages) in Viengthong district under the AIP2021 is still being reviewed by NC-NX BOMU in September 2021. NC-NX BOMC and BOMU insisted to conduct the detailed land use planning down to household level. EMO team clarified that the primary objective of the of the activity is to review and update the land use categories classified by GOL only. However, if the allocated budget under AIP2021 is sufficient then the detailed land use planning at household level could be considered.

b. Component 2 – Enforcement

The fund disbursement from DOF-MAF to Bolikhamxay NC-NX BOMU for the approved AIP2021 is still being processed in September 2021, so no patrolling work was carried out from August to September 2021. Some of the patrol team members were assigned in the patrol sub-station to safeguard the facility and make observations nearby the sub-station. The results of patrolling in July 2021 are as follow:

Team	Patrolling Area/distance	Observations/Actions Taken
1	25 July – 13 August 2021 Totally Protected Zone (TPZ) highest priority area including Houy Payang and north of Nam San Mountain ridges.	25 July – 13 August 2021 The team found a bullet close to Houy Payang, observed two hunting dogs at Nam San (inside TPZ) and heard gunshots (Home-made gun) in two locations close to Nam Chouan (Inside TPZ highest priority area).

Team	Patrolling Area/distance	Observations/Actions Taken
	(14 days covering 43.93 km distance of forest and 18.78 km distance of road patrol)	
2	14 July – 3 August 2021 Nam Houng TPZ high priority area including Nam Houng, Nam Kha Gna, Nam Tong, Houy Yateng and ridges. (13 days covering 50.84 km distance of forest patrol)	14 July – 3 August 2021 The team encountered and destroyed a fresh fishing camp located at Nam Houng and observed five buffalos at the upstream of Nam Kha Gna (inside Controlled Used Zone (CUZ)).
3	14 July – 3 August 2021 TPZ high priority area including Nam Ma, Nam Sa Nga and Nam Kapong. (13 days covering 64.39 km distance of forest patrol)	14 July – 3 August 2021 The team destroyed an old fishing camp located at Nam Ma and a fresh hunting camp at Nam Kapong. They also observed three buffalos at Nam Ma (inside CUZ).
4	14 July – 3 August 2021 TPZ highest priority area including Nam Sone, Houy Pong and mountain ridges. (13 days covering 35.21 km distance of forest patrol and 12.72 km distance of road patrol)	14 July – 3 August 2021 The team did not encounter any threats to biodiversity during patrolling.

FIGURE 4-1: MAP OF PATROLLING TRACK IN JULY 2021

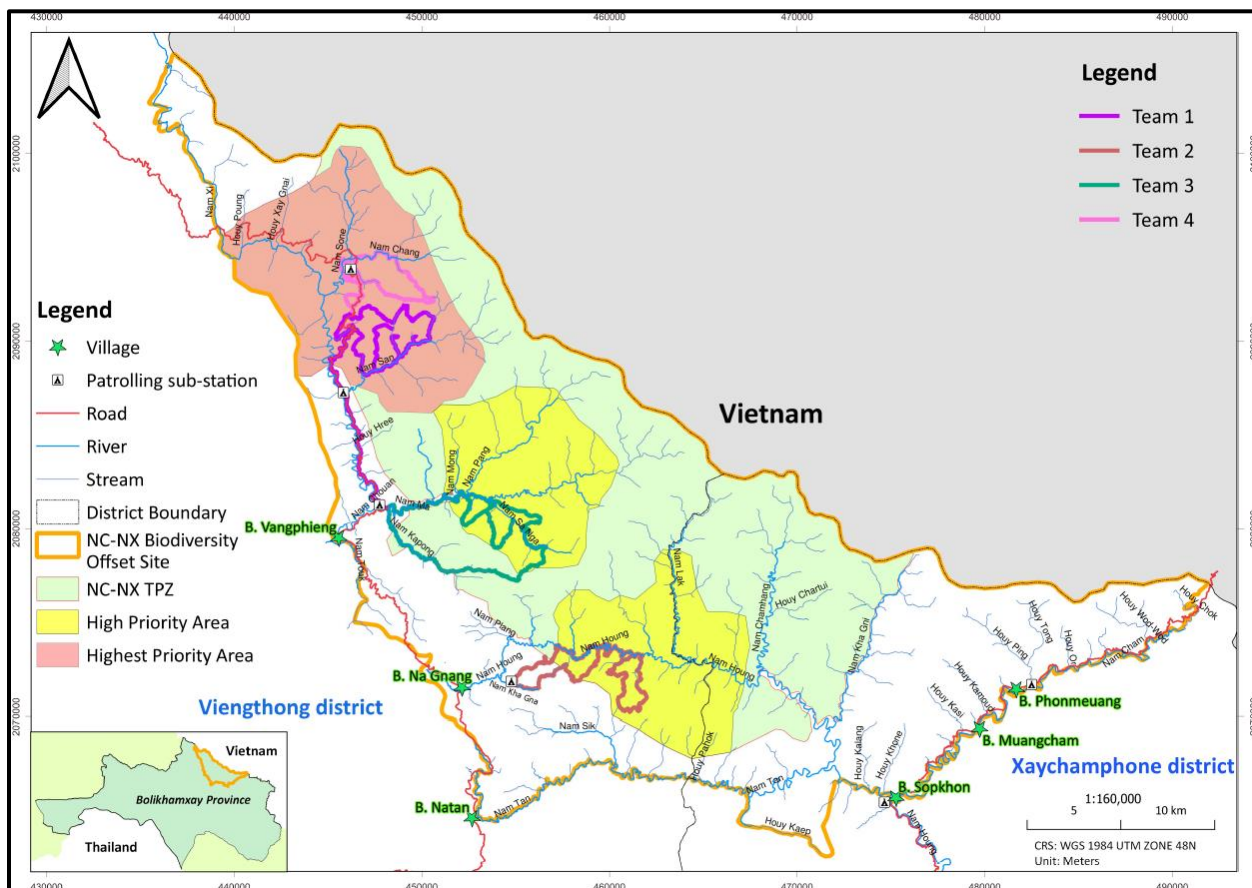


FIGURE 4-2: MAP OF THREATS IN JULY 2021

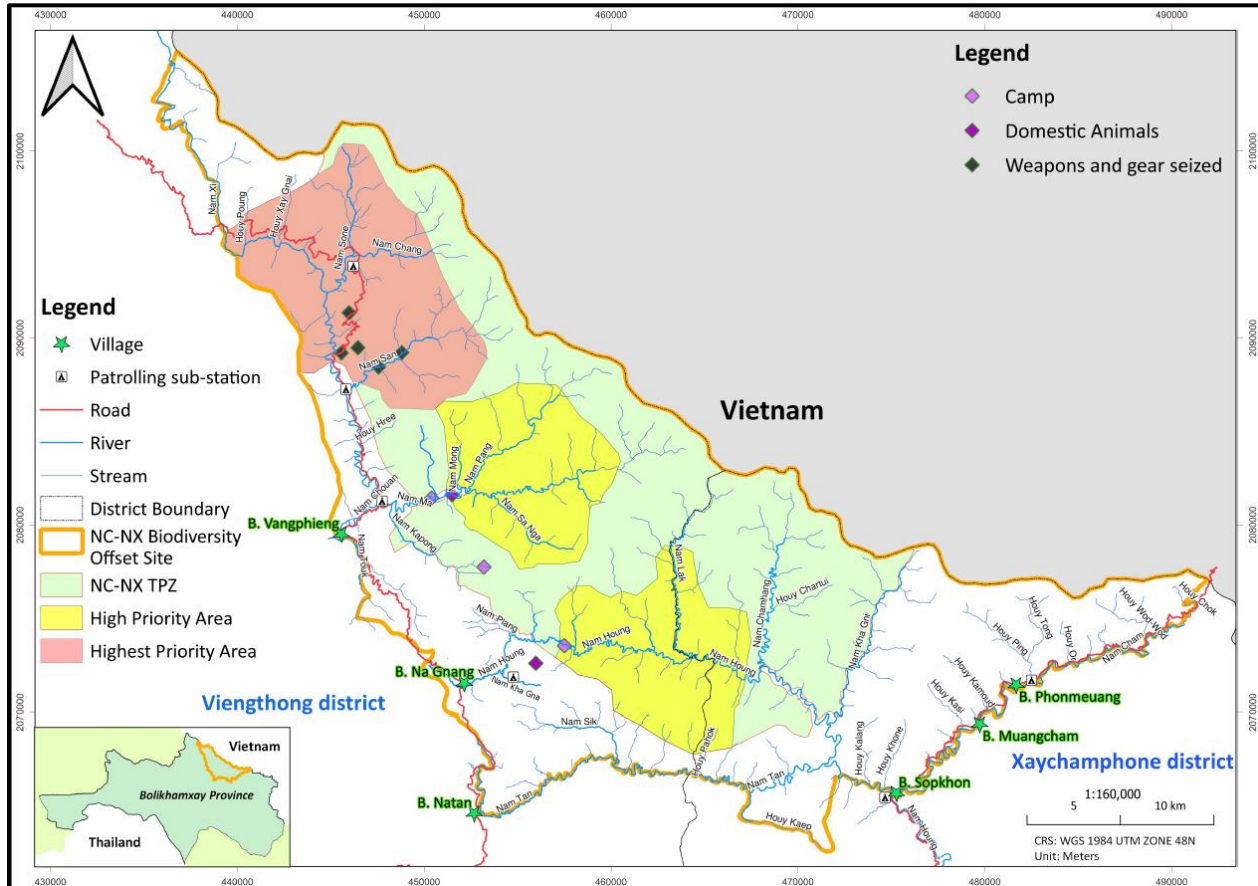


FIGURE 4-3: FRESH FISHING CAMP FOUND BY TEAM 2 AT NAM HOUNG IN JULY 2021



FIGURE 4-4: OLD FISHING CAMP FOUND BY TEAM 3 AT NAM MA IN JULY 2021



c. Component 3 – Conservation Outreach

Biodiversity Service Provider (BSP)-Wildlife Conservation Society (WCS) presented the schedule of the outreach activities in 2021 and the strategy outline during the monthly meeting on 19 August 2021. BSP-WCS continued to finalize the outreach strategy document in September 2021. The outreach activity will be implemented after NC-NX BOMU has received the funds under the approved AIP2021 from DOF-MAF.

d. Component 4 – Conservation linked livelihood

A further discussion with Bolikhamxay Province Agriculture and Forestry Office (PAFO) on the NC-NX Community Development Plan (CDP) was organized on 2 September 2021. The Minutes of Meeting (MOM) was finalized on 29 September 2021 as reference for CDP approval. It should be noted that the CDP activities have already been incorporated into the NC-NX Biodiversity Offset Management (BOM) AIP2021.

The third snare removal activity for July 2021 was undertaken between 23 July and 07 August 2021. No snares were detected during the field activity. The snare removal program was discussed during the monthly meeting on 19 August 2021 for improvement. BSP-WCS provided a snare removal SMART training to NC-NX BOMU and NNP1 EMO staffs at NC-NX BOMU office in Viengthong District on 1 September 2021. The SMART database was further revised by BSP. The snare removal activity was postponed until NC-NX BOMU has received the funds under the approved AIP2021 from DOF-MAF.

e. Component 6 – Biological Monitoring

NNP1 provided comments to ADB about the Term of References (TORs) for biological monitoring surveys on 3 August 2021 and some of the comments were clarified by BSP-WCS on 4 August 2021. BSP-WCS and NNP1 also provided comments on the draft TOR of NNL auditor on 28 July and 3 August 2021 respectively. ADB provided clarification on 18 August 2021.

NNP1, ADB, and BSP-WCS had further discussion about TORs and expert engagement during the 2nd Memorandum of Understanding (MOU) meeting between NNP1, ADB, and BSP-WCS on 8 September 2021. A further technical discussion was also organized between EMO and BSP-WCS on 14 September 2021. The TORs for the surveys were finalized and it was agreed that only three surveys will be conducted in the last quarter of 2021 in the NNP1 watershed area which are camera-trap, acoustic, and Lao Newt and Bent-toed gecko survey. NNP1 is processing the procurement of experts to support the Lao Newt and Bent-toed gecko survey.

4.2.2 Preparation of Annual Implementation Plan (AIP) 2021

The Bolikhamxay NC-NX Biodiversity Offset Management (BOM) AIP2021 covering the implementation period between July and December 2021 was approved on 3 August 2021 and an official request for fund disbursement by DOF-MAF was submitted to NNP1PC on 10 August 2021. However, NNP1 EMO found that there was a miss-match between the official letter and the approved plan. The documents were revised and re-submitted for fund disbursement process. NNP1PC transferred the Q3 2021 fund that covers the implementation activities between July-September 2021 to DOF-MAF on 26 August 2021.

NC-NX BOMU informed EMO Team on 23 September 2021 that the Q3 AIP2021 funds were still being processed at National Treasury Department (NTD) of Ministry of Finance (MOF). DOF-MAF further clarified on 24 September 2021 that NTD implements a strict process on the fund disbursement to projects due to reduced GOL Tax revenues. NTD requested the projects only to manage the funds for implementation of activities while the funds for procurement of equipment/service will be managed by NTD. DOF-MAF has informed the relevant committees to communicate with their provincial management to obtain the acknowledgement from the Provincial Treasury Department on the procurement practices managed by the project. This acknowledgement will be used as reference to request NTD consideration so that the procurement can be continuously managed by the project at provincial level. If NTD accepts the acknowledgement/explanation from the Provincial Treasury Department then then the funds could be fully transferred to BOMU.

5 FISHERY MONITORING

Three species groups and two species dominated the fish catch by weight in Q3 2021 ²as listed in **Table 5-1**. All species are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species³.

TABLE 5-1: FISH SPECIES DOMINATING THE FISH CATCH IN Q3 2021

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Mastacembelus armatus, Mastacembelus favus</i>	ປາຫຼາດ	276.9	LC
<i>Hampala dispar, Hampala macrolepidota</i>	ປາສຸດ	255.8	LC
<i>Oreochromis niloticus</i>	ປານົນ	250.1	LC
<i>Barbonymus gonionotus, Hypsibarbus malcomi, Hypsibarbus vernayi, Hypsibarbus wetmorei</i>	ປາປາກ	203.5	LC
<i>Channa striata</i>	ປາຄໍ້	171	LC

² Q3 2021 is calculated for data of July and August 2021 (without September 2021) due to COVID-19 lockdown.

³ The IUCN Red List of Threatened Species is the world's most comprehensive inventory and classification of threatened species. The Red List classifies species into nine groups: Extinct (EX), Extinct in the wild (EW), Critically endangered (CR), Endangered (EN), Vulnerable (VU), Near threatened (NT), Least concern (LC), Data deficient (DD), and Not Evaluated (NE). The term "Threatened" includes Critically Endangered, Endangered, and Vulnerable.

