NAM NGIEP 1
POWER COMPANY

Nam Ngiep 1 Hydropower Project

Quarterly Environment Monitoring Report
First Quarter of 2020

January to March 2020

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ABBREVIATIONS / ACRONYMS

AIP	Annual Implementation Plan
ADB	Asian Development Bank
BAC	Biodiversity Advisory Committee
BOF	Biodiversity Offset Framework
BOMC	Biodiversity Offset Management Committee
BOMP	Biodiversity Offset Management Plan
CA	Concession Agreement between the NNP1PC and GOL
CAP	Corrective Action Plan
COD	Commercial Operation Date
CVC	Conventional Vibrated Concrete
CWC	Civil Works Contract
EC	Electrolytic Conductivity
EIA	Environmental Impact Assessment
EMMR	Environmental Management and Monitoring Reports
EMO	Environmental Management Office of ESD within NNP1PC
EMU	Environmental Monitoring Unit
EMWC	Electrical-Mechanical Works Contract
EPF	Environmental Protection Fund
ESD	Environmental and Social Division of NNP1PC
ESMMP	Environmental and Social Monitoring and Management Plan
GOL	Government of Lao PDR
GIS	Geographic Information Systems
HMWC	Hydraulic Metal Works Contract
HR	Human Resources
IEE	Initial Environmental Examination
IMA	Independent Monitoring Agency
INRMP	Integrated Natural Resources Management Plan
ISP	Intergraded Spatial Planning
kV	kilo-Volt
LTA	Lender's Technical Advisor
MAF	Ministry of Agriculture and Forestry
MEM	Ministry of Energy and Mines, Lao PDR

MOM	Minutes of Meeting
MONRE	Ministry of Natural Resource and Environment, Lao PDR
MOU	Memorandum of Understanding
NCR	Non-Compliance Report
NNP1PC	Nam Ngiep 1 Power Company Limited
OC	Obayashi Corporation
ONC	Observation of Non-Compliance
OSOV	Owners' Site Office and Village
PAFO	Provincial Department of Agriculture and Forestry
PONRE	Provincial Department of Natural Resource and Environment, MONRE
RCC	Roller Compacted Concrete
SIR	Site Inspection Report
SOP	Standard Operating Procedure
SMO	Social Management Office of ESD within NNP1PC
SS-ESMMP	Site Specific Environmental and Social Monitoring and Management Plan
TOR	Terms of Reference
TSS	Total Suspended Solids
UAE	United Analysis and Engineering Consultant Company Ltd.
WMF	Watershed Management Fund
WMP	Watershed Management Plan
WRPC	Watershed and Reservoir Protection Committee
WRPO	Watershed and Reservoir Protection Office
WWTS	Wastewater Treatment System

1 EXECUTIVE SUMMARY

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

During Q1 2020, the Environmental Management Office (EMO) of NNP1PC received five Detailed Work Program (DWP) & Site Specific ESMMPs and three Site Decommissioning Plans for review and approval. A total of eleven Observations of Non-Compliance (ONCs) were active, (two ONCs carried over from Q4 2019, and nine ONCs were newly opened). Out of these, five ONCs were resolved during the reported period and six ONCs have been carried over to Q2 2020.

A new local contractor was on board since 24 February 2020 for a one-year contract for general waste management in the host villages (Thaheua and Hat Gniun villages), Phouhomxay Village and NNP1 project sites and camps as well as operation of Houay Soup and NNP1 project landfill.

During Q1 2020, a total of 70.5 m^3 solid waste from NNP1 project sites and camps was disposed of at the NNP1 Project Landfill, a decrease of 96.2 m^3 compared to Q4 2019. A total of 65.2 m^3 solid waste from Phouhomxay, Thaheua and Hat Gniun villages was disposed of at the Houay Soup Landfill. A total of 2,680 kg recyclable waste was recorded at the Community Waste Bank and villagers collected a total of 1,870 kg of food waste from the Owner's Site Office and Village (OSOV) for feeding their animals.
The monthly site visit by the Bolikhan District EMU was not carried out, but a quarterly site visit by the Environmental Management Unit (EMU) of Xaysomboun Province was carried out during 11-17 January 2020.

During Q1 2020, the concentration of dissolved oxygen (DO) at the depth of 0.2 m in the Main Reservoir R02, R03, R04 and R05 fluctuated between 1.4 – 9.8 mg/L. The Nam Ngiep Upstream station (NNG01), Nam Chian (NCH01), Nam Phouan (NPH01) and Main Reservoir at R01 had DO levels above 6 mg/L. In addition, the DO concentrations in Nam Xao and Nam Houay Soup were above 6 mg/L, except for a couple of measurements.

The DO concentrations at the surface level in the re-regulation reservoir (R07) were between 0.64 – 4.77 mg/L. During the period with gate and/or spillway discharge on 16 January and 25 March 2020, the DO concentrations in the downstream stations remained above 6 mg/L due to the aeration generated by the gate/weir discharge. During the remaining part of Q1 2020, the DO level fell below 6 mg/L in the downstream stations during periods with turbine discharge.

The depth profiles monitoring indicates formation of oxyclines and thermal stratification in the main reservoir at all stations at depths between 1.0 – 32.0 m, except at R01.
On 30 January 2020, some dead fish were observed in the main reservoir, and specimens were collected at R05 for fish species identification.

Bolikhamxay Provincial WRPO kicked off the implementation activities under AIP2019 in January 2020. However, they confirmed in March 2020 that most of implementation activities under AIP2019 will be postponed until the country lockdown for COVID-19 outbreak is over and the Bolikhamxay Provincial Regulation for Watershed Management is ready. The implementation activities by Xaysomboun Provincial WRPO are delayed. NNP1PC-EMO Management proposed to the Chair of the Xaysomboun Provincial WRPC to have a workshop to brief all the WRPC-WRPO members on the planned activities approved including budget to avoid further delay in the implementation activities under the AIP2019.

Bolikhamxay Provincial WRPO completed the first draft of AIP2020 in January 2020 and this is subsequently being reviewed by NNP1PC-EMO team and management. The preparation of AIP2020 by Xaysomboun Provincial WRPO started in January 2020. Due to delays in the progress of plan preparation, NNP1PC-EMO Management requested the WRPO to submit an official progress report and status of plan preparation as reference to obtain further support and guidance from Xaysomboun Provincial WRPC.

The NC-NX Biodiversity Offset Management AIP2020 was approved by ADB on 03 March 2020. The Biodiversity Offset Management Unit (BOMU) prepared an official document to request for fund disbursement at the end of March 2020. Bolikhamxay Provincial BOMU has continued implementing the management activities at NC-NX offset site using the remaining budget of AIP2019.

The five type of species that dominated the fish catch by weight in Q1 2020 include two species (*Channa striata* and *Tor sinensis*) and species group of Poropuntius, Hampala and *Sikukia gudgeri* and *Amblyrhynchichthys truncatus* that are classified as Least Concern (LC) according to the IUCN Red List of Threatened Species, except *Tor sinensis* which is classified as Vulnerable (VU) and *Sikukia gudgeri which* is classified as Data Deficient (DD). The recorded catch includes four Vulnerable species (VU), and three Near Threatened species (NT).

2 INTRODUCTION

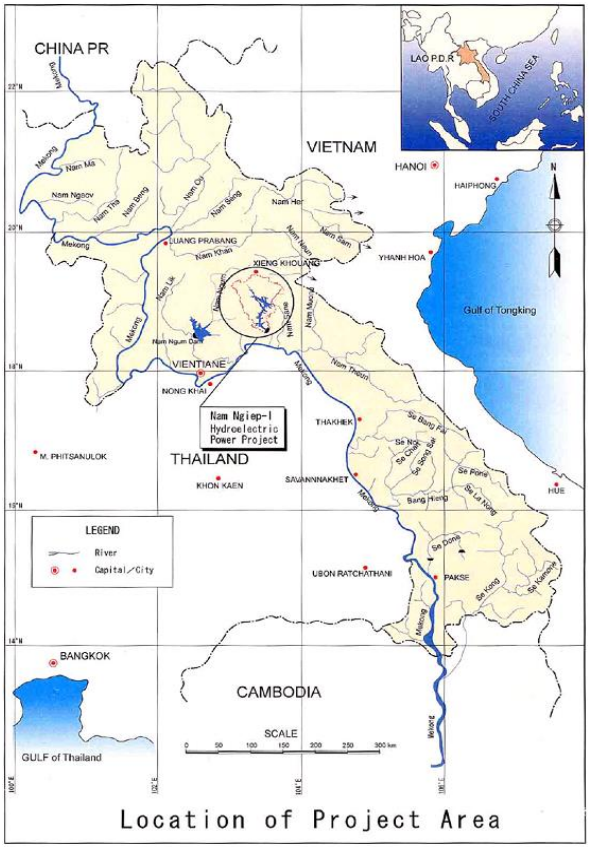
The Nam Ngiep originates in the mountains of Xieng Khouang Province, flowing through Khoun District into Thathom District of Xaysomboun Province, through Hom District and into Bolikhan District of Bolikhamxay Province. The Nam Ngiep meets the Mekong River just upstream from Paksan in Bolikhamxay Province.

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

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

This Quarterly Environment Report provides a summary of environmental monitoring activities and mitigation actions during **Q1 2020**. The report is published on the Company website (https://namngiep1.com/).

Related construction Site Specific Environmental and Social Monitoring and Management Plans (SS-ESMMPs) are also publicly disclosed on the Company website as required under the Concession Agreement.



3 ENVIRONMENTAL MANAGEMENT AND MONITORING

The environmental management and monitoring activities reported in this section document implementation of the relevant sub-plans and programmes of the Environmental and Social Management and Monitoring Plan for the Operation Phase during Q1 2020.

3.1 Contractor SS-ESMMPs

During Q1 2020, five Detailed Work Programme (DWP) & Site Specific Environmental and Social Management Plans (SS-ESMMPs), and three Site Decommissioning and Rehabilitation Plans (SDRP) were submitted for review and approval by the Environmental Management Office (EMO). All these submitted documents were cleared under the document review timeframe as shown in **Table 3-1**.

More details can be found in ***Appendix 1***.

TABLE 3-1*: DOCUMENT REVIEWED DURING Q1 2020*

Document Name	Rev. 1	Rev. 2	Rev. 3	Approved
Site Decommissioning and Rehabilitation Plan for Song Da5 Camp No.1	√	√		√
Site Decommissioning & Rehabilitation Plan for SD5, Temporary CVC Batching Plant & Stockyard	√	√		√
Site Decommissioning and Rehabilitation Plan for VSP Camp and Spoil Disposal Area	√			√
DWP&SS-ESMMP for Installation of Double Corrosion Protection Rock Bolts at the Left Bank Slope	√	√		√
DWP & SS-ESMMP for Supply and Installation of Log Booms at the Main Dam and Re-Regulation Dam" Nam Ngiep 1 Hydropower Project	√	√		√
DWP & SS-ESMMP for Supply and installation of Transmission Line Tower No.1	√			√
DWP & SS-ESMMP for Removing the Stump and Clean Irrigation at Main Canal	√			√
DWP & SS-ESMMP for Construction of Irrigation Sub-Canal in Phouhomxay Resettlement Village	√			√