The recorded catch of Threatened species (IUCN Red List classification) in Q3 2021 are presented in **Table 5-2**. The list includes four species that are classified as Vulnerable species (VU) in Q3 2021

Table 5-2: Threatened Species of Q3 2021 Fish Catch

Species	Lao Name	Fish Catch (kg)	IUCN Red List Classification
<i>Cirrhinus cirrhosus</i>	ປາແກງ/ປານວນຈັນ	13	VU
<i>Cyprinus carpio</i>	ປາໄນ	116.4	VU
<i>Scaphognathops bandanensis</i>	ປາວຽນໄຟ/ປາປຽນ	27.6	VU
<i>Tor sinensis</i>	ປາແດງ	107.7	VU

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

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

Species	Q3 2015	Q4 2015	Q1 2016	Q2 2016	Q3 2016	Q4 2016	Q1 2017	Q2 2017	Q3 2017	Q4 2017	Q1 2018	Q2 2018	Q3 2018	Q4 2018	Q1 2019	Q2 2019	Q3 2019	Q4 2019	Q1 2020	Q2 2020	Q3 2020	Q4 2020	Q1 2021	Q2 2021	Q3 2021
<i>Bangana behri</i>	+	+	+	+	+	+	+	+	+			+	+	+		+									
<i>Cirrhinus cirrhosus</i>	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+		+	+	+		+		+
<i>Cyprinus carpio</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+
<i>Datnioides undecimradiatus</i> *																+									
<i>Epalzeorhynchus munense</i>												+													
<i>Luciocyprinus striolatus</i>	+	+	+	+			+	+	+	+			+	+											
<i>Pangasianodon hypophthalmus</i>	+																								
<i>Probarbus jullieni</i>	+	+	+			+		+	+	+		+		+			+	+			+	+			
<i>Probarbus labeamajor</i>				+	+			+																	
<i>Scaphognathops bandanensis</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
<i>Tor sinensis</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+

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

Species abundance and occurrence is based on the 7-day reported catch from the DCL survey in Q3 2021. The catch is divided in 3 areas including above the main dam, below the main dam and Mekong area. Main biodiversity indicators in Q3 2021 for above dam, below dam and Mekong area are presented in **Table 5-4** to explain the diversity of fish. This diversity index (Shannon) explains that the high value means high diversity.

TABLE 5-4: MAIN BIODIVERSITY INDICATORS FOR Q3 2021

Biodiversity Indicators	Mekong	Below dam	Above dam
Total species and groups	40	44	41
Single species	34	31	26
Species groups	6	13	15
Top 15 species (% total catch weight)	88.55%	78.31%	93.59%

Biodiversity Indicators	Mekong	Below dam	Above dam
Proportion for species groups	12.58%	55.83%	47.83%
Diversity index (Shannon)	2.8495	3.0795	2.7016

The mean daily fish catch per household from July 2015 to August 2021 is displayed in **Figure 5-1** and the mean fish catch per household per fishing day for Q3 from 2015 to 2021 are shown in **Table 5-5**.

FIGURE 5-1: MEAN DAILY FISH CATCH PER HOUSEHOLD FROM JULY 2015 TO AUGUST 2021

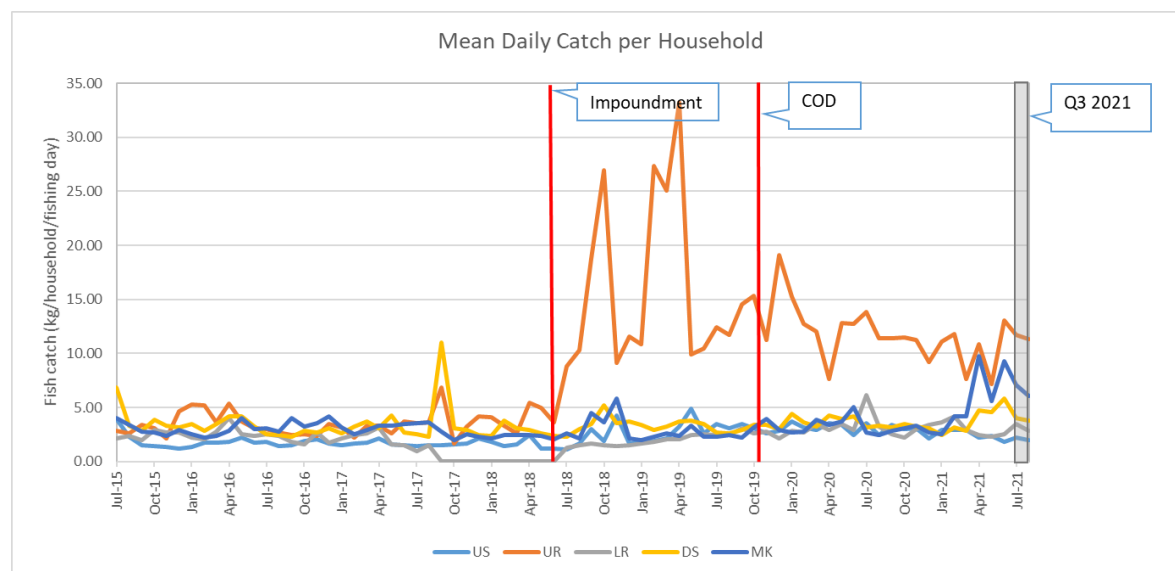


TABLE 5-5: MEAN DAILY FISH CATCH PER HOUSEHOLD FOR Q3 FROM 2015 TO 2021

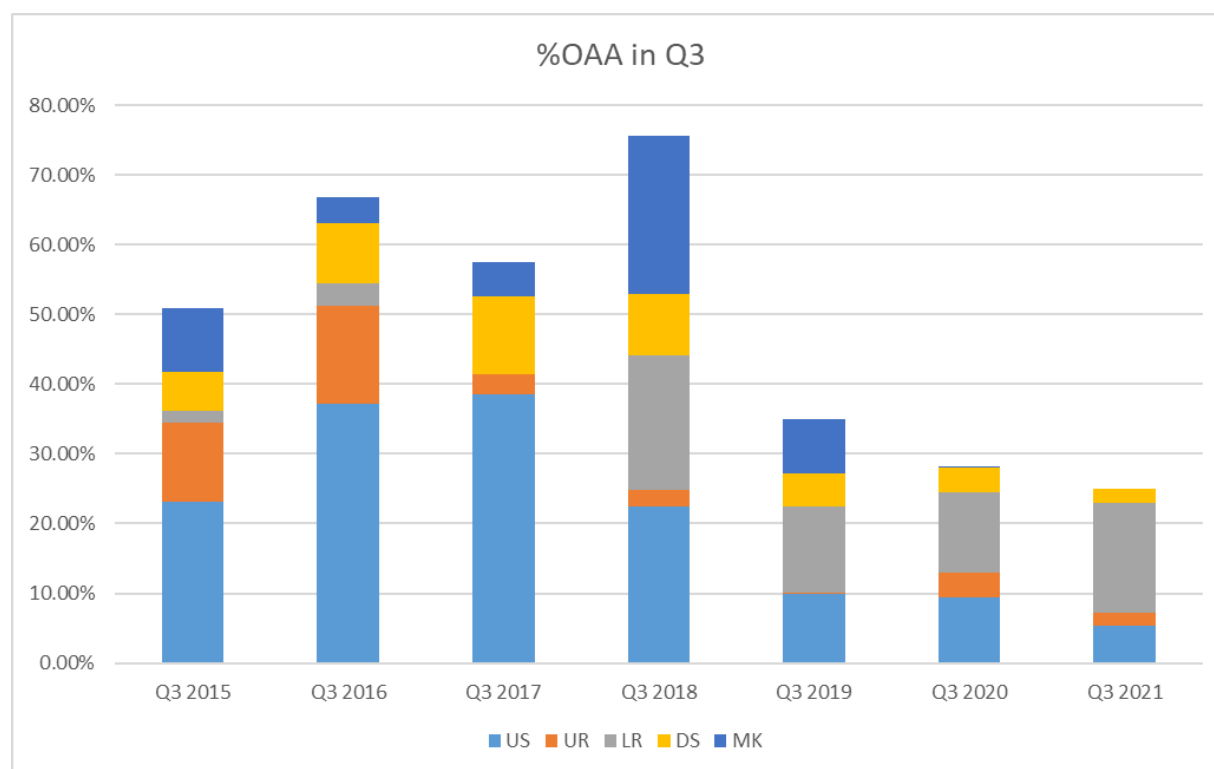
Fishing Zone	Q3 2015 (kg)	Q3 2016 (kg)	Q3 2017 (kg)	Q3 2018 (kg)	Q3 2019 (kg)	Q3 2020 (kg)	Q3 2021 (kg)
Upstream	2.56	1.59	1.49	1.94	3.31	3.12	2.10
Upper reservoir	2.94	2.71	4.71	12.64	12.90	12.20	11.52
Lower reservoir	2.16	2.24	NA	1.49	2.67	3.97	3.16
Downstream	4.32	2.42	5.31	2.93	2.73	3.20	3.92
Mekong	3.38	3.30	3.32	3.08	2.30	2.67	6.55

The survey results in Q3 2021 indicate that Nam Ngiep is the main fishing habitat for the upstream and downstream zones, while the main fishing habitat for the upper reservoir, lower reservoir and Mekong zones are the reservoir, tributaries and streams and Mekong respectively. The proportion of fishing habitats in Q3 2021 are displayed in **Table 5-6**.

TABLE 5-6: PROPORTION OF THE CATCH REPORTED BY MAIN HABITATS (%) IN Q3 2021

Habitats	US	UR	LR	DS	MK
Mekong	0.00%	0.00%	0.00%	10.49%	76.10%
Nam Ngiep	57.93%	8.26%	0.00%	55.61%	7.25%
Nam Xan	0.00%	0.00%	0.00%	0.00%	0.00%
Reservoir	0.34%	87.25%	16.76%	0.00%	0.00%
Tributary and stream	33.30%	2.38%	63.02%	32.79%	0.00%
Wetland	8.44%	2.11%	20.22%	1.10%	16.65%
Others	0.00%	0.00%	0.00%	0.00%	0.00%

Total reported fish and other aquatic animals (OAA) catch (proportion of OAA) for the same 7-day period in Q3 from 2015 to 2021 are shown in **Figure 5-2**.

FIGURE 5-2: PROPORTION OF OAA TO THE TOTAL REPORTED KILOGRAM (KG) OF FISH AND OAA FOR A 7-DAY PERIOD BY FISHING ZONE IN Q3 2015 TO Q3 2021

6 Health and Safety

6.1 RELATED TO NNP1PC HEALTH AND SAFETY

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

A summary of the safety incidents reported during the Operation Phase (September 2019 to September 2021) are provided in **Table 6-1**.

TABLE 6-1: SAFETY INCIDENTS REPORTED DURING THE OPERATION PHASE (SEPTEMBER 2019 TO SEPTEMBER 2021)

Type of Incidents	LTI	RI	NM	PD	FI	MVI	Total
No. of Incidents in August 2021	0	1	0	0	0	0	1
Cumulative Total Incidents to 30 June 2021	0	1	0	0	0	0	1

LEGEND:

LTI	-	Lost Time Incident
RI	-	Recordable Injury ⁴
NM	-	Near Miss
PD	-	Property Damage
FI	-	Fire Incident
MVI	-	Motor Vehicle Incident

During Q3 2021, there was one incident which was recordable injury (RI) which occurred in August 2021. The details on the incident are provided below.

On 09 August 2021 at around 10:50 AM inside the main dam gallery, an injury incident occurred (slip on the working platform of drilling works) which involved an employee of the KENBER contractor who slipped on the wet drilling platform while attempting to inspect the grouting hole.

⁴ An **injury** or illness is **recordable** if it involves restricted work or transfer to another job. An employee is said to be on “restricted work” when he or she is unable to perform one or more routine functions of the job, beginning on the day after the **injury** or illness occurs

Unfortunately, the slip caused his head to collide with the cable tray and he received minor injured to his head.

6.2 RELATED TO COVID-19

According to the WHO COVID-19 situation report for Lao PDR dated 28 April 2021, Lao PDR was experiencing an increase in COVID-19 cases, with 453 cases reported from 20-27 April, of which 435 were locally acquired (but most of which were epidemiologically linked to importation).

The Prime Minister (PM) Order No. 15/PM dated 21 April 2021 was issued for the Prevention, Control and Preparedness for the COVID-19 and the implementation and enforcement have been extended four times through the PM Order No. 462/PM dated 5 May 2021, PM Order No. 528/PM dated 20 May 2021, PM Order No. 595/PM dated 4 June 2021, PM Order No. 671/PM dated 19 June 2021, PM Order No.1036/PMO dated 19 August 2021, PM Order No. 1094/PMO dated 31 August 2021, and PM Order No. 1177/PMO dated 15 September 2021 respectively.

6.2.1 NNP1PC COVID-19 Measures

NNP1PC has implemented COVID-19 preventive measures since 2020 in line with the guidelines within the country, WHO, and the International Labour Organization (ILO). The general protocol being implemented includes:

1. Paramedics stationed at the site clinic at OSOV have started screening and checking body temperature of all staff, consultants and contractors at OSOV1 and OSOV2 once per day and twice a day for those on self-quarantine, The details about when, where and how often the screening will take place will be announced separately;
2. A mask will be provided to each staff per week and more as appropriate for high-risk staff who need to be working with local communities/contact with external stakeholders;
3. If a member of staff family comes back from a trip overseas of those listed as COVID-19 infected country, the staff must be self-quarantined for 14 days to monitor symptoms and by working from home or taking annual leave (and stay at home for self-isolation);
4. If a staff have any of the COVID-19 symptoms (i.e., dry cough, high fever, difficult breathing, sweats, chills, headaches) or have high temperature or flulike symptoms, they must contact their immediate supervisor and seek medical help immediately (clinic at OSOV or nearest medical centre) or by calling the hotline no. 166 or +85620 54066777;
5. If their medical case is found to be of the definition of COVID-19, they will be immediately removed from the site (site-based staff) and referred to the medical treatment facility in Vientiane Capital that is equipped to treat COVID-19;
6. If staff have any other sickness with a qualified medical certificate that it is not COVID-19, they can take sick leave or work in the office with proper protection (face mask and practice personal hygiene);
7. Refrain from meeting with staff and external stakeholders of more than 20 people. If such a meeting is necessary, alternative ways of communications e.g., telephone conference, Skype or other online platforms is recommended;
8. When visiting community members or contractors, wear a mask and keep your distance from another person at least one 1.5 meter apart;
9. Alcohol-based hand gel will be continued to be provided in all NNP1PC offices;

10. Common areas e.g., offices, canteens, bathrooms and kitchens will be thoroughly cleaned with alcohol (disinfectant liquid);
11. All staff must practice personal hygiene and take preventive measures as per above strictly;
12. All staff are asked to follow and implement NNP1PC and GOL preventive measures that have and to be issued periodically; and
13. These measures are also applicable for NNP1PC contractors and subcontractors and they shall take these as if they are their own measures.

Following the latest PM Order No. 1177/PMO dated 15 September 2021 and its extensions, NNP1PC has implemented a lockdown for site-based operations (OSOV1 and OSOV2) until 30 September 2021 with the following protocol:

1. Subject to prior approval of respective DMD by filling out the Site Access Form attached herewith, staff and contractors currently residing in OSOV 1 and OSOV 2 as well as in Hat Gniun Village are allowed to travel outside of the camp and Hat Gniun village to buy daily essentials or foods in Pakxan or Bolikhan Districts ONLY. While they are living or being in the community outside the camp, they need to avoid direct interactions with local communities, congested areas such as enclosed markets with limited air ventilation and keep social distancing at least one meter. They are not allowed to join/hold social functions or group drinking outside or in the resided Village and they must implement COVID-19 Countermeasures of the Government strictly;
2. Subject to prior approval by respective DMD and COVID-19 Committee, staff can be allowed to return home for annual leave or to work from home if their residences are not in a Red Zone (Seal-off area);
3. The residents of OSOV1 and OSOV2 can interact with one another and dining in the canteen are allowed but precautionary measures such as social distance at least one meter and personal hygiene shall be practiced. Different dining time between OSOV1, OSOV2 and Contractor (such as EGAT O&M and Kenber) will be organized to reduce congestions in the canteen;
4. All sport events are allowed onsite;
5. Even though there is a lockdown of both camps, essential activities such as operation and maintenance of power facilities, water quality monitoring, social and environmental activities and others must be continued where permissible by GOL and communities by following strict GOL preventative measures such as wearing face masks both in the offices and outside, sanitizing hands/equipment and keeping a distance of at least 1.5 m;
6. Staff/consultants who are performing these activities outside of the site area apart from the Main and Re-regulation dams/powerhouses, dyke, road, T/L line must obtain approval by the DMD of each division in advance at least 1 hour before departure/arrival by filling out form attached herewith for presenting to the security guard at the main exit;
7. Contractors performing work around the Project areas including Powerhouse maintenance, grouting work, concrete work, waste collection, road and other small site maintenance/monitoring may not need to obtain Authorized Site Access Form as long as their works are acknowledged by respective DMDs. They have to maintain no direct contact with

- staff in these camps and strictly work in their responsible areas. If interaction is unavoidable, social distancing of at least of 2 meters shall be insured and mask wearing is a must;
8. During the extended lockdown period, the residents of both camps can leave their respective site in case of emergency such as accidents, health and family related issues and other requests as found reasonable by respective management. Staff must obtain prior consent from their managers and approval from the respective DMD-TD or DMD-ESD;
 9. Food and essential items to be delivered to the site for camp residents must be loaded at the main entrance and these will be collected and sterilized by the respective team before distribution. Materials for construction activities can be transported into site directly as long as there is no direct contact with any camp residents;
 10. Social events/gathering in case of need inside the camp area are allowed but mask-wearing and social distancing of at least one meter must be ensured; and
 11. During the lockdown period, the Administration team in the Vientiane Office will provide support to procure personnel essential needs and delivered to the main entrance gate of OSOV and these will be picked up by the site ADM and then delivered to the staff.

In the 9th extended lockdown period, the following preventive measures for staff and Contractors inside and outside the Project areas are to be implemented at all times as follows:

1. Relevant Division to ensure that their contractors' staff working inside and outside the Project areas are regularly checked for body temperatures and use of face masks/hand gel in their camps and work outside. No new workers from known infected areas are allowed to enter. If any of their staff travel to the community-based infected Provinces to purchase materials/goods, they have to implement the same measures as NNP1PC staff, i.e., perform 14 days self-isolation for those with no/one vaccine shot and 7 days for those that have completed 2 shots but less than one month;
2. Paramedics stationed at the site clinic at OSOV have to continue with the screening and checking body temperature of all staff, consultants and contractors at OSOV1 and OSOV2 once per day and twice a day for those on self-quarantine;
3. A mask will be provided to each staff per week and more as appropriate for high-risk staff who need to be working with local communities/contact with external stakeholders;
4. If a member of staff family comes back from a trip overseas of those listed as COVID-19 infected country or from Red Zone in Laos, the staff must be self-quarantined for 14 days to monitor their symptoms by working from home or taking annual leave (and stay at home for self-isolation);
5. If staff or Contractors are found to have any of the COVID-19 symptoms (i.e., dry cough, high fever, difficult breathing, sweats, chills, headaches) or have high temperature or flulike symptoms, they must contact their immediate supervisor and seek medical help immediately (clinic at OSOV or nearest medical centre) or by calling a hotline no. 166 or +85620 54066777;
6. If their medical case is found to be of the definition of COVID-19, they will be immediately removed from the site (site-based staff) and referred to the medical treatment facility in Vientiane Capital that is equipped to treat COVID-19;

7. If staff have any other sickness with a qualified medical certificate that it is not COVID-19, they can take sick leave or work in the office with proper protection (face mask and practice personal hygiene);
8. Meeting with staff and external stakeholders not more than 20 people are allowed but preventive measures must be observed such as keeping social distance at least 1 meter, taking body temperature, wearing mask and washing hands with alcohol-based gel. If physical meeting could be avoided, alternative ways of communications e.g., telephone conference, Skype or other online platforms is recommended;
9. When visiting community members or GoL staff, wear a mask and keep your distance from another person at least 1.5 meter apart;
10. Alcohol-based hand gel will be continued to be provided in all NNP1PC offices;
11. Common areas e.g., offices, canteens, bathrooms and kitchens will be thoroughly cleaned with alcohol (disinfectant liquid);
12. All staff and Contractors must practice personal hygiene and take preventive measures as per above strictly;
13. All staff and Contractors are asked to follow and implement NNP1PC and GOL preventive measures that have and to be issued periodically; and
14. These measures are also applicable for NNP1PC, Contractors and subcontractors and they shall take these as if they are their own measures.

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

Workplace risk assessment	
<ul style="list-style-type: none"> The exposure risk for NNP1PC entities (employee, consultant, contractor, sub-contractor) during the increased COVID-19 cases which was started in April 2021 is defined based on the WHO Guideline (2020)⁵ that is “medium exposure risk”. The medium exposure risk means that jobs or work tasks with close, frequent contact with the general public, or other co-workers, visitors, clients or customers, or contractors, but that do not require contact with people known to be or suspected of being infected with COVID-19. In areas where COVID-19 cases continue to be reported, this risk level may be applicable to workers who have work-related frequent and close contact with the general public, visitors, or customers in high-population-density work environments (e.g., food markets, bus stations, public transport, and other work activities where physical distancing of at least 1 m may be difficult to observe), or work tasks that require close and frequent contact between co-workers. In areas without community transmission of COVID-19, this scenario may include frequent contact with persons returning from areas with community transmission. 	
Risk	Preventive measures
Job or work tasks with close or frequent contact in the area where COVID-19 continue to be reported or contact with persons returning from area with community transmission	<ul style="list-style-type: none"> Implement the lockdown for site-based operation (OSO V1 and OSO V2) with specific protocol as mentioned in the section of “NNP1PC COVID-19 Measures”. The lockdown started from 23 April 2021 until 30 September 2021 with possible extension following the country guideline on COVID-19 measures (PM Order No. 1177/PMO dated 15 September 2021) During the lockdown, the staffs were also encouraged to be well updated on the situation within their work-related places and hometown to reduce non-essential travel as much as possible; to implement the self-quarantine for at least 14 days after returning from their work-related places and home town with the COVID-19 low-risk of community transmission; and to be part of country COVID-19

⁵ Annex to Considerations for public health and social measures in the workplace in the context of COVID-19. WHO (10 May 2020)

	<p>vaccination program that rolled out in the nearby medical facilities, and.</p> <ul style="list-style-type: none"> • In the case of infection as mentioned within “NNP1PC COVID-19 measures then the staff will be immediately removed from the site and referred to the medical treatment facility in Vientiane Capital that is equipped to treat COVID-19.
Impact on NNP1 project and OHS	Mitigation
<ul style="list-style-type: none"> • The country wide lockdown measures following PM Order No. 15/PM dated 21 April 2021 is being implemented since 21 April 2021 impacting the continuation some project implementation activities. 	<ul style="list-style-type: none"> • The project activities within the project area with COVID-19 low-risk of community transmission continues to progress such as Dam operation and maintenance work; EMO environmental monitoring work within the NNP1 reservoir; or SMO livelihood centre operation. • Any implementation and monitoring activities that does not require field work will be performed through an online platform such as the discussion on the preparation of Annual Implementation Plan (AIP) 2021 under watershed and biodiversity management or monthly meeting with NC-NX BOMU. • Close coordination with relevant GOL committees in case that some restrictions are lifted by local authorities that will allow the continuation of some field activities. For example: Bolikhamxay and Xaysomboun Provincial authority eased the travelling restriction from or to the respective provincial administrative area in early of June 2021 and some of NNP1 ESD program could be resumed such as livelihood development activity, social monitoring, fishery monitoring, etc..; Bolikhamxay PAFO and NC-NX BOMU agreed with the proposal from EMO Team to allow NC-NX patrolling work to continue during the country wide lockdown because the NC-NX offset site is within the COVID-19 low-risk community transmission. • Any continuation of project implementation and monitoring activities

	especially for the field work must comply NNP1PC COVID-19 measures and any with applicable guidelines.
<ul style="list-style-type: none"> The site lockdown between April to September 2021 might impact psychological state of site residents 	<ul style="list-style-type: none"> NNP1PC COVID-19 measures during this lockdown allow the site residents to leave their respective site in case of emergency such as accidents, health and family related issues and other requests as found reasonable by respective management. NNP1PC COVID-19 measures during this lockdown period allow for social events/gathering but for less than 20 people with mask-wearing and social distancing of at least one meter must be ensured.

Lockdown schedule	Impact on NNP1PC project implementation and monitoring activities		
	TD	SMO	EMO
01 July – 30 September 2021 (Ref: PM Order No.1036/PMO dated 19 August 2021, PM Order No. 1094/PMO dated 31 August 2021, and PM Order No. 1177/PMO dated 15 September 2021 respectively)	No impact on the overall power generation and maintenance work.	To be reported in the SMO Quarterly Progress Report (Q3 2021).	<ul style="list-style-type: none"> No monthly and quarterly visit by EMU. No impact on EMO environmental monitoring program except for some water quality testing parameters that needs to be performed the analysis in Thailand. EMO fishery monitoring program was postponed during this lockdown period. Relevant GOL committees in Xaysomboun and Bolikhamxay confirmed that the implementation activities under watershed and biodiversity monitoring could resume during this lockdown period.

			<ul style="list-style-type: none">• Xaysomboun planned to continue reservoir patrolling in September 2021 but the activity needs to be postponed due to the new COVID-19 cases.• The meeting discussions between NNP1PC management and Xaysomboun Provincial Governor/Bolikhamxay Vice Provincial Governor to follow up on the pending issues with GOL including the allowance issues were postponed.• The training needs assessment on the capacity of WRPO and GOL staff related to land-use and forest management under component 1 of the approved WMP was finalized was postponed.
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7 External missions and visits

According to the GOL and the Company COVID19 lockdown measures, there was no external missions or visits during Q3 2021.

The ISO14001:2015 accreditation audit (Stage 1 Audit) by an accreditation company (SGS (Lao) Sole Co., Ltd.) was conducted remotely on 07 September 2021, no critical findings were observed but six non-critical findings were reported and corrective actions shall be taken before the Stage 2 Audit which will be held in December 2021.

The action priorities recommended by ADB and IAP during the virtual mission in December 2020 are listed for further follow-up as follows:

No	Requested/Recommended Actions	Status as of 30 June 2021
1	Conclusion of the Environment and Social LTA Contract extension.	Pending - ADB shared the drafted LTA ToR for NNP1PC's consideration on 19 February 2021, the TOR was reviewed 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 on the feasibility studies but the issue has not yet been solved. NNP1PC will submit study results on countermeasures against the downstream low DO issue by Q4 2021.
4	Submit the draft GOL AIP2021 of WRPOs and BOMU for ADB review and approval as soon as possible.	Pending – related 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 finalized and approved for implementing by BOMU, as well as the WM AIP2021 of BLX. The AIP2021 of XSB WRPO was submitted to NNP1PC for further sharing with ADB for review but not yet finalized by GOL.
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 with 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 with ADB on 26 March 2021. The inspection of 115 kV was scheduled to be conducted by EDL in April 2021 and the summary

No	Requested/Recommended Actions	Status as of 30 June 2021
		of findings are shared in the Q2 2021 Environment Monitoring Report.
7	Provide the latest dam safety report.	Completed – the report was shared with ADB in Dec 2020.
8	Provide the landslide monitoring report.	Pending – NNP1 conducts visual inspection of reservoir slope every month. The results of landslide inspection will be shared by the end of December 2021.
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	
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. The completion date is postponed to Q4 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, including the drills, is still under updating. The completion date is postponed to Q4 2021.
13	Revise/update the Emergency Action Plan (EAP), engagement with the emergency authorities, and perform desktop and field test.	Pending - the updated version of EAP was done in April 2021 and submitted to DEM-MEM, the drill/test are underway for NNP1 staff for completion by December 2021.
14	Revise/update the Emergency Evacuation Plan (EEP) including an update on associated training and drills performed.	Pending - The EEP is under updating by the external consultant and the drills for downstream villagers are planned to be conducted during this wet season. The updated EEP will be shared with relevant GOL agencies including the National and local Disaster Preparedness and Responses Committee, MEM and MONRE at local levels. This is planned to be completed by this year if consultation meetings are allowed by GOL.
	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	Completed - already discussed with BSP for further actions.