3.2 Results of Compliance Inspections at Construction Sites

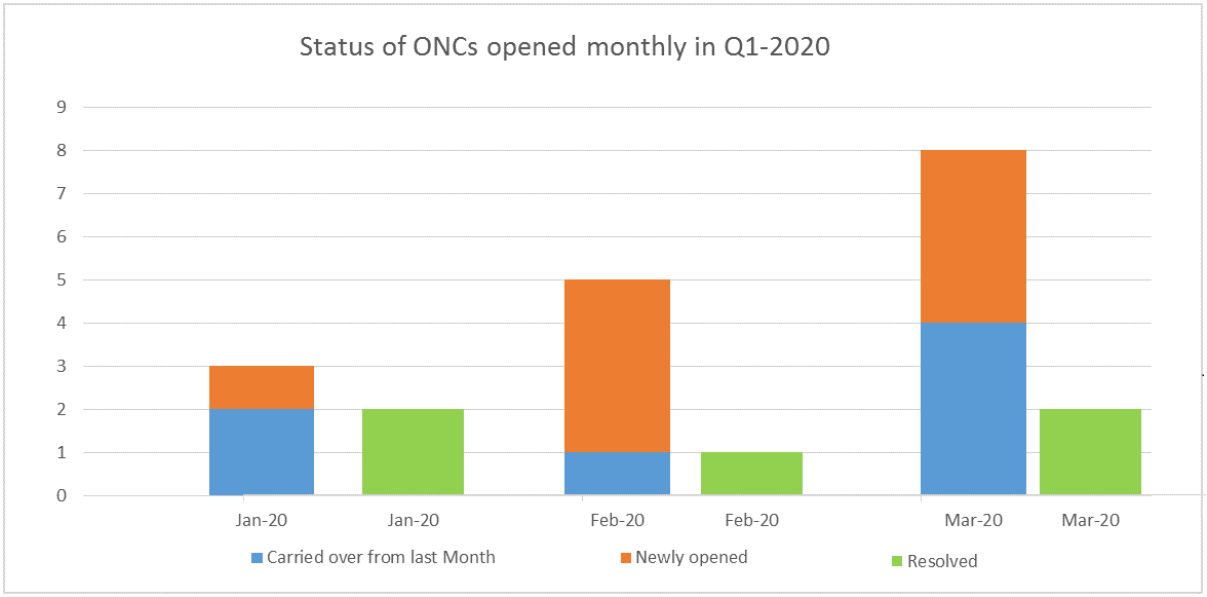
During Q1 2020, the EMO conducted bi-weekly and weekly follow-up inspections of site decommissioning and rehabilitation works at 28 construction sites and camps of the main civil works, temporary contractor camps and construction sites of NNP1 new contractors. An increase of eight monitoring sites compared to Q4 2019 were the new temporary sites (construction sites and camps) of construction contractors under NNP1's Variation Orders.

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

TABLE 3-2: *STATUS OF NON-COMPLIANCE REPORT DURING Q1 2020*

Status	ONC	NCR-Level 1	NCR-Level 2	NCR-Level 3	Incident Report
Carried over ONC/NCR from the previous quarter	2	0	0	0	0
Newly opened ONC/NCR	9	0	0	0	0
Total No. of ONC/NCR	**11**	**0**	**0**	**0**	**0**
Resolved ONC/NCR	5	0	0	0	0
Unresolved ONC/NCR carried forward to the next quarter	**6**	**0**	**0**	**0**	**0**

FIGURE 3-1: *STATUS OF ONC DURING Q1 2020*



PHOTOGRAPH 1: NNP1PC (TD-EMO) - CONTRACTOR JOINT INSPECTION AT THE MAIN QUARRY FOR SITE GRADING AND SOIL COVERING

PHOTOGRAPH 2: NNP1PC (TD-EMO)- CONTRACTOR JOINT INSPECTION FOR THE REVEGETATION AND AFTER-CARE AT OC CAMP

PHOTOGRAPH 3: LTA SITE VISIT ON 25 FEBRUARY 2020

PHOTOGRAPH 4: TEMPORARY NURSERY SET UP BY OC'S SUB-CONTRACTOR AT SONG DA 5 CAMP NO.1

3.3 Results of Site Decommissioning and Rehabilitation

Main Quarry:

Following the recommendation from the LTA mission in August 2019 and the latest IAP-ADB mission in December 2019, NNP1PC has instructed the Contractor to undertake the corrective actions for the rehabilitation including grading and reshaping the main quarry bottom, soil placement and grass seeding. The corrective actions started in the beginning of January 2020.

In January 2020, the contractor performed grading and shaping of the main quarry bottom, NNP1PC (EMO and TD) regularly visited and checked the site conditions jointly with the Contractor. NNP1PC allowed the Contractor to use the deposited sand/soil material in the re-regulation pond below the former RCC plant for the main quarry rehabilitation.

In February 2020, the Contractor submitted the final landform map for NNP1PC review and comment. It was also noted that, as a result of the bottom grading, the deep pond at the main

quarry was made shallower. The deposited sand/soil material from the area below the former RCC plant was placed on the quarry bottom and grass seeding as well as water sprinkle installation works were commenced.

The main quarry revegetation included:

- Installed water pipe lines and 16 sprinklers;
- Sown a total of 02 kg of Ruzi grass seeds - more will be added as required during the liability period;
- Planted a total of 787 stumps of local grass (about 5 meter spacing);
- Assigned three labours work on site for the revegetation aftercare and maintenance.

Rehabilitation of other Sites:

The revegetation work has been included in the punch list of the Civil Work Contractors and spraying of water from water trucks is implemented every day during the dry season with a weekly watering schedule being monitored by NNP1PC. EMO carried out weekly site inspections and NNP1PC and the contractors carried out joint monthly site inspections and evaluations. The Site Inspection Reports (SIR) were issued to the Contractor for implement the defect correction (See **Appendix 2**). The progress of revegetation will be evaluated and added in the next quarterly reports. Even though sufficient vegetation may not be achieved in some areas by the end of the Civil Works Defects Liability Period (31 January 2021), NNP1PC will continue to implement revegetation works to achieve the required result using retention budget held by NNP1PC.

3.4 WASTE MANAGEMENT AT THE CONSTRUCTION SITES

3.4.1 General Waste Management

During Q1 2020, a total of 70.5 m^3 of solid waste from NNP1 project sites and camps was disposed at the NNP1 Project Landfill, a decrease of 96.2 m^3 compared to Q4 2019 due to all contractors and sub-contractors were demobilized from the project sites.

A new local contractor was on board since 24 February 2020 with a one-year contract for general waste management in the host villages (Thaheua and Hat Gniun villages), Phouhomxay Village and NNP1 project sites and camps as well as operation of Houay Soup landfill and NNP1 project landfill.