No	Requested/Recommended Actions	Status as of 30 June 2021
	highest priority area or produce clear case-specific justification to depart from the BOMP.	
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 Q3 2021

No	Site name	Document Name	Contractor / Subcontractor	Approval Status by EMO/NNP1 (date)	Detailed Site Information	Monthly Construction & Operation Status as of 30 September 2021
1	Main Dam	DWP & SS-ESMMP for Remedial Grouting work at Main Dam	KENBER Geotechnics (Thailand) Co., Ltd.	3 rd submission 13 September 2021. No objection with no further comment on 20 September 2021	Remedial of grouting works at Main Dam body	In progress
2	OSOV1	DWP & SS-ESMMP for the construction of Biofilm septic tanks replacement at OSOV1	Soulignet Choumanitham Construction Co., Ltd.	1 st submission 19 August 2021. No objection with no comment on 23 August 2021	Replacement of broken biofilm septic tanks in the OSOV1	In progress
3	Transmission Line 230 KV	Environmental Checklist for pre-construction site for the nuts and bolts welding of 230 kV transmission line	CTEC (Thailand)	1 st submission 23 September 2021. No objection with no comment on 24 September 2021	Nuts and bolts welding for the towers of TL 230 KV	In progress

APPENDIX 2: ENVIRONMENTAL MONITORING CORRECTIVE ACTIONS Q3 2021

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
ONC_KENBER-0001	29.07.2021	KENBER's Temporary Camp (Rental houses)	<p>- Lack of proper waste segregation. General waste, recycle waste (scrap metal, aluminium, plastic, glasses and cardboard) and hazardous waste (DE NEEF HA Cut AF, known as “PU”) are mixed. Three waste labels (Recycle, general and hazardous) displayed in same waste bin.</p> <p>- There was an insufficient number of waste bins / bags provided for the camp (rental houses) which may result in lack of waste segregation practices on site.</p>	<p>1). Segregate the waste according to below waste sorting for further proper disposal and eliminations:</p> <ul style="list-style-type: none"> - General waste (dispose of at NNP1 landfill); - Chemical waste – Polyurethane waste (shall be disposed and buried at spoil disposal No. 6); - Hazardous waste (Sell and pay to an approved local firm); - Recycle waste (Sell to local recycle waste buyer/firm); • Scrap metal; • Glass; • Plastic bottle; • Aluminium can; • Cardboard. <p>2). Setting up a temporary recycle waste storage;</p> <p>3). Provide waste management awareness training for all workers.</p> <p>4). Provide a sufficient waste bins/bags for the rental houses for waste segregation and disposal.</p> <p>Note: No hazardous waste and recycle waste is allowed to dispose of at NNP1 landfill.</p>	10.08.2021	09.09.2021	<p><u>Unresolved</u></p> <p>TD site engineer reported that the issue was resolved on site after EMO's latest follow- up and joint site inspection on 09 September 2021. EMO will inspect the corrective actions to verify their effectiveness</p>

13 December 2021

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
ONC_KENBER-0002	29.07.2021	KENBER's Temporary Camp (Rental houses)	No proper hazardous material storage area set-up on site. A 200 litters fuel drum is stored on the porch of rental house beside a dining table and smoking area with high risk of falling/collapse and/or spills and fire.	1) A proper temporary hazardous material storage area with hardstand floor, bunding and roofing at safe distance from the accommodation and assembly area need to be provided; 2) A manual pump is recommended to be used for the refilling activities to avoid/prevent spillage;	10.08.2021	09.09.2021	<u>Unresolved</u> TD site engineer reported that the issue was resolved on site after EMO's latest follow-up and joint site inspection on 09 September 2021. EMO will inspect the corrective actions to verify their effectiveness
ONC_KENBER-0003	29.07.2021	KENBER's Temporary Camp (Rental houses)	There were no control devices installed for the cooking, washing and bathing areas of each rental house. The grey water is released to directly to the natural land and stream. Without an appropriate counter measure, this has high risks of: - Generating a pollution to the natural land and streams; - becoming an un-pleasant and unhygienic site (foul odour, spread of infectious diseases fly infestation).	The contractor was instructed to: - Excavate/ provide a grey water retaining pond(s) with sufficient capacity to collect the grey water from the facilities. - The grey water shall be drained by a proper PVC piping system from the source to a retaining pond(s) to avoid animals' swallows and disturbances.	10.08.2021	09.09.2021	<u>Unresolved.</u> TD site engineer reported that the issue was resolved on site after EMO's latest follow-up and joint site inspection on 09 September 2021. EMO will inspect the corrective actions to verify their effectiveness

13 December 2021

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
ONC_KENBER-0004	29.07.2021	Main Dam	<ul style="list-style-type: none">- There was evidence of black oil spill on the concrete floor and side ditch of the Main Dam crest without proper clean-up. Some oil mixed with water was collected and contained in plastic bag without a proper containment.- An old generator has been operating without spill protection. Evidence of oil spills from the generator was observed without clean-up and / or provision of a proper counter measures;	<p>The contractor was instructing to:</p> <ul style="list-style-type: none">- Immediately clean-up the oil spill on the concrete floor and stagnant oil mixed with water by absorbent pads /sheet or dry sand including containing the oil mixed water in the plastic bag to a proper container. The contaminated absorbent sheet and contaminated sand including oil mixed water shall be well collected and removed to designated hazardous material storage area for further disposal and elimination by the approved local waste treatment contractor.- Provide a proper oil drip tray/steel tray to collect the spillage and provide appropriate roofing (tent) for the generator to prevent of drip oil being washed by rain water. In other hand, please fix the source of oil dripping.	30.07.2021	26.08.2021	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow- up Date	Status
ONC_KE NBER- 0005	29.07.2021	Main Dam	There was evidence of highly turbid water being drained from the grouting works of gallery to outlet and discharged to the Nam Ngiep River (downstream of dam) without proper and efficiency sedimentation control devices/facilities. Two series of sandbag dikes were installed. However, its effectiveness is low.	The contractor was instructed to: - Provide/install more sedimentation traps along the open ditch where applicable; - Dry alum (Aluminium Sulphate), shall be applied, if necessary; - A regular clean-up of sediment from the sedimentation traps shall be provided to maintain the capacity and effectiveness of sedimentation trap.	05.08.2021	09.09.2021	Unresolved TD site engineer reported that the issue was resolved on site after EMO's latest follow- up and joint site inspection on 09 September 2021. EMO will inspect the corrective actions to verify their effectiveness
ONC_KE NBER- 0006	29.07.2021	Main Dam	There was evidence of black oil spill from the machinery maintenances and handling activities, and also the hydrocarbon spill from the re-fuelling for generator without clean-up. EMO has previously verbally instructed the contractor (site manager), to take corrective action and pay attention	The contractor was instructing to: - Clean-up the oil and hydrocarbon spills by absorbent sheets and dry sand; - Provide steel trays for the maintenance and refuelling activities; - workers shall be trained on hazardous material management and spill response.	05.07.2021	26.08.2021	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

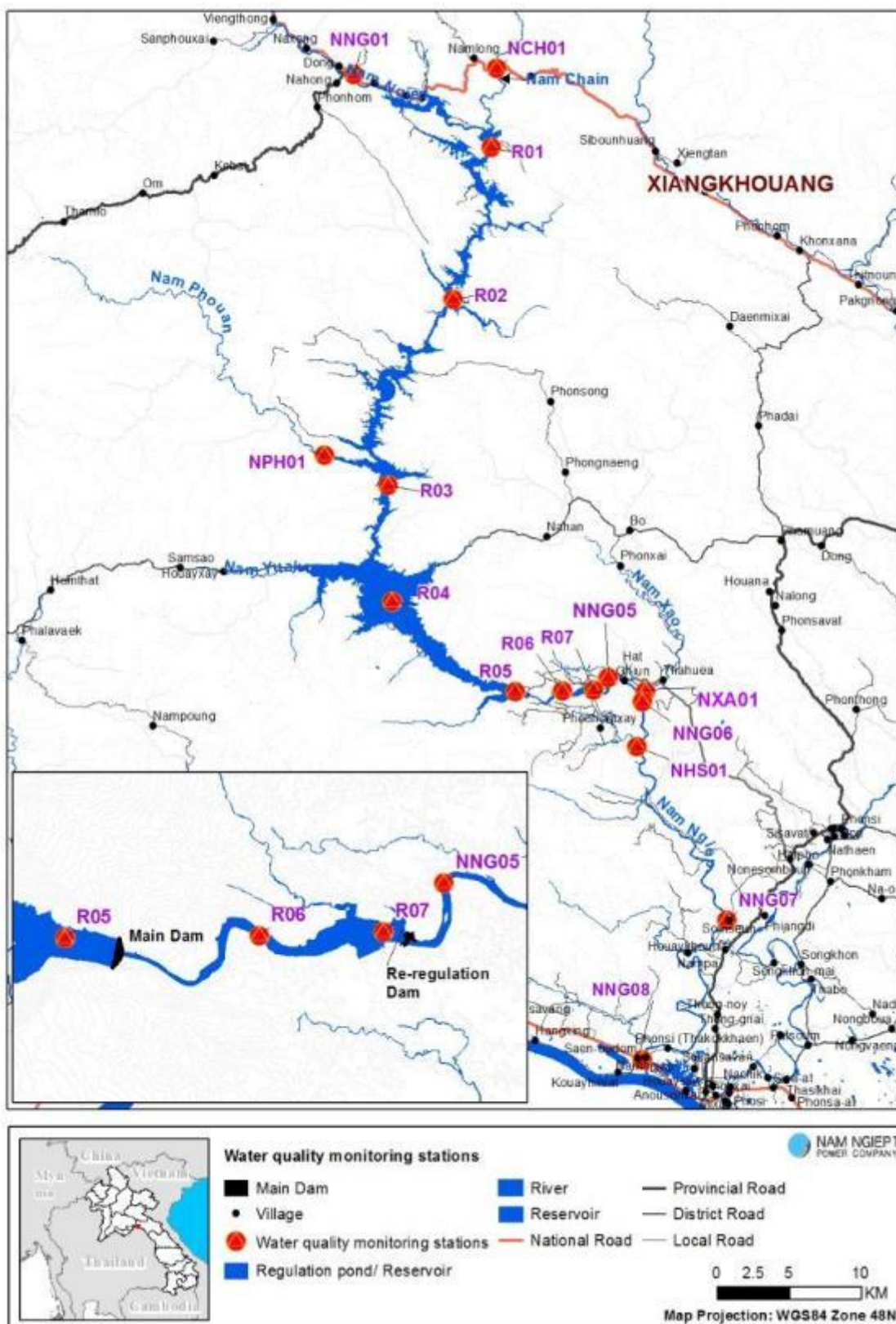
Site Code	Location station	Zone
NNG01	Nam Ngiep Upstream of Ban Phiengta	Upstream Project Construction Site
R01	Main reservoir upstream main dam approx. 50 Km.	
R02	Main reservoir upstream main dam approx. 35 Km.	
NNG02/R03	Nam Ngiep Upstream of Nam Phouan Confluence / Main reservoir upstream main dam approx. 21 Km.	
NNG03/R04	Nam Ngiep Downstream of Ban Sopyouak / 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).	<ul style="list-style-type: none"> - 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].

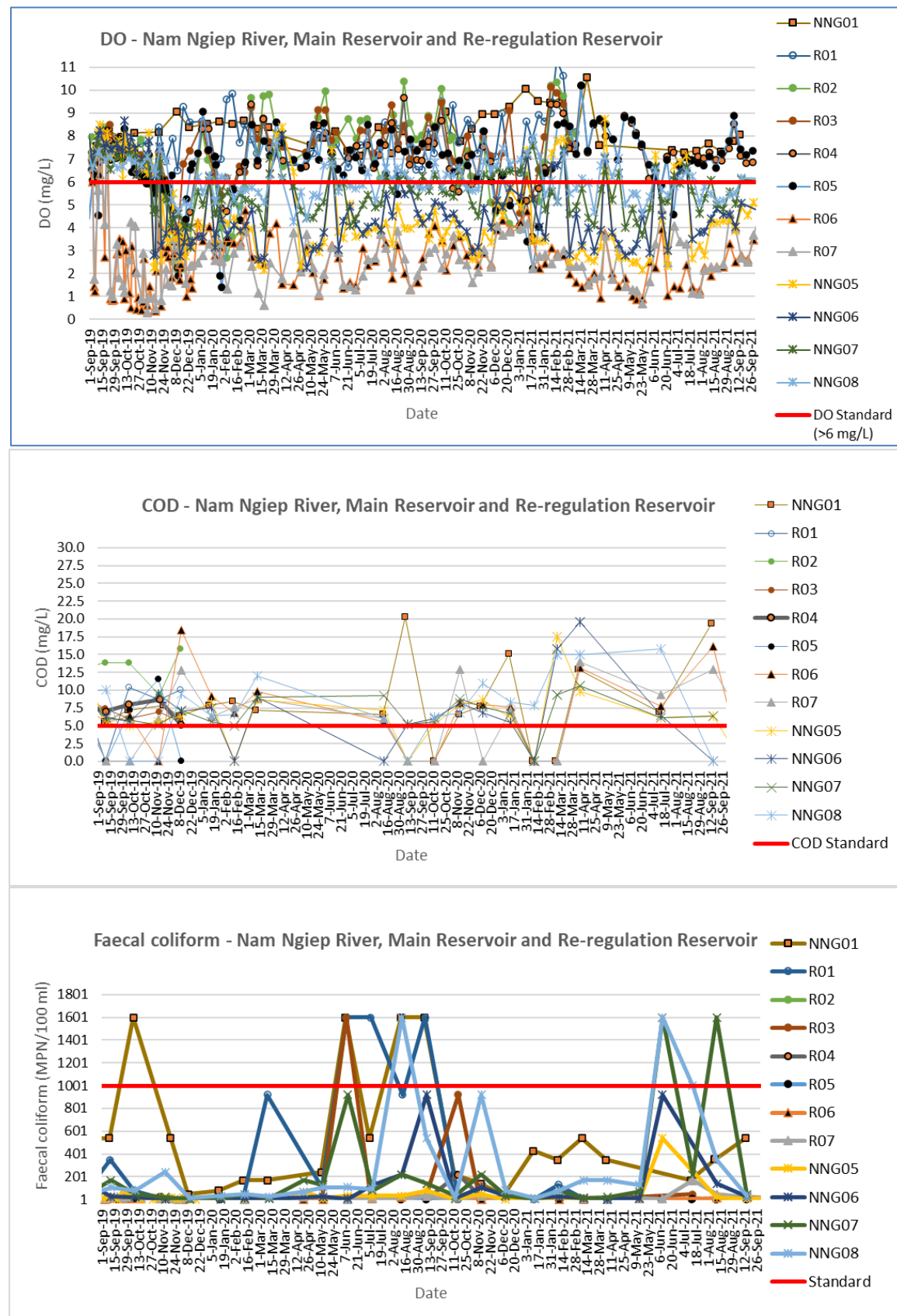
Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Fortnightly	pH, DO (%), DO (mg/L), Conductivity (µs/cm), TDS (mg/L), Temperature (°C), Turbidity (NTU)	All stations
Monthly	TSS (mg/L), BOD ₅ (mg/L), COD (mg/L), NH ₃ -N (mg/L), NO ₃ -N (mg/L), total coliform (MPN/100 mL), faecal coliform (MPN/100 mL), Hydrogen sulphide (mg/L), Phytoplankton biomass, TOC and TKN.	As per ESMMP-OP.

SURFACE WATER QUALITY MONITORING LOCATIONS

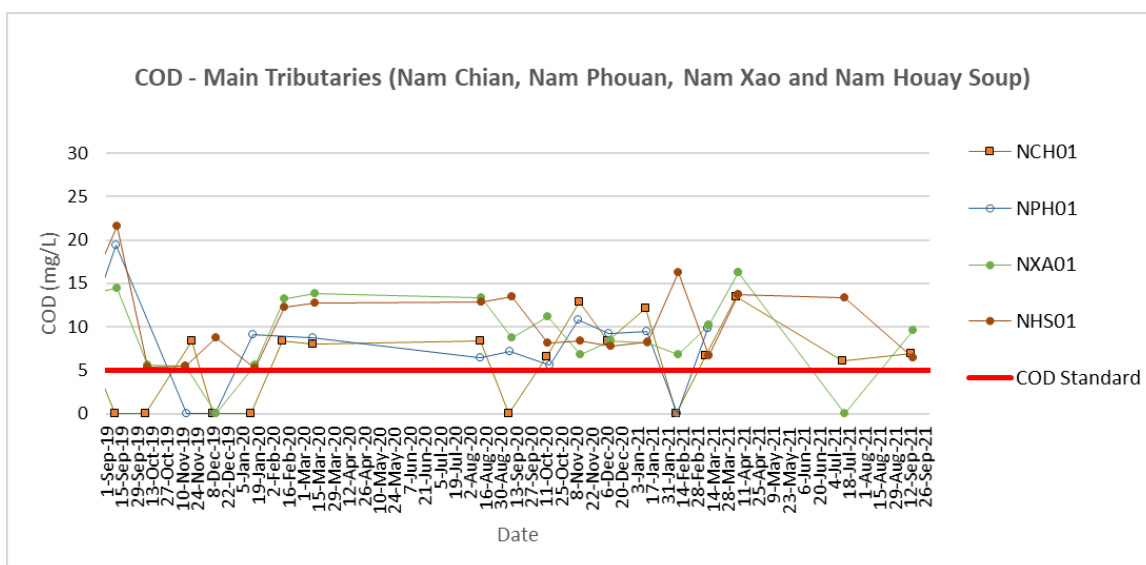
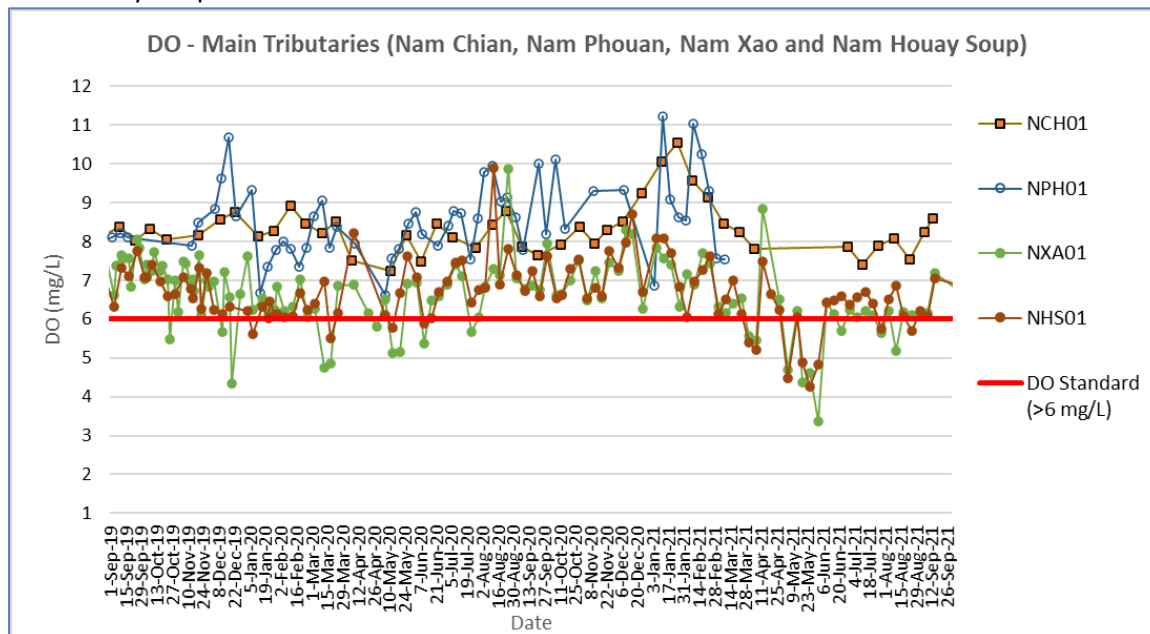


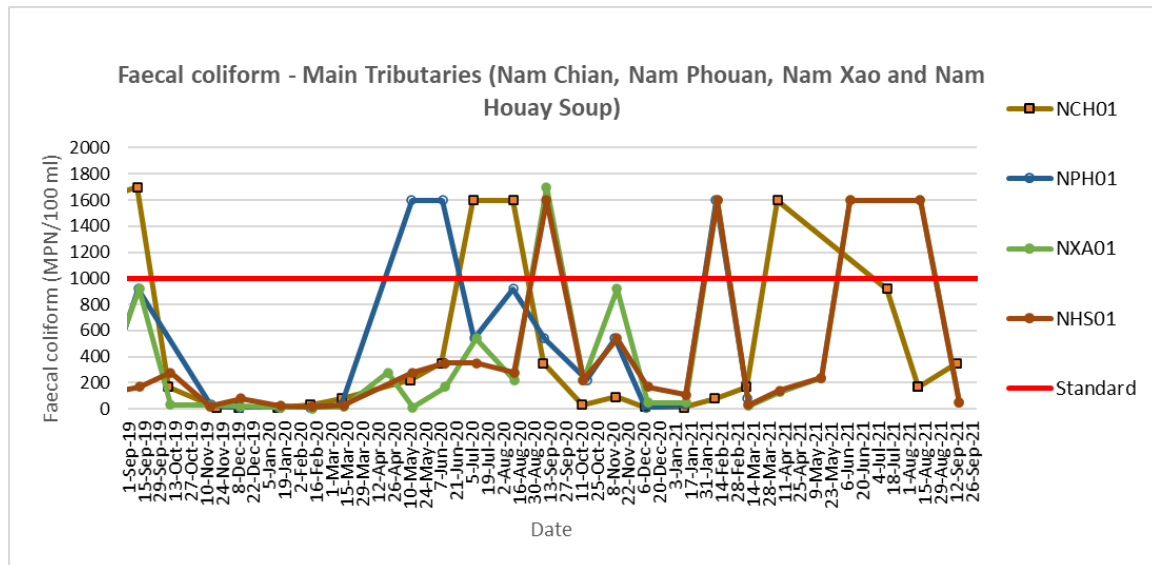
APPENDIX 4: KEY TRENDS OF WATER QUALITY MONITORING FROM JANUARY 2020 TO END OF SEPTEMBER 2021 (ONLY PARAMETERS THAT EXCEEDED THE STANDARDS)

NAM NGIEP SURFACE WATER

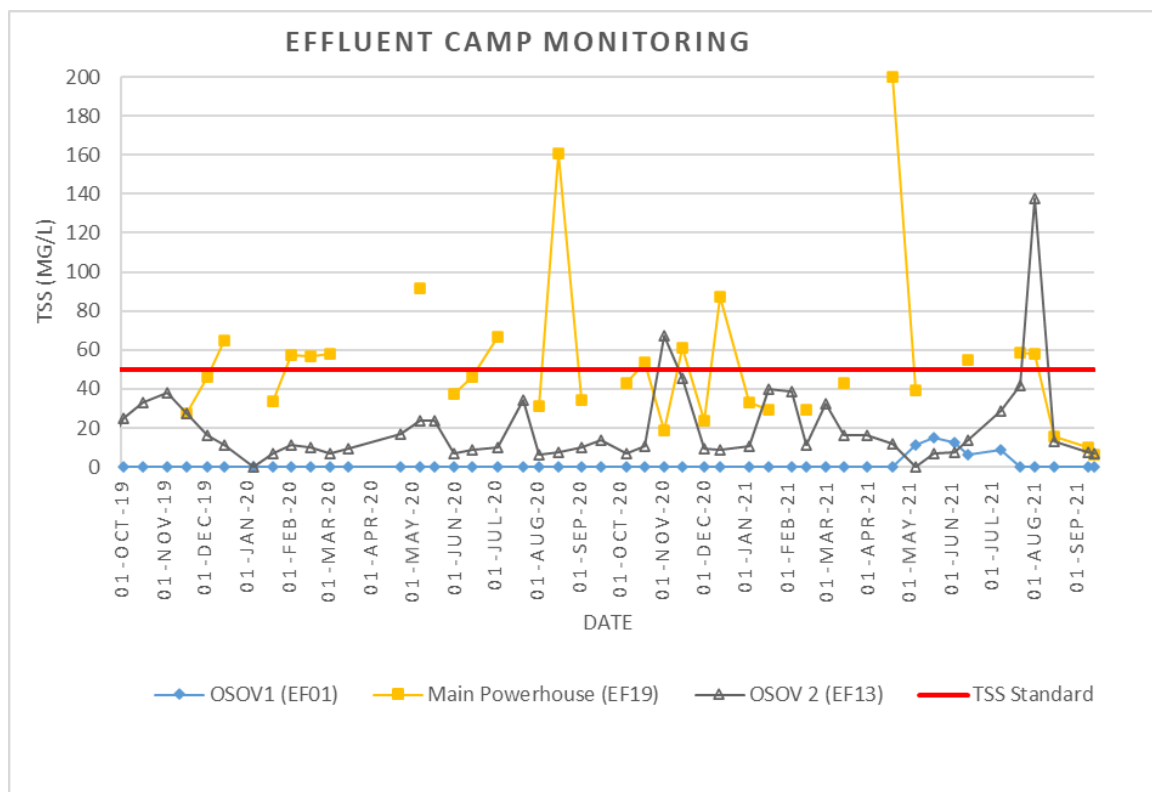


Key Water Quality Parameters for the Nam Ngiep Tributaries: Nam Chian, Nam Phouan, Nam Xao, Nam Houay Soup