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

TABLE 3-3: *AMOUNTS OF RECYCLABLE WASTE DURING Q1 2020*

Source and Type of Recyclables		Unit	Total in Q1 of 2020 (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	Glass bottles	kg	38	0	38
3	Plastic bottles	kg	41	0	41

Source and Type of Recyclables		Unit	Total in Q1 of 2020 (A)	Sold (B)	Remaining Amount (A - B)
4	Aluminium cans	kg	39	0	39
5	Paper/Cardboard	kg	47	30*	17
Sub-Total 2		kg	**165**	**30**	**135**
Grand Total 1+2		kg	**165**	**30**	**135**

Note: **In early January 2020, a total of 30 Kg cardboard was managed by: (i) 13.8 kg un-usable was disposed at NNP1 landfill; and (ii) 16.2 kg was reused by NNP1 staffs and drivers.*

3.4.2 Hazardous Waste Management

During Q1 2020, joint hazardous materials and waste inventory inspections were carried out at the remaining operation and construction sites and camps as well as NNP1PC's warehouse and OSOV camps. The amount of hazardous waste and hazardous material that were collected, stored and disposed during Q1 2020 are shown in **Table 3-4**. The treatment and disposal of hazardous waste including used hydraulic oil and engine oil were outsourced to Khounmixay Processing Factory**.** The remaining waste will be collected, treated and disposed by Khounmixay Processing Factory.

TABLE 3-4*: HAZARDOUS MATERIAL AND HAZARDOUS WASTE RECORDED DURING Q1 2020*

No.	Type of Hazardous Material & Hazardous Waste	Unit	Total in Q1 2020 (A)	Used/ Disposed in Q1 2020 (B)	Remaining (A - B)
1	Diesel (fuel)	Litter	24,239	18,800	5,439
2	Lubricants (turbine oil)	Litter	6,400	0	6,400
3	Grease oil	Drum (30L)	7	0	7
4	Gear oil	Litter	100	0	100
5	Thinner	Drum (25L)	1	0	1
6	Colour paint	Can (3L)	1	0	1
7	Sika	Can (0.5L)	7	0	7
8	Fire extinguishers (18.5 kg)	Unit	8	0	8
9	Aluminium sulfate	Litter	0	0	0
10	Chlorine powder	Kg	25	1	24
11	Chlorine liquid	Litter	40	3	37
12	Used oil	Litre	2,072	2,000	72
13	Ink cartridge	Unit	191	72	119
14	Halogen/fluorescent bulbs	Unit	78	0	78
15	Empty spray can	Can	80	0	80
16	Used tire	Unit	0	0	0
17	Used battery	Unit	0	0	0
18	Oil water mixture	Litre	0	0	0
19	Contaminated soil/sand	m^3	0.17	0	0.17
20	Clinic waste	kg	3.4	0	3.4

3.4.3 Sewage Sludge Disposal

As part of site improvement and maintenance activity, a total of 188 m^3 of sewage sludge from the owner site office and villages OSOV1, OSOV2 (ESD camp); main powerhouse; and re-regulation dam powerhouse was transported and disposed at the spoil disposal area No. 6 by following NNP1PC's Standard Operating Procedure (SOP) on Sewage/Black Water Disposal.

3.5 COMMUNITY WASTE MANAGEMENT SUPPORT

3.5.1 Animal Fodder (Pig Feed) Collection Programme

During Q1 2020, local villagers collected 1,870 kg of food waste from the Owner's Site Office and Village (OSOV) for feeding their animals, a decrease of 4,740 kg compared to Q4 2019 due to all main contractors and sub-contractors were demobilized.

3.5.2 Community Solid Waste Management and Recycling Programme

During Q1 2020, the Community Recycle Waste Bank collected a total of 643 kg glass bottles and 71 kg of paper/cardboard was sold as presented in **Table 3-5** below.

TABLE 3-5: *AMOUNT OF RECYCLABLES SOLD AT THE COMMUNITY RECYCLE WASTE BANK*

Type of Waste	Unit	Remaining in Q4 2019	Additional in Q1 2020	Sold/disposed in Q1 2020	Remaining in Q1 2020
Glass bottles	kg	1,149.0	643.0	0	1,792.0
Paper/cardboard	kg	923.5	0	71.0	852.5
Plastic bottles	kg	35.5	0	0	35.5
Aluminium cans	kg	0	0	0	0
Scrap metal	kg	0	0	0	0
Total	**kg**	**2,108.0**	**643.0**	**71.0**	**2,680.0**

During the absence of a local waste management Contractor from 01 January to 23 February 2020, EMO supported pickup and transport of solid wastes from the waste drop-off stations at the two host villages, and Phouhomxay village for disposal at the Houay Soup Landfill.

On 11 March 2020, a quarterly maintenance of the Community Recycle Waste Bank at Hat Gnuin village was carried out which included cutting grass, storage cleaning and installing new waste posters.

3.5.3 Houay Soup Landfill

During Q1 2020, approximately 65.2 m^3 of solid waste was collected from Thaheua, Hat Gniun and Phouhomxay villages and transported for disposal at Houay Soup Landfill. The basic landfill maintenance was carried out which included fixing fence, cleaning up the open ditches and cutting grass.

As of March 2020, the remaining capacity of the Houay Soup Landfill is approximately 5,850 m^3. The landfill could be served for 22 years by considering the average monthly waste disposal of 22 m^3, 30% of volume reduction by the waste compaction, and 30% reduction of the landfill's total volume by the soil cover.