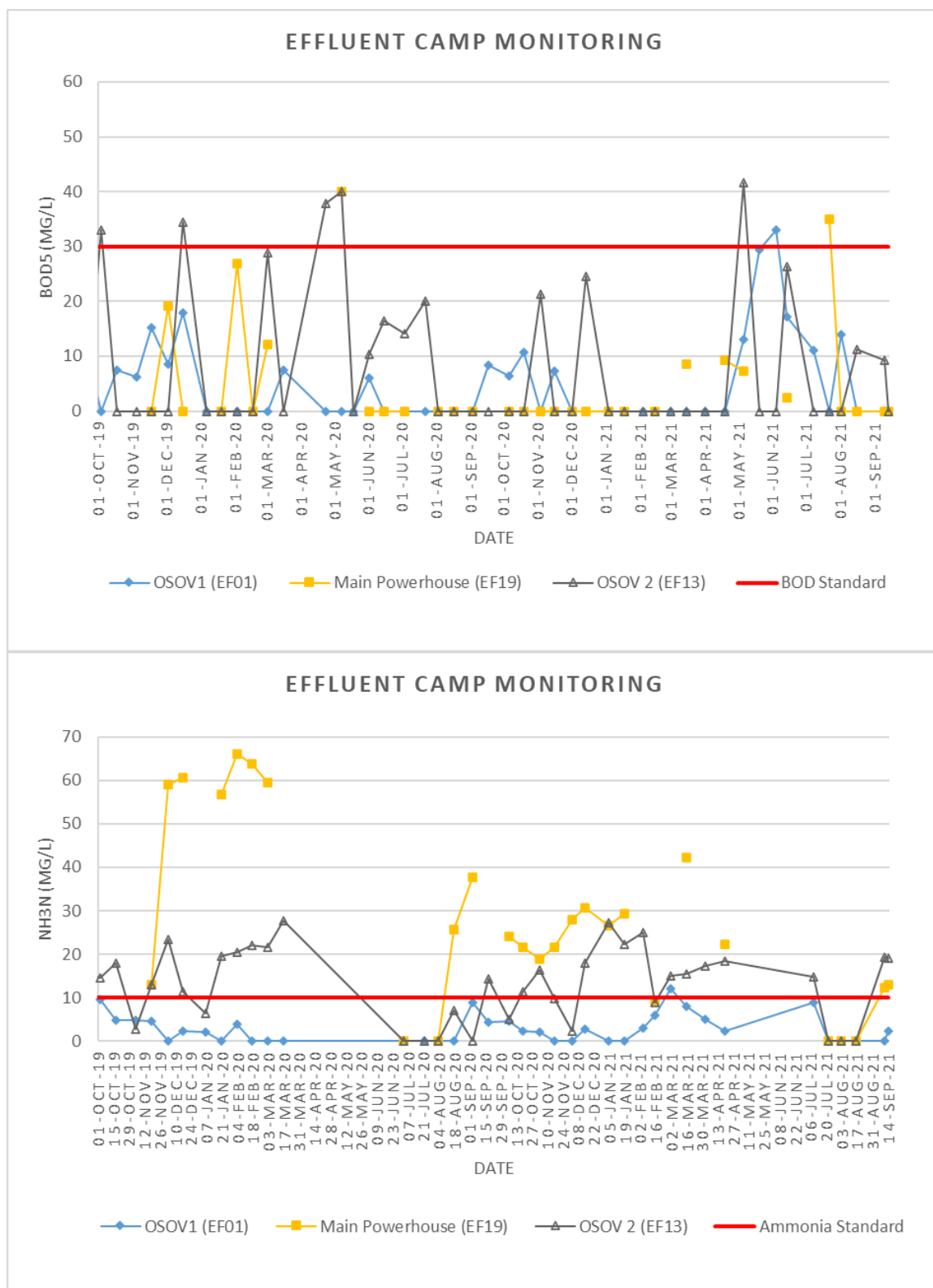


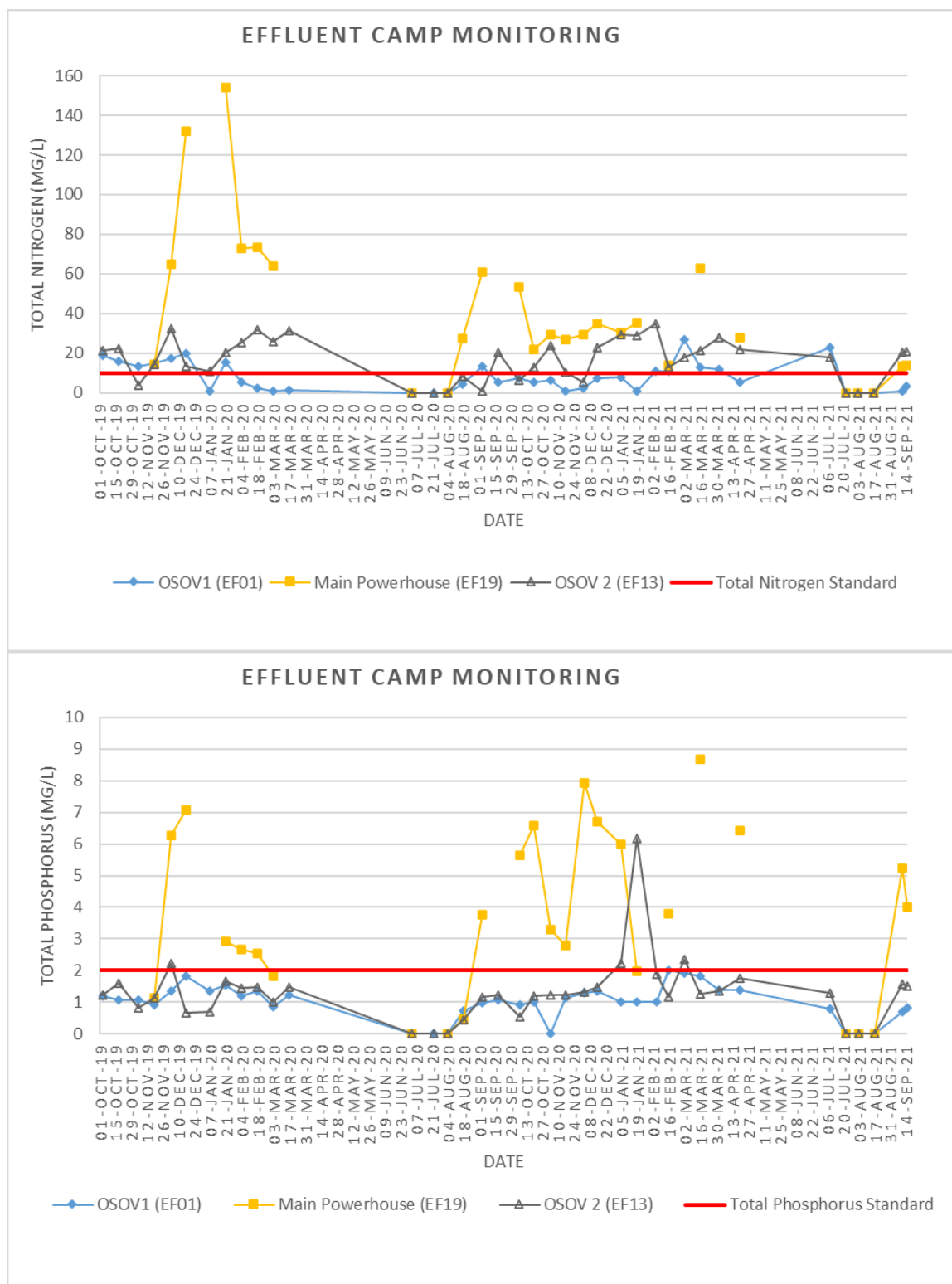


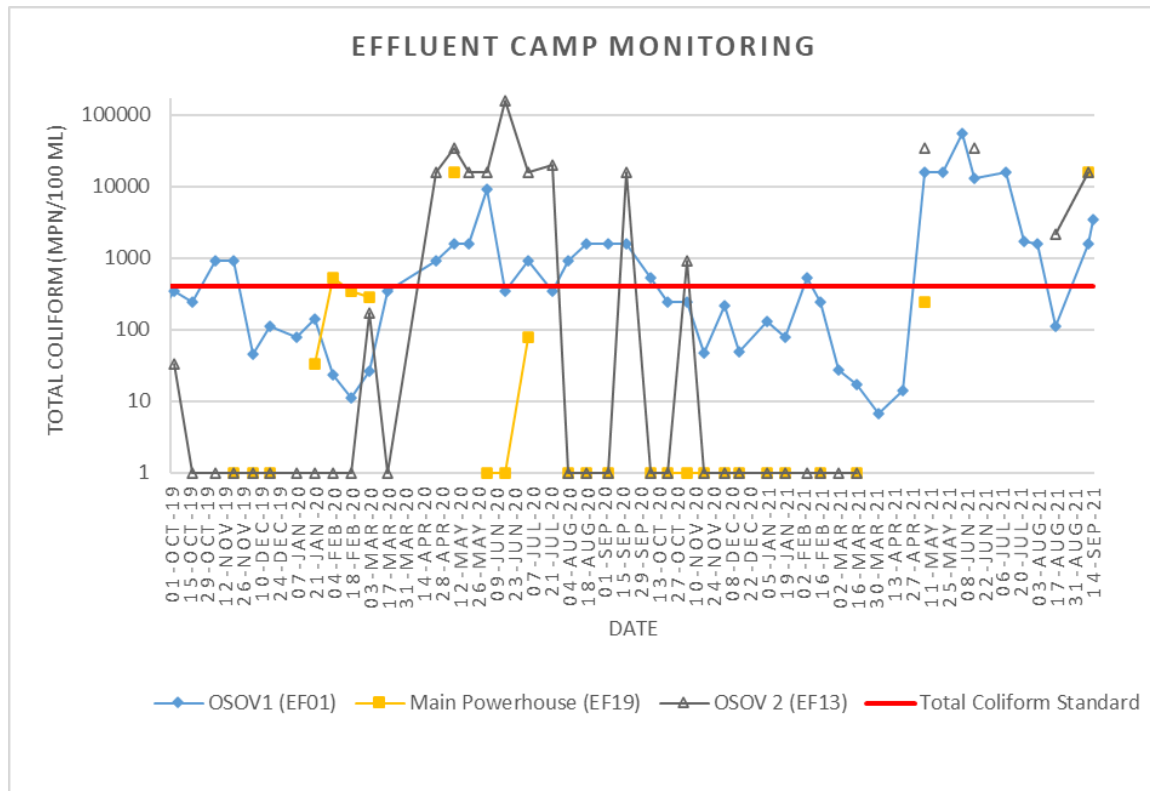
Camps' Effluent Water Quality Trends (Since October 2019 – September 2021)



13 December 2021







APPENDIX 5: WATER QUALITY MONITORING DATA**APPENDIX 5-1: SURFACE WATER QUALITY MONITORING – Q3 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						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
6-Jul-21	pH	5.0 - 9.0					6.97	6.94										
7-Jul-21	pH	5.0 - 9.0							6.9	6.99	6.82	6.56	6.94	7.11			7.11	6.76
12-Jul-21	pH	5.0 - 9.0	6.56											6.92				
13-Jul-21	pH	5.0 - 9.0					7.39	7.71										
14-Jul-21	pH	5.0 - 9.0							6.44	6.44	6.59	6.78	6.91	6.9			6.66	6.91
20-Jul-21	pH	5.0 - 9.0					6.54	6.66										
21-Jul-21	pH	5.0 - 9.0							6.71	6.99	7.02	6.66	7.22	7.36			7.18	7.5
26-Jul-21	pH	5.0 - 9.0	6.86											7.08				
27-Jul-21	pH	5.0 - 9.0					7.03	7.22										
29-Jul-21	pH	5.0 - 9.0							7.07	7.01	7	7.15	7.17	7.21			7.22	7.23
3-Aug-21	pH	5.0 - 9.0					6.82	7.36										
4-Aug-21	pH	5.0 - 9.0							6.66	6.82	6.87	7.06	7.04	7.1			7.02	7.13
9-Aug-21	pH	5.0 - 9.0	6.92											6.87				
10-Aug-21	pH	5.0 - 9.0					7.83	7.56										
11-Aug-21	pH	5.0 - 9.0							6.67	6.88	6.87	7.17	7.13	7.2			7.12	7.31
17-Aug-21	pH	5.0 - 9.0					7.08	7.28										
18-Aug-21	pH	5.0 - 9.0							7.02	7.03	7.06	7.11	7.15	7.2			7.13	7.24
23-Aug-21	pH	5.0 - 9.0	7.14											7.22				
24-Aug-21	pH	5.0 - 9.0					6.74	7.05										
25-Aug-21	pH	5.0 - 9.0							6.85	6.86	6.94	7.11	6.94	7.03			7.12	7.2
1-Sep-21	pH	5.0 - 9.0					6.52	6.07										

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		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
2-Sep-21	pH	5.0 - 9.0							6.09	6.29	6.27	6.47	6.44	6.42			6.4	6.63
6-Sep-21	pH	5.0 - 9.0	6.14												6.22			
7-Sep-21	pH	5.0 - 9.0					6.85	6.85										
8-Sep-21	pH	5.0 - 9.0							6.29	6.36	6.42	6.56	6.52	6.63			6.5	6.68
13-Sep-21	pH	5.0 - 9.0	6.19												6.06			
14-Sep-21	pH	5.0 - 9.0					6.41	6.68										
15-Sep-21	pH	5.0 - 9.0							6.07	6.08	6.16	6.32	6.28	6.23		6.36	6.28	
21-Sep-21	pH	5.0 - 9.0					6.57	6.72										
22-Sep-21	pH	5.0 - 9.0							6.59	6.64	6.6							
28-Sep-21	pH	5.0 - 9.0					6.57	6.51										
29-Sep-21	pH	5.0 - 9.0							6.63	6.62	6.78							
6-Jul-21	Sat. DO (%)						92.3	90.8										
7-Jul-21	Sat. DO (%)								16.5	42.3	84.7	80.6	74.4	76.2			78.3	81.1
12-Jul-21	Sat. DO (%)		91.5												90.8			
13-Jul-21	Sat. DO (%)						95.1	95.4										
14-Jul-21	Sat. DO (%)								28	41.1	87.7	82.1	85.3	84.1			79.1	83.8
20-Jul-21	Sat. DO (%)						92.9	91.2										
21-Jul-21	Sat. DO (%)								17	13.9	32.1	42.7	68.6	76.4			76.9	77.7
26-Jul-21	Sat. DO (%)		89.4												93.2			
27-Jul-21	Sat. DO (%)						93.5	88.7										
29-Jul-21	Sat. DO (%)								15.4	13.8	39.5	47	57.3	63.3			72.8	72.8
3-Aug-21	Sat. DO (%)						92.6	87.7										
4-Aug-21	Sat. DO (%)								27.5	26.7	34.4	47.1	64.9	71.5			79.2	80.1

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		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
9-Aug-21	Sat. DO (%)		96.7											97.6				
10-Aug-21	Sat. DO (%)						97.3	94.2										
11-Aug-21	Sat. DO (%)								23.5	27.9	51.4	53.7	74.2	67.4			65.2	83.9
17-Aug-21	Sat. DO (%)						91.7	85.7										
18-Aug-21	Sat. DO (%)								27.9	27.7	51.5	58.3	62.1	63.9			78.3	75.2
23-Aug-21	Sat. DO (%)		88.2												90.3			
24-Aug-21	Sat. DO (%)						92.2	95.8										
25-Aug-21	Sat. DO (%)								28.3	29.2	52.3	56.3	59.7	64.6			76.8	72.2
1-Sep-21	Sat. DO (%)						100.3	104.2										
2-Sep-21	Sat. DO (%)								41.2	58.5	53.8	58.7	70.7	68.7			80.4	77.8
6-Sep-21	Sat. DO (%)		97.4												98.3			
7-Sep-21	Sat. DO (%)						114.4	117.2										
8-Sep-21	Sat. DO (%)								30.9	41.2	47.3	49.7	61.9	68.1			78.1	75.4
13-Sep-21	Sat. DO (%)		98.5												102.9			
14-Sep-21	Sat. DO (%)						94.3	97.1										
15-Sep-21	Sat. DO (%)								34.3	33.1	59.9	62	76.2	77.2		90.7	87	
21-Sep-21	Sat. DO (%)						90.3	96										
22-Sep-21	Sat. DO (%)								32.1	30.8	46.5							
28-Sep-21	Sat. DO (%)						90.6	97.1										
29-Sep-21	Sat. DO (%)								42.7	46.1	68.6							
6-Jul-21	DO (mg/L)	>6.0					6.76	6.7										
7-Jul-21	DO (mg/L)	>6.0							1.37	3.4	6.86	6.48	5.94	6.06			6.06	6.57
12-Jul-21	DO (mg/L)	>6.0	7.27												7.4			

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
13-Jul-21	DO (mg/L)	>6.0					7.07	7.11										
14-Jul-21	DO (mg/L)	>6.0							2.38	3.28	7.14	6.62	6.68	6.45			6.21	6.69
20-Jul-21	DO (mg/L)	>6.0					6.94	6.96										
21-Jul-21	DO (mg/L)	>6.0							1.41	1.15	2.66	3.52	5.6	6.24			6.11	6.39
26-Jul-21	DO (mg/L)	>6.0	7.34												7.9			
27-Jul-21	DO (mg/L)	>6.0					7.12	6.82										
29-Jul-21	DO (mg/L)	>6.0							1.27	1.13	3.22	3.8	4.61	5.08			5.64	5.74
3-Aug-21	DO (mg/L)	>6.0					7.05	6.72										
4-Aug-21	DO (mg/L)	>6.0							2.26	2.17	2.81	3.83	5.28	5.8			6.21	6.52
9-Aug-21	DO (mg/L)	>6.0	7.66												8.08			
10-Aug-21	DO (mg/L)	>6.0					7.28	7.11										
11-Aug-21	DO (mg/L)	>6.0							1.91	2.28	4.21	4.41	6.06	5.45			5.17	6.87
17-Aug-21	DO (mg/L)	>6.0					6.96	6.6										
18-Aug-21	DO (mg/L)	>6.0							2.28	2.26	4.21	4.81	5.01	5.13			6.19	6.07
23-Aug-21	DO (mg/L)	>6.0	7.32												7.54			
24-Aug-21	DO (mg/L)	>6.0					6.92	7.25										
25-Aug-21	DO (mg/L)	>6.0							2.3	2.4	4.28	4.57	4.82	5.17			6.1	5.71
1-Sep-21	DO (mg/L)	>6.0					7.46	7.79										
2-Sep-21	DO (mg/L)	>6.0							3.29	4.66	4.34	4.59	5.59	5.43			6.14	6.2
6-Sep-21	DO (mg/L)	>6.0	7.79												8.24			
7-Sep-21	DO (mg/L)	>6.0					8.53	8.89										
8-Sep-21	DO (mg/L)	>6.0							2.51	3.98	3.87	4.06	5.03	5.52			6.17	6.08
13-Sep-21	DO (mg/L)	>6.0	8.07												8.61			

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		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
14-Sep-21	DO (mg/L)	>6.0					7.14	7.43										
15-Sep-21	DO (mg/L)	>6.0							2.79	2.7	4.9	5.06	6.1	6.18			7.2	7.04
21-Sep-21	DO (mg/L)	>6.0					6.83	7.18										
22-Sep-21	DO (mg/L)	>6.0							2.61	2.5	4.53							
28-Sep-21	DO (mg/L)	>6.0					6.85	7.34										
29-Sep-21	DO (mg/L)	>6.0							3.48	3.67	5.1							
6-Jul-21	Conductivity (µs/cm)						70	71										
7-Jul-21	Conductivity (µs/cm)								86	58	79	87	66	53			142	19
12-Jul-21	Conductivity (µs/cm)		81												33			
13-Jul-21	Conductivity (µs/cm)						71	71										
14-Jul-21	Conductivity (µs/cm)								82	85	82	88	64	66			125	25
20-Jul-21	Conductivity (µs/cm)						71	70										
21-Jul-21	Conductivity (µs/cm)								82	81	79	84	62	46			145	18
26-Jul-21	Conductivity (µs/cm)		86												29			
27-Jul-21	Conductivity (µs/cm)						70	68										