3.6 RESERVOIR OPERATIONS

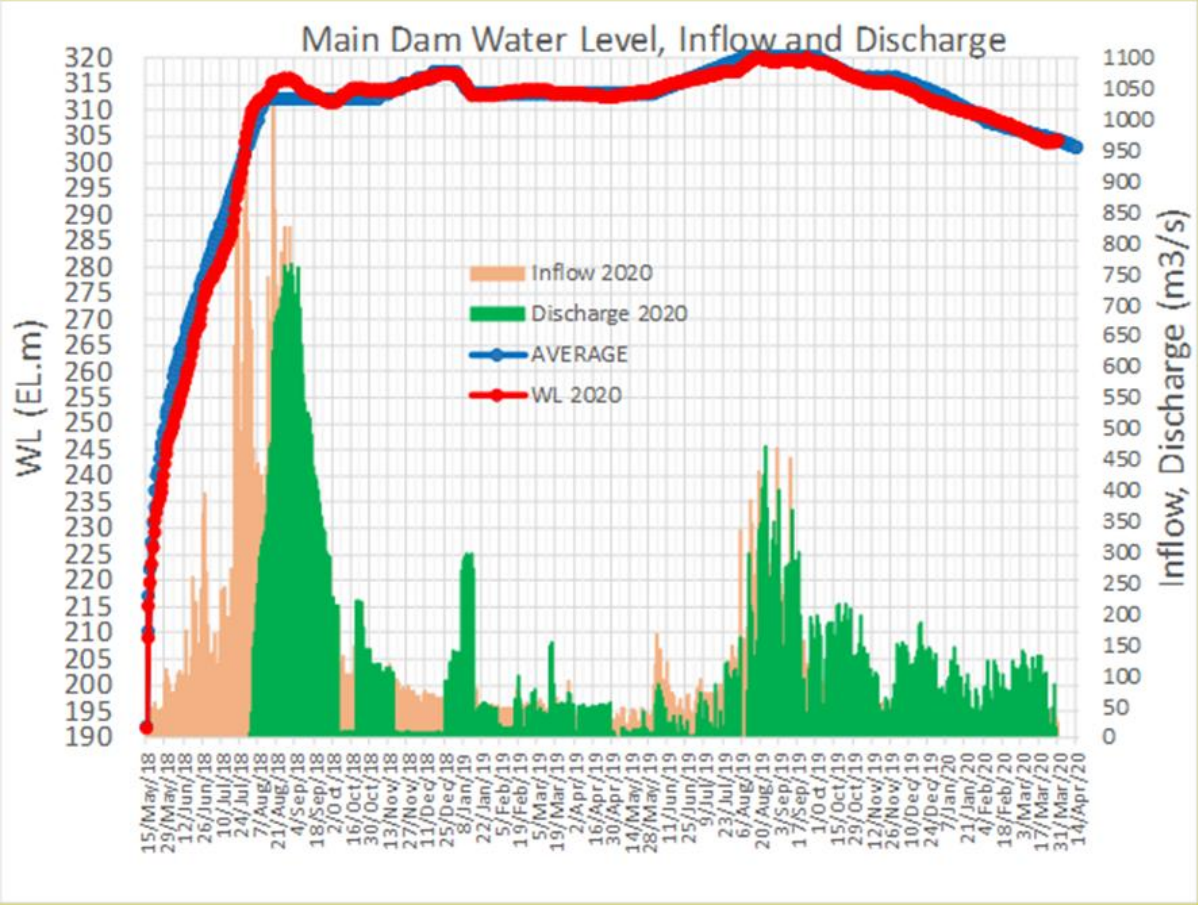
3.6.1 Main Reservoir

The water level in the main reservoir, inflow to the reservoir and discharge from the reservoir since the start of the impounding on 15 May 2018 is presented in the graph in ***Figure 3-2***.

During Q1 2020, the mean daily inflow to the main reservoir was 32 m^3/s. The minimum daily inflow was 17 m^3/s, maximum daily inflow was recorded at 80 m^3/s, and 25th percentile of 25 m^3/s and 75th percentile of 38 m^3/s.

During Q1 2020, the water level in the main reservoir decreased with 7.3 m from El. 311.2 m asl. to El. 303.9 m asl.

FIGURE 3-2: *IMPOUNDING PROGRESS OF THE MAIN RESERVOIR*



3.6.2 Environmental Flow Requirements (EFRs) for the Operation Phase

NNP1PC has monitored compliance with the Environmental Flow Requirements (EFRs) stipulated in the CA, Annex C, Clause 53 (g) and as further modified in the Environmental Flow Assessment Report of July 2014 approved by MONRE. The EFRs have been monitored in accordance with the monitoring programme outlined in the ESMMP-OP 2019 (Vol. II, Part 2 on Subplan 1 on Reservoir and River Health Management).

The results of the EFR compliance monitoring during Q1 2020 are summarized in ***Table 3-6***.

TABLE 3-6: *SUMMARY OF EFRS COMPLIANCE MONITORING IN Q1 2020*

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)	111 out of 114 measurements comply
3	Maximum rate of change (both rise and fall, separately) in stage of 0.6 m per hour	100% of hourly fluctuations comply
4	Maximum fluctuation in stage of 1.7 m over 24-hour (this requirement is about range and determines the maximum difference in stage height over 24-hour periods)	100% of 24-hour fluctuations comply
5	Maximum fluctuation in stage of 1.7 m over 7-days (this requirement is about range and determines the maximum difference in stage height over 7-day periods)	All 7-day fluctuations comply

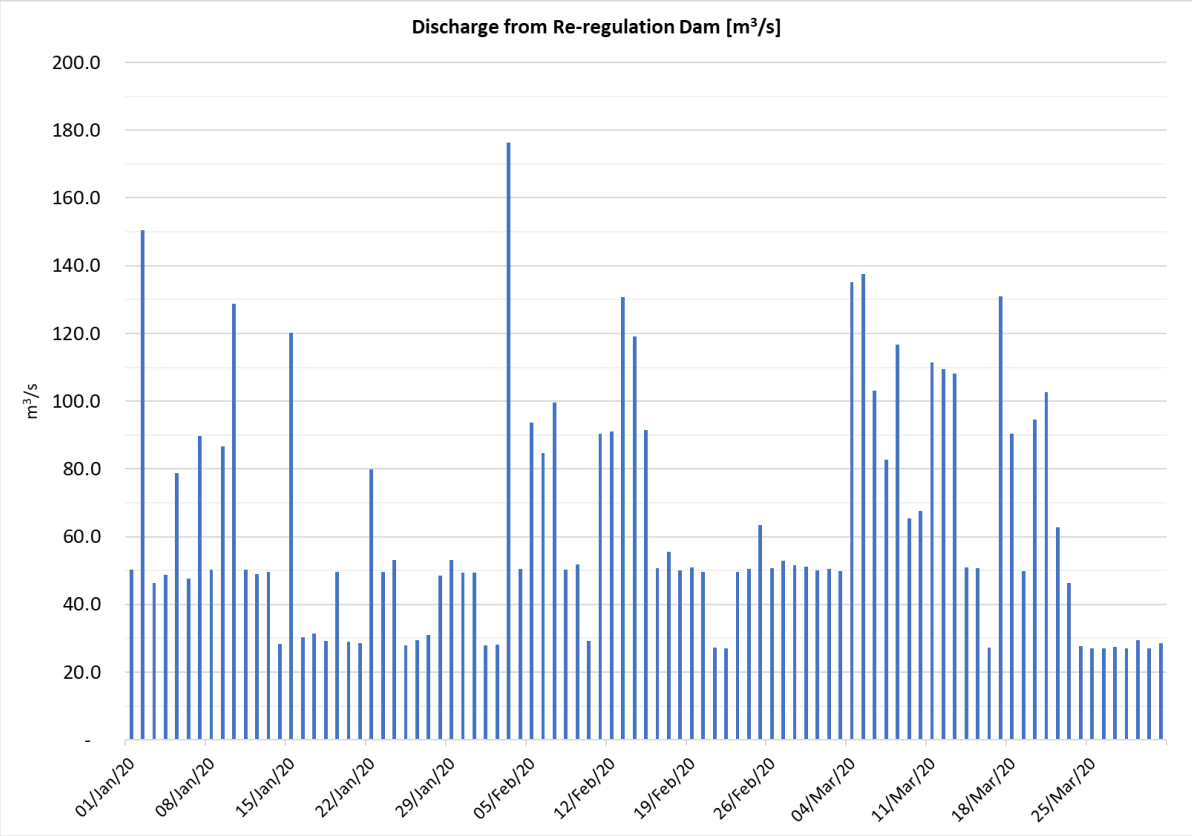
3.6.2.1 Minimum Flow Requirements

The discharge monitoring data for the re-regulation dam during Q1 2020 indicates that the minimum flow requirement of 27 m^3/s has been met at all times - as presented in ***Figure 3-3***

During Q1 2020, the mean discharge from the re-regulation dam was about 55 m^3/s in January 2020 and about 70 m^3/s to 75 m^3/s in February and March 2020 respectively. The turbine discharges varied between 50 m^3/s and 140 m^3/s interrupted by periods with gate discharge of about 30 m^3/s including the last week of March 2020 due to maintenance work.

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.

FIGURE 3-3: *DISCHARGE FROM THE RE-REGULATION DAM DURING Q1 2020*



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 3-4.*** These locations represent cross-sections with possible shallow water depths at low discharge rates.

The monitoring is undertaken to confirm compliance with the water depth requirements in the Concession Agreement, Annex C, and the approved Environmental Flow Assessment (at least 0.5 m measured immediately downstream the re-regulation dam).

The results of the monitoring are presented in ***Table 3-7***. Depths below 0.5 m are shown in red font.

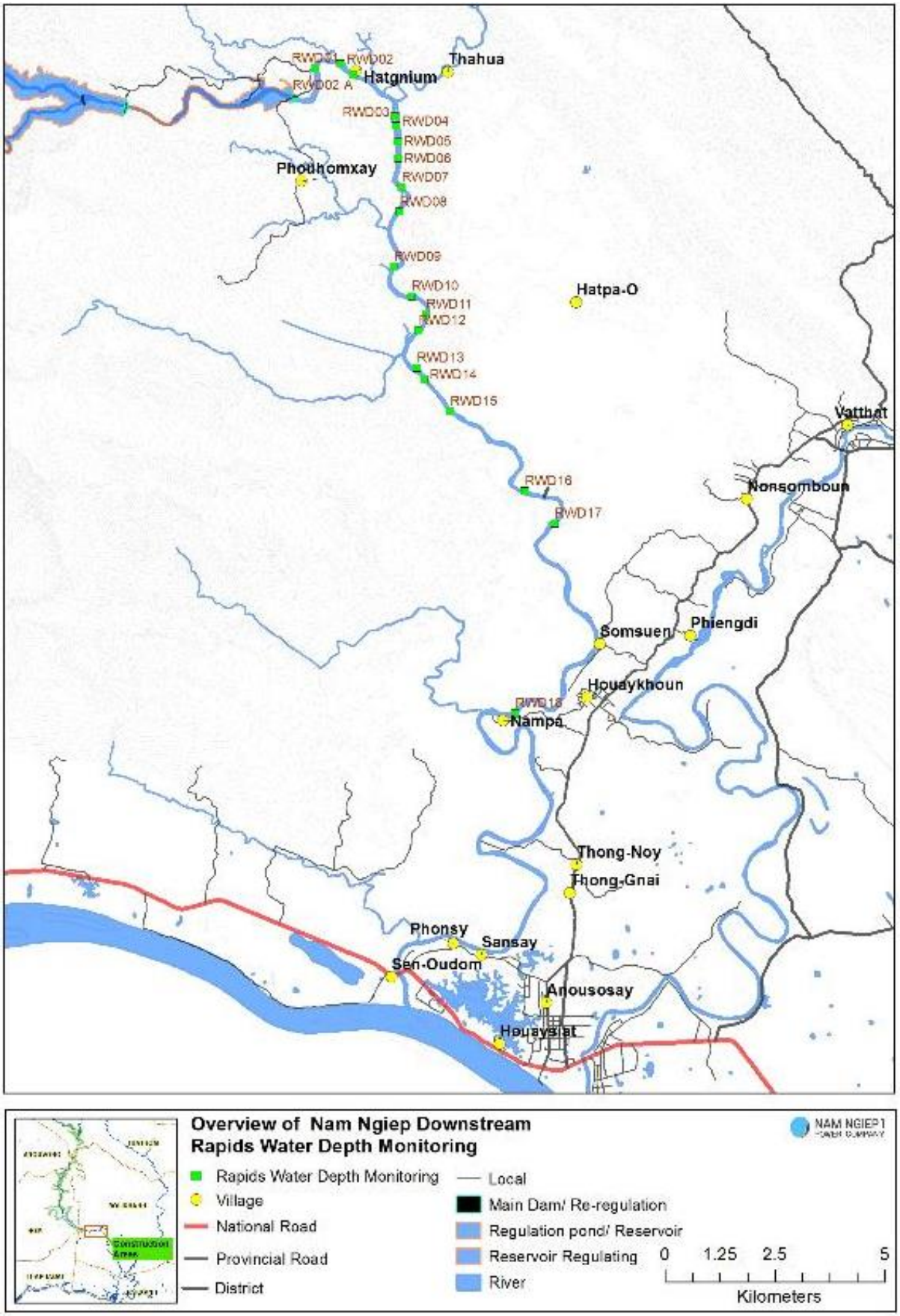
During Q1 2020, there was no instances of difficult navigation due to reduced water depths, and only on one occasion, at stations close to the dam, was a water depth of less than 0.5 m measured.