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		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
29-Jul-21	Conductivity (µs/cm)								76	76	75	77	73	66			115	22
3-Aug-21	Conductivity (µs/cm)						71	68										
4-Aug-21	Conductivity (µs/cm)								76	76	74	78	74	50			114	20
9-Aug-21	Conductivity (µs/cm)		89												30			
10-Aug-21	Conductivity (µs/cm)						71	70										
11-Aug-21	Conductivity (µs/cm)								76	75	73	75	71	60			103	15
17-Aug-21	Conductivity (µs/cm)						69	69										
18-Aug-21	Conductivity (µs/cm)								73	71	69	72	65	59			91	18
23-Aug-21	Conductivity (µs/cm)		99												30			
24-Aug-21	Conductivity (µs/cm)						69	69										
25-Aug-21	Conductivity (µs/cm)								73	71	72	73	69	61			85	25
1-Sep-21	Conductivity (µs/cm)						69	68										
2-Sep-21	Conductivity (µs/cm)								72	54	67	77	70	56			113	22

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
6-Sep-21	Conductivity (µs/cm)		98											30				
7-Sep-21	Conductivity (µs/cm)						68	66										
8-Sep-21	Conductivity (µs/cm)								72	87	70	72	69	66		93	19	
13-Sep-21	Conductivity (µs/cm)		99											31				
14-Sep-21	Conductivity (µs/cm)						67	65										
15-Sep-21	Conductivity (µs/cm)								73	72	72	73	71	67		100	17	
21-Sep-21	Conductivity (µs/cm)						66	63										
22-Sep-21	Conductivity (µs/cm)								71	71	72							
28-Sep-21	Conductivity (µs/cm)						67	64										
29-Sep-21	Conductivity (µs/cm)								72	72	72							
6-Jul-21	Temperature (°C)						31.48	31.44										
7-Jul-21	Temperature (°C)								25.28	26.67	26.18	26.68	26.95	26.99			29.84	26.06
12-Jul-21	Temperature (°C)		31.02												25.76			
13-Jul-21	Temperature (°C)						31.02	30.79										
14-Jul-21	Temperature (°C)								25	27.12	25.8	26.33	27.96	28.94			30.32	27.64

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		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
20-Jul-21	Temperature (°C)					30.68	29.42											
21-Jul-21	Temperature (°C)							25.07	25.14	25.2	25.01	25.82	25.72			27.49	25.32	
26-Jul-21	Temperature (°C)		25.27											23.75				
27-Jul-21	Temperature (°C)					29.78	28.98											
29-Jul-21	Temperature (°C)							25.49	25.92	25.59	26.05	26.17	25.56			29.48	27.5	
3-Aug-21	Temperature (°C)					29.85	29.14											
4-Aug-21	Temperature (°C)							25.6	25.85	25.59	26.01	25.96	26.03			27.81	25.9	
9-Aug-21	Temperature (°C)		27.34											24.89				
10-Aug-21	Temperature (°C)					30.58	30.08											
11-Aug-21	Temperature (°C)							25.76	25.59	25.54	25.72	25.69	26.21			27.73	25.53	
17-Aug-21	Temperature (°C)					29.75	28.95											
18-Aug-21	Temperature (°C)							25.75	25.65	25.65	25.85	26.25	26.74			27.9	26.15	
23-Aug-21	Temperature (°C)		26.45											24.76				
24-Aug-21	Temperature (°C)					30.37	29.9											
25-Aug-21	Temperature (°C)							25.77	25.66	25.8	26.02	26.33	26.71			28.21	27.37	
1-Sep-21	Temperature (°C)					30.99	30.5											
2-Sep-21	Temperature (°C)							26.8	27.22	26.45	27.05	27.33	27.44			29.2	27.02	
6-Sep-21	Temperature (°C)		26.72											24.21				
7-Sep-21	Temperature (°C)					30.79	29.71											
8-Sep-21	Temperature (°C)							25.8	25.22	25.62	25.75	25.88	26.1			27.44	26.28	
13-Sep-21	Temperature (°C)		25.42											24.46				
14-Sep-21	Temperature (°C)					29.89	29.24											
15-Sep-21	Temperature (°C)							25.93	25.95	26.01	26.31	26.69	26.74			27.24	26.15	

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		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
21-Sep-21	Temperature (°C)					29.86	30.55											
22-Sep-21	Temperature (°C)							26.04	26.1	26.53								
28-Sep-21	Temperature (°C)					30	29.98											
29-Sep-21	Temperature (°C)							26.56	27.17	26.42								
12-Jul-21	TSS (mg/L)		21.8											10.28				
13-Jul-21	TSS (mg/L)					<5	<5											
14-Jul-21	TSS (mg/L)							<5	5.4	<5	<5	6.03	6.09			12.4	29.43	
9-Aug-21	TSS (mg/L)		20.8											5.8				
10-Aug-21	TSS (mg/L)					2.5	2.24											
11-Aug-21	TSS (mg/L)							2.8	3.01	3.02	15.2	14.08	25.41			54.59	67.1	
13-Sep-21	TSS (mg/L)		54.83											5.28				
14-Sep-21	TSS (mg/L)					3	3.01											
15-Sep-21	TSS (mg/L)							0.76	1.29	1.94	1.71	3.49	6.09			16.46	5.6	
12-Jul-21	BOD ₅ (mg/L)	<1.5	<1											<1				
13-Jul-21	BOD ₅ (mg/L)	<1.5				<1	<1											
14-Jul-21	BOD ₅ (mg/L)	<1.5						<1	<1	<1	<1	<1	<1			<1	<1	
9-Aug-21	BOD ₅ (mg/L)	<1.5	<1											<1				
10-Aug-21	BOD ₅ (mg/L)	<1.5				<1	<1											
11-Aug-21	BOD ₅ (mg/L)	<1.5						<1	<1	<1	<1	<1	<1			<1	<1	
14-Sep-21	BOD ₅ (mg/L)	<1.5				<1	<1											
15-Sep-21	BOD ₅ (mg/L)	<1.5						<1	<1	<1	<1	<1	<1			<1	<1	
12-Jul-21	COD (mg/L)	<5.0	6.9											6.1				
14-Jul-21	COD (mg/L)	<5.0						7.7	9.3	6.1	6.5	6.1	15.8			<5	13.4	

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		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
13-Sep-21	COD (mg/L)	<5.0	19.3											6.9				
15-Sep-21	COD (mg/L)	<5.0						16.1	12.9	6.4	<5	6.4	6,8			9.6	6.4	
12-Jul-21	NH ₃ -N (mg/L)	<0.2	<0.2											<0.2				
14-Jul-21	NH ₃ -N (mg/L)	<0.2				<0.2	<0.2											
13-Sep-21	NH ₃ -N (mg/L)	<0.2	<0.2											<0.2				
14-Sep-21	NH ₃ -N (mg/L)	<0.2				<0.2												
12-Jul-21	NO ₃ -N (mg/L)	<5.0	0.11											0.13				
13-Jul-21	NO ₃ -N (mg/L)	<5.0				<0.02	<0.02											
13-Sep-21	NO ₃ -N (mg/L)	<5.0	0.13											0.13				
14-Sep-21	NO ₃ -N (mg/L)	<5.0				<0.02	<0.02											
12-Jul-21	Faecal coliform (MPN/100 mL)	<1,000	170											920				
13-Jul-21	Faecal coliform (MPN/100 mL)	<1,000					0	2										
14-Jul-21	Faecal coliform (MPN/100 mL)	<1,000				49	11		49	11	79	170	220	240		220	94	
9-Aug-21	Faecal coliform (MPN/100 mL)	<1,000	350											170				
10-Aug-21	Faecal coliform (MPN/100 mL)	<1,000					2	5										
11-Aug-21	Faecal coliform (MPN/100 mL)	<1,000							17	49	21	140	1,600	350		1,600	1,600	
13-Sep-21	Faecal coliform (MPN/100 mL)	<1,000	540											350				

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		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
14-Sep-21	Faecal coliform (MPN/100 mL)	<1,000					0	2										
15-Sep-21	Faecal coliform (MPN/100 mL)	<1,000							27	22	8	27	49	33			47	47
12-Jul-21	Total Coliform (MPN/100 mL)	<5,000	540												1,600			
13-Jul-21	Total Coliform (MPN/100 mL)	<5,000					2	2										
14-Jul-21	Total Coliform (MPN/100 mL)	<5,000				130	49		130	49	130	920	280	350			920	140
9-Aug-21	Total Coliform (MPN/100 mL)	<5,000	1,600												920			
10-Aug-21	Total Coliform (MPN/100 mL)	<5,000					5	14										
11-Aug-21	Total Coliform (MPN/100 mL)	<5,000							79	140	26	220	1,600	540			1,600	1,600
13-Sep-21	Total Coliform (MPN/100 mL)	<5,000	1,600												1,600			
14-Sep-21	Total Coliform (MPN/100 mL)	<5,000					0	5										
15-Sep-21	Total Coliform (MPN/100 mL)	<5,000							110	140	23	130	540	540			920	920
12-Jul-21	TKN (mg/L)		<1.5												<1.5			
13-Jul-21	TKN (mg/L)						<1.5	<1.5										
13-Sep-21	TKN (mg/L)		<1.5												<1.5			
14-Sep-21	TKN (mg/L)						<1.5	<1.5										

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		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
6-Jul-21	Secchi Disk (m)					3.8	3.8											
7-Jul-21	Secchi Disk (m)							0.8	1.2									
13-Jul-21	Secchi Disk (m)					3.6	3.4											
14-Jul-21	Secchi Disk (m)							2	1.2									
20-Jul-21	Secchi Disk (m)					3.5	3											
21-Jul-21	Secchi Disk (m)							1.8	1.6									
27-Jul-21	Secchi Disk (m)					3.5	3.2											
28-Jul-21	Secchi Disk (m)							2.6	2.5									
3-Aug-21	Secchi Disk (m)					3	3.1											
4-Aug-21	Secchi Disk (m)							2.1	2.2									
10-Aug-21	Secchi Disk (m)					3.4	3.6											
11-Aug-21	Secchi Disk (m)							2.5	2									
17-Aug-21	Secchi Disk (m)					3.1	3											
18-Aug-21	Secchi Disk (m)							2.8	2									
24-Aug-21	Secchi Disk (m)					3.1	3.3											
25-Aug-21	Secchi Disk (m)							2.3	2.2									
1-Sep-21	Secchi Disk (m)					3.2	3.5											
2-Sep-21	Secchi Disk (m)							2.5	2.4									
7-Sep-21	Secchi Disk (m)					3	3.2											
8-Sep-21	Secchi Disk (m)							2.8	2.6									
14-Sep-21	Secchi Disk (m)					3.5	2.8											
15-Sep-21	Secchi Disk (m)							3.4	3.2									
21-Sep-21	Secchi Disk (m)					1.3	2.5											

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		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
22-Sep-21	Secchi Disk (m)							1.1	1.3									
28-Sep-21	Secchi Disk (m)					3.75	3											
12-Jul-21	TOC (mg/L)		1.85											1.63				
14-Jul-21	TOC (mg/L)							1.84	1.79	1.76	1.82	3.03	2.25			2.75	4.97	
13-Sep-21	TOC (mg/L)		2.42											1.13				
15-Sep-21	TOC (mg/L)							1.1	1.19	1.19	1.09	1.14	1.3			2.03	4.39	
13-Jul-21	Phytoplankton Biomass (g dry wt/m³)					1.2	0.4											
14-Sep-21	Phytoplankton Biomass (g dry wt/m³)					2.4	1.2											
12-Jul-21	Total Phosphorus (mg/L)		<0.01											<0.01				
13-Jul-21	Total Phosphorus (mg/L)					<0.01	<0.01											
13-Sep-21	Total Phosphorus (mg/L)		0.02											<0.01				
14-Sep-21	Total Phosphorus (mg/L)					<0.01	<0.01											
12-Jul-21	Total Dissolved Phosphorus (mg/L)		<0.01											<0.01				
13-Jul-21	Total Dissolved Phosphorus (mg/L)					<0.01	<0.01											
13-Sep-21	Total Dissolved Phosphorus (mg/L)			0.02										<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						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
14-Sep-21	Total Dissolved Phosphorus (mg/L)						<0.01	<0.01										
13-Jul-21	Hydrogen Sulfide (mg/L)						<0.02	<0.02										
14-Sep-21	Hydrogen Sulfide (mg/L)						<0.02	<0.02										
13-Jul-21	TSS (mg/L)-bottom						<5	<5										
10-Aug-21	TSS (mg/L)-bottom						8.27	<5										
14-Sep-21	TSS (mg/L)-bottom						13.5	0.64										
13-Jul-21	BOD ₅ (mg/L)-bottom						<1	<1										
10-Aug-21	BOD ₅ (mg/L)-bottom						<1	<1										
14-Sep-21	BOD ₅ (mg/L)-bottom						<1	<1										
13-Jul-21	Total Coliform (MPN/100 mL)-bottom						0	2										
10-Aug-21	Total Coliform (MPN/100 mL)-bottom						2	4										
14-Sep-21	Total Coliform (MPN/100 mL)-bottom						7.8	2										

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		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
13-Jul-21	Faecal coliform (MPN/100 mL)-bottom					0	2											
10-Aug-21	Faecal coliform (MPN/100 mL)-bottom					0	2											
14-Sep-21	Faecal coliform (MPN/100 mL)-bottom					2	2											
13-Jul-21	NH ₃ -N (mg/L)-bottom					0.3	0.2											
14-Sep-21	NH ₃ -N (mg/L)-bottom					<0.2	<0.2											
13-Jul-21	NO ₃ -N (mg/L)-bottom					<0.02	<0.02											
14-Sep-21	NO ₃ -N (mg/L)-bottom					0.2	0.04											
13-Jul-21	TKN (mg/L)-bottom					<1.5	<1.5											
14-Sep-21	TKN (mg/L)-bottom					<1.5	<1.5											
13-Jul-21	Total Dissolved Phosphorus (mg/L)-bottom					<0.01	<0.01											
14-Sep-21	Total Dissolved Phosphorus (mg/L)-bottom					0.06	0.02											

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		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir		Downstream				Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
13-Jul-21	Total Phosphorus (mg/L)-bottom					<0.01	<0.01											
14-Sep-21	Total Phosphorus (mg/L)-bottom					0.07	0.03											
13-Jul-21	Hydrogen Sulfide (mg/L)-bottom					0.14	0.27											
14-Sep-21	Hydrogen Sulfide (mg/L)-bottom					0.16	0.47											
13-Jul-21	Phytoplankton Biomass (g dry wt/m³)-bottom					1.8	2.4											
14-Sep-21	Phytoplankton Biomass (g dry wt/m³)-bottom					1.2	12.2											