It is noted that the water depths were measured at the navigation of the observed shallowest locations and it may not be the deepest points. Starting by December 2020, the water depths will be measured across the cross sections where visual observations or boat navigation indicate shallow waters to ensure that the measurements the deepest channel.

TABLE 3-7: *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)
3-Jan-20	52	0.75	0.82	0.85	0.95	1.12	0.94	1.07	1.04	1.14	1.12	1.28	1.4	1.35	1.55	1.75	1.85	1.56	1.8	1.48
16-Jan-20	31	1.05	1.1	1.13	1.22	1.4	1.2	1.35	1.3	1.41	1.35	1.5	1.6	1.62	1.55	1.75	1.8	1.56	1.76	1.58
5-Feb-20	52	1.05	1.1	1.13	1.22	1.4	1.2	1.35	1.3	1.41	1.35	1.5	1.6	1.65	1.57	1.77	1.84	1.6	1.8	1.62
20-Feb-20	51	0.7	0.8	0.86	0.97	1.12	0.95	1.1	1.03	1.07	1.05	1.03	1.37	1.43	1.56	1.67	1.73	1.55	1.7	1.5
26-Feb-20	52	1.29	1.42	1.45	1.55	1.72	1.54	1.67	1.64	1.73	1.7	1.66	1.98	2.03	2.23	2.39	2.49	2.21	2.44	2.13
25-Mar-20	28.9	0.37	0.43	0.45	0.54	0.71	0.67	0.47	0.69	0.76	0.74	0.84	1.09	1.19	1.29	1.32	1.35	1.26	1.35	1.24

FIGURE 3-4: ***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.

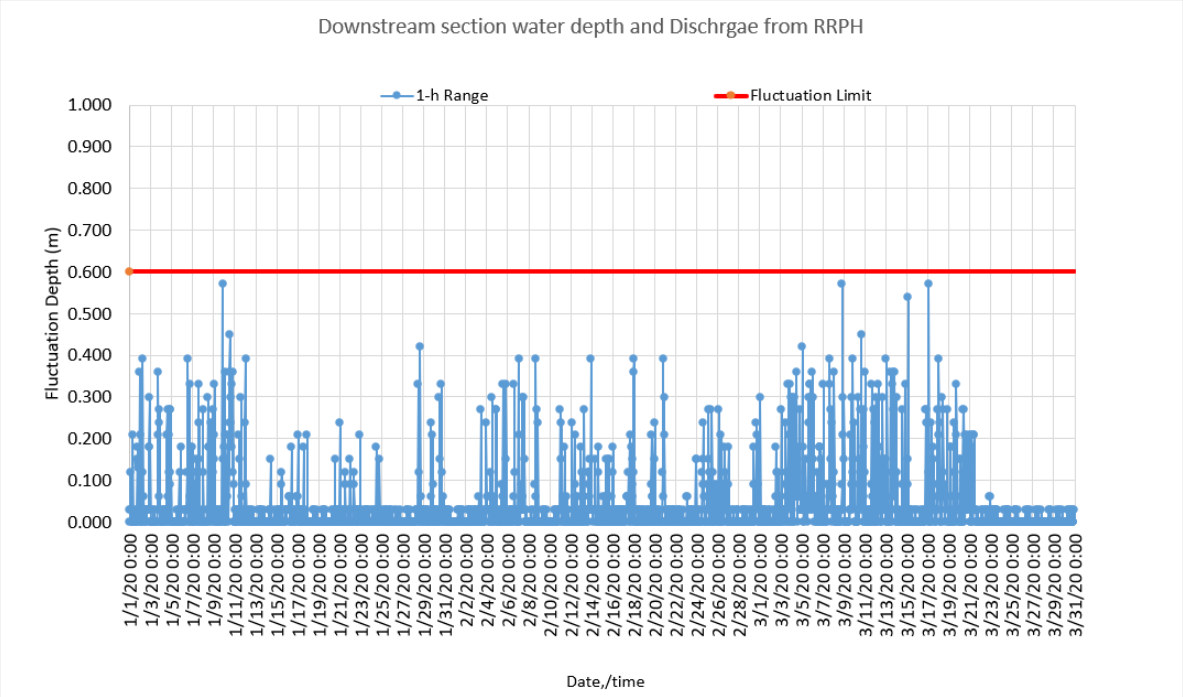
For the 0.6 m in 1-hour maximum fluctuation EFR, the cumulative rises and falls are calculated from the hourly water level recordings at the existing hydrometric gauging station at Hat Gniun Village.

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

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

During Q1 2020, the maximum fluctuation in stage of 0.6 m over 1-hour was complied with for 100% of the hourly fluctuations. The results are presented in ***FIGURE 3-5***.