APPENDIX 5-2: EFFLUENT CAMP MONITORING RESULTS – Q3 2021

Date	Parameter (Unit)	Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
		Guideline in the CA			
08-Jul-21	pH	6.0 - 9.0	7.08	7.16	
22-Jul-21	pH	6.0 - 9.0	6.99	7.13	8.63
02-Aug-21	pH	6.0 - 9.0	6.91	6.83	7.69
16-Aug-21	pH	6.0 - 9.0	7.04	7.35	7.82
10-Sep-21	pH	6.0 - 9.0	6.25	6.94	7.05
14-Sep-21	pH	6.0 - 9.0	6.17	6.85	6.82
08-Jul-21	Sat. DO (%)		29.6	24.7	
22-Jul-21	Sat. DO (%)		44.1	13.2	55.2
02-Aug-21	Sat. DO (%)		44.3	17.8	34
16-Aug-21	Sat. DO (%)		70.9	46.5	83.3
10-Sep-21	Sat. DO (%)		75.6	86.8	19.9
14-Sep-21	Sat. DO (%)		77.3	97.5	62.9
08-Jul-21	DO (mg/L)		2.3	1.95	
22-Jul-21	DO (mg/L)		3.37	1.02	4.19
02-Aug-21	DO (mg/L)		3.4	1.36	2.58
16-Aug-21	DO (mg/L)		5.54	3.63	6.37
10-Sep-21	DO (mg/L)		5.84	6.72	1.51
14-Sep-21	DO (mg/L)		5.91	7.53	4.76
08-Jul-21	Conductivity (µs/cm)		338	528	
22-Jul-21	Conductivity (µs/cm)		495	997	978
02-Aug-21	Conductivity (µs/cm)		445	1278	1064
16-Aug-21	Conductivity (µs/cm)		329	362	864
10-Sep-21	Conductivity (µs/cm)		402	490	753
14-Sep-21	Conductivity (µs/cm)		468	472	850
08-Jul-21	Temperature (°C)		28.58	27.42	
22-Jul-21	Temperature (°C)		29.32	28.53	29.39
02-Aug-21	Temperature (°C)		29.13	29.04	29.95
16-Aug-21	Temperature (°C)		28.23	28.14	29.14
10-Sep-21	Temperature (°C)		28.65	28.54	29.71
14-Sep-21	Temperature (°C)		29.49	28.68	29.91
08-Jul-21	TSS (mg/L)	<50	8.88	29	
22-Jul-21	TSS (mg/L)	<50	<5	41.79	58.89
02-Aug-21	TSS (mg/L)	<50	<5	137.5	58.06
16-Aug-21	TSS (mg/L)	<50	<5	13.11	15.76
10-Sep-21	TSS (mg/L)	<50	<5	7.6	10
14-Sep-21	TSS (mg/L)	<50	<5	6.8	6.02
08-Jul-21	BOD ₅ (mg/L)	<30	10.98	<6	
22-Jul-21	BOD ₅ (mg/L)	<30	<6	<6	34.92
02-Aug-21	BOD ₅ (mg/L)	<30	13.98	<6	<6
16-Aug-21	BOD ₅ (mg/L)	<30	<6	11.28	<6
10-Sep-21	BOD ₅ (mg/L)	<30	<6	9.21	<6
14-Sep-21	BOD ₅ (mg/L)	<30	<6	<6	<6
08-Jul-21	COD (mg/L)	<125	29.2	81.4	

		Site Name	OSOV1	OSOV 2	Main Powerhouse
		Station Code	EF01	EF13	EF19
Date	Parameter (Unit)	Guideline in the CA			
22-Jul-21	COD (mg/L)	<125	n/a	n/a	n/a
02-Aug-21	COD (mg/L)	<125	n/a	n/a	n/a
16-Aug-21	COD (mg/L)	<125	n/a	n/a	n/a
10-Sep-21	COD (mg/L)	<125	<25	42.7	42
14-Sep-21	COD (mg/L)	<125	<25	31.5	39
08-Jul-21	NH ₃ -N (mg/L)	<10.0	9	14.9	
22-Jul-21	NH ₃ -N (mg/L)	<10.0	n/a	n/a	n/a
02-Aug-21	NH ₃ -N (mg/L)	<10.0	n/a	n/a	n/a
16-Aug-21	NH ₃ -N (mg/L)	<10.0	n/a	n/a	n/a
10-Sep-21	NH ₃ -N (mg/L)	<10.0	<2	19.3	12.2
14-Sep-21	NH ₃ -N (mg/L)	<10.0	2.4	19	13
08-Jul-21	Total Nitrogen (mg/L)	<10.0	22.9	18.1	
22-Jul-21	Total Nitrogen (mg/L)	<10.0	n/a	n/a	n/a
02-Aug-21	Total Nitrogen (mg/L)	<10.0	n/a	n/a	n/a
16-Aug-21	Total Nitrogen (mg/L)	<10.0	n/a	n/a	n/a
10-Sep-21	Total Nitrogen (mg/L)	<10.0	0.91	20.6	13.3
14-Sep-21	Total Nitrogen (mg/L)	<10.0	3.21	20.9	13.9
08-Jul-21	Total Phosphorus (mg/L)	<2	0.8	1.28	
22-Jul-21	Total Phosphorus (mg/L)	<2	n/a	n/a	n/a
02-Aug-21	Total Phosphorus (mg/L)	<2	n/a	n/a	n/a
16-Aug-21	Total Phosphorus (mg/L)	<2	n/a	n/a	n/a
10-Sep-21	Total Phosphorus (mg/L)	<2	0.69	1.56	5.23
14-Sep-21	Total Phosphorus (mg/L)	<2	0.82	1.51	4.02
08-Jul-21	Faecal Coliform (MPN/100 mL)	<400	16000	0	
22-Jul-21	Faecal Coliform (MPN/100 mL)	<400	1600	0	0
02-Aug-21	Faecal Coliform (MPN/100 mL)	<400	1600	0	0
16-Aug-21	Faecal Coliform (MPN/100 mL)	<400	49	1400	0
10-Sep-21	Faecal Coliform (MPN/100 mL)	<400	920	9200	9200
14-Sep-21	Faecal Coliform (MPN/100 mL)	<400	210	0	0
08-Jul-21	Total coliform (MPN/100 mL)	<400	16000	0	
22-Jul-21	Total coliform (MPN/100 mL)	<400	1700	0	0
02-Aug-21	Total coliform (MPN/100 mL)	<400	1600	0	0
16-Aug-21	Total coliform (MPN/100 mL)	<400	110	2200	0
10-Sep-21	Total coliform (MPN/100 mL)	<400	1600	16000	16000
14-Sep-21	Total coliform (MPN/100 mL)	<400	3500	0	0

APPENDIX 5-3: GROUNDWATER QUALITY MONITORING RESULTS – Q3 2021

		Site Name	Phouhomxay Village		Somseun Village	Nampa Village	Thongnoy Village	Pou Village
		Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01
Month Year	Parameter (Unit)	Guideline						
06-Jul-21	pH	6.5 - 9.2	6.58	7.09				
12-Jul-21	pH	6.5 - 9.2						6.1
23-Jul-21	pH	6.5 - 9.2			7.1	7.26	7.21	
06-Aug-21	pH	6.5 - 9.2	6.56	7.00	7.17	7.19	7.15	
09-Aug-21	pH	6.5 - 9.2						6.05
20-Aug-21	pH	6.5 - 9.2	6.84	6.98				
06-Jul-21	Sat. DO (%)		58.2	36.8				
12-Jul-21	Sat. DO (%)							79
23-Jul-21	Sat. DO (%)				53	77.7	42.1	
06-Aug-21	Sat. DO (%)		32.8	26.7	73.7	81.9	54.3	
09-Aug-21	Sat. DO (%)							84.7
20-Aug-21	Sat. DO (%)		30.3	27.6				
06-Jul-21	DO (mg/l)		4.73	3.01				
12-Jul-21	DO (mg/l)							5.87
23-Jul-21	DO (mg/l)				4.28	6.25	3.27	
06-Aug-21	DO (mg/l)		2.7	2.16	5.71	6.46	4.18	
09-Aug-21	DO (mg/l)							6.28
20-Aug-21	DO (mg/l)		2.45	2.24				
06-Jul-21	Conductivity (µS/cm)		416	438				
12-Jul-21	Conductivity (µS/cm)							18
23-Jul-21	Conductivity (µS/cm)				339	402	399	
06-Aug-21	Conductivity (µS/cm)		231	463	346	399	402	
09-Aug-21	Conductivity (µS/cm)							17
20-Aug-21	Conductivity (µS/cm)		236	465				
06-Jul-21	Temperature (°C)		26.11	25.78				
12-Jul-21	Temperature (°C)							31.08
23-Jul-21	Temperature (°C)				26.22	26.4	28.32	
06-Aug-21	Temperature (°C)		26.32	26.52	28.55	27.58	29.04	
09-Aug-21	Temperature (°C)							29.17
20-Aug-21	Temperature (°C)		26.3	25.92				
06-Jul-21	Fecal coliform (MPN/100ml)	0	33	2				
12-Jul-21	Fecal coliform (MPN/100ml)	0						2
23-Jul-21	Fecal coliform (MPN/100ml)	0			0	2	79	

		Site Name	Phouhomxay Village		Somseun Village	Nampa Village	Thongnoy Village	Pou Village
		Station	GPHX01	GPHX02	GSXN01	GNPA01	GTHN01	GPOU01
Month Year	Parameter (Unit)	Guideline						
06-Aug-21	Fecal coliform (MPN/100ml)	0	0	0	0	23	240	
09-Aug-21	Fecal coliform (MPN/100ml)	0						0
20-Aug-21	Fecal coliform (MPN/100ml)	0	0	0				
06-Jul-21	E.coli Bacteria (MPN/100ml)	0	33	2				
12-Jul-21	E.coli Bacteria (MPN/100ml)	0						2
23-Jul-21	E.coli Bacteria (MPN/100ml)	0			0	2	27	
06-Aug-21	E.coli Bacteria (MPN/100ml)	0	0	0	0	23	79	
09-Aug-21	E.coli Bacteria (MPN/100ml)	0						0
20-Aug-21	E.coli Bacteria (MPN/100ml)	0	0	0				

APPENDIX 5-4: GRAVITY FED WATER SUPPLY MONITORING RESULTS – Q3 2021

Date	Parameter (Unit)	Site Name	Thaheua Village	Hatngiun Village	Phouhomxay Village	
		Station	WTHH02	WHGN02	WPHX02	WPHX03
		Guideline				
20-Jul-21	pH	6.5 - 8.5			5.55	5.48
23-Jul-21	pH	6.5 - 8.5	6.94	6.84		
06-Aug-21	pH	6.5 - 8.5	7.06	7.07	6.97	7.07
20-Jul-21	Sat. DO (%)				103	111.1
23-Jul-21	Sat. DO (%)		108.9	108.3		
06-Aug-21	Sat. DO (%)		83.5	93.3	91.8	90.3
20-Jul-21	DO (mg/L)				8.12	8.7
23-Jul-21	DO (mg/L)		8.63	8.5		
06-Aug-21	DO (mg/L)		6.45	7.21	7.18	7.08
20-Jul-21	Conductivity (µS/cm)	<1,000			11	9
23-Jul-21	Conductivity (µS/cm)	<1,000	73	98		
06-Aug-21	Conductivity (µS/cm)	<1,000	70	93	10	11
20-Jul-21	Temperature (°C)	<35			27.96	28.1
23-Jul-21	Temperature (°C)	<35	27.16	27.83		
06-Aug-21	Temperature (°C)	<35	28.75	28.7	28.02	28.15
20-Jul-21	Faecal Coliform (MPN/100 mL)	0			70	79
23-Jul-21	Faecal Coliform (MPN/100 mL)	0	17	26		
06-Aug-21	Faecal Coliform (MPN/100 mL)	0	79	79	49	33
20-Jul-21	E.coli Bacteria (MPN/100 mL)	0			70	79
23-Jul-21	E.coli Bacteria (MPN/100 mL)	0	17	26		
23-Jul-21	E.coli Bacteria (MPN/100 mL)	0				
06-Aug-21	E.coli Bacteria (MPN/100 mL)	0	79	79	49	23

APPENDIX 5-5: LANDFILL LEACHATE MONITORING RESULTS – Q3 2021

		Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
			Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharge Point
			LL1	LL2	LL3	LL4	LL5	LL6	LL7
			Location	Station	Guideline				
Date	Parameter (Unit)	Guideline							
8-Jul-21	pH	6.0-9.0				7.82		7.93	
2-Aug-21	pH	6.0-9.0				9.51		9.54	
10-Sep-21	pH	6.0-9.0				7.23		7.06	
8-Jul-21	Sat. DO (%)					88.2		79.1	
2-Aug-21	Sat. DO (%)					113.7		163.8	
10-Sep-21	Sat. DO (%)					91.5		111.6	
8-Jul-21	DO (mg/L)					6.84		6.2	
2-Aug-21	DO (mg/L)					8.12		11.95	
10-Sep-21	DO (mg/L)					6.93		8.42	
8-Jul-21	Conductivity (µS/cm)					112		181	
2-Aug-21	Conductivity (µS/cm)					122		165	
10-Sep-21	Conductivity (µS/cm)					81		156	
8-Jul-21	Temperature (°C)					28.44		28.05	
2-Aug-21	Temperature (°C)					33.08		32.16	
10-Sep-21	Temperature (°C)					29.87		29.9	
8-Jul-21	BOD5 (mg/L)	<30				16.5		13.8	
2-Aug-21	BOD5 (mg/L)	<30				<6		<6	
10-Sep-21	BOD5 (mg/L)	<30				<6		<6	
8-Jul-21	COD (mg/L)	<125				78		48.7	
8-Jul-21	Faecal Coliform (MPN/100mL)	<400				170		1600	
2-Aug-21	Faecal Coliform (MPN/100mL)	<400				33		79	
10-Sep-21	Faecal Coliform (MPN/100mL)	<400				49		13	
8-Jul-21	Total Coliform (MPN/100mL)	<400				1,600		1,600	
2-Aug-21	Total Coliform (MPN/100mL)	<400				920		1,600	
10-Sep-21	Total Coliform (MPN/100mL)	<400				920		1,600	
8-Jul-21	Total nitrogen (mg/L)	<10				0.99		2.11	
8-Jul-21	Ammonia nitrogen (mg/L)	<10				<2		<2	
8-Jul-21	Oil & Grease (mg/L)	<10				1		<1	
10-Sep-21	NH3-N (mg/l)	2				<2		<2	
10-Sep-21	COD (mg/l)	25				53.9		<25	
10-Sep-21	Total Nitrogen (mg/l)	0.1				0.94		0.85	
10-Sep-21	FAT, Oil & Grease (mg/)	1				2		<1	