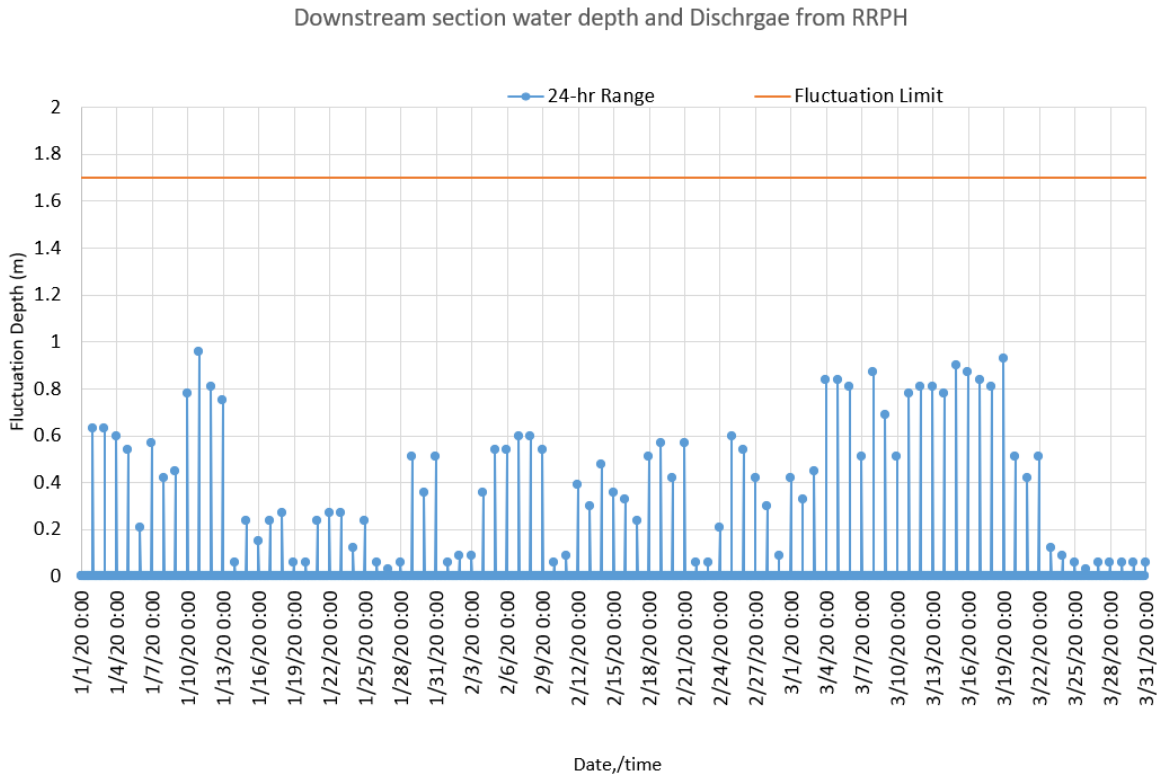
FIGURE 3-5: *HOURLY STAGE HEIGHT FLUCTUATIONS DURING Q1 2020*



During Q1 2020, the maximum range in stage of 1.7 m over 24-hour was complied with for all 24-hour periods (00:00 – 23:00).

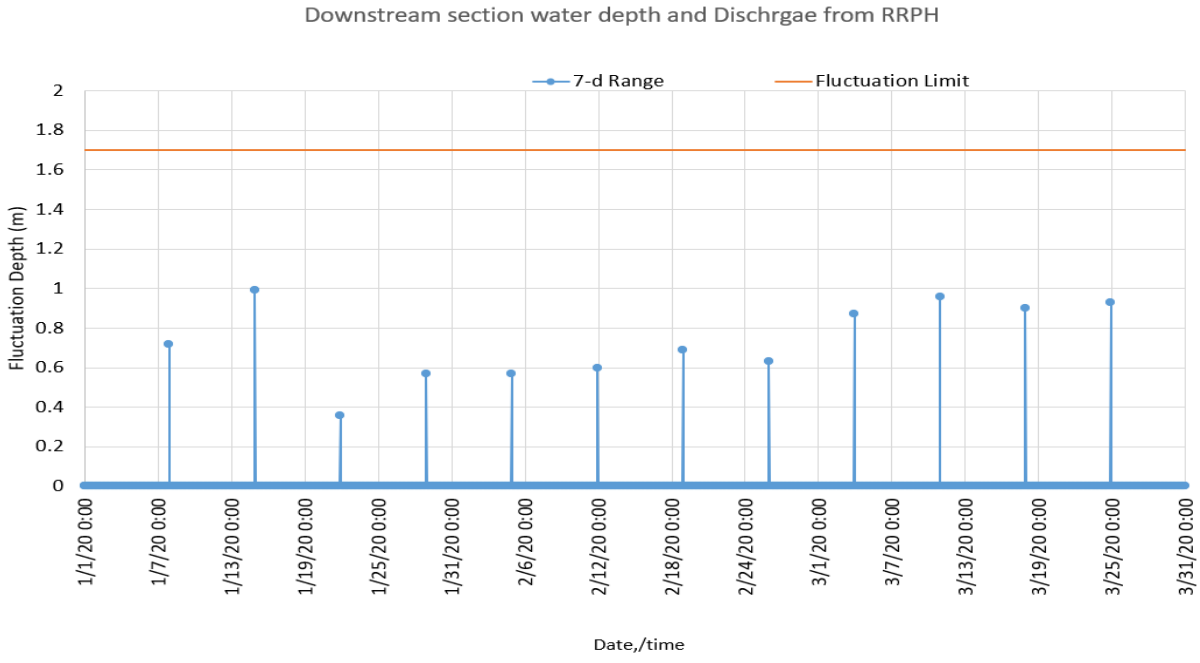
The results of the monitoring are presented in ***FIGURE 3-6.***

FIGURE 3-6: *24-HOUR STAGE HEIGHT DIFFERENCE (M) DURING Q1 2020*



During Q1 2020, 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 3-7***.

FIGURE 3-7: *7-DAY STAGE HEIGHT*



DIFFERENCE (M) DURING Q1 2020

3.7 ENVIRONMENTAL MONITORING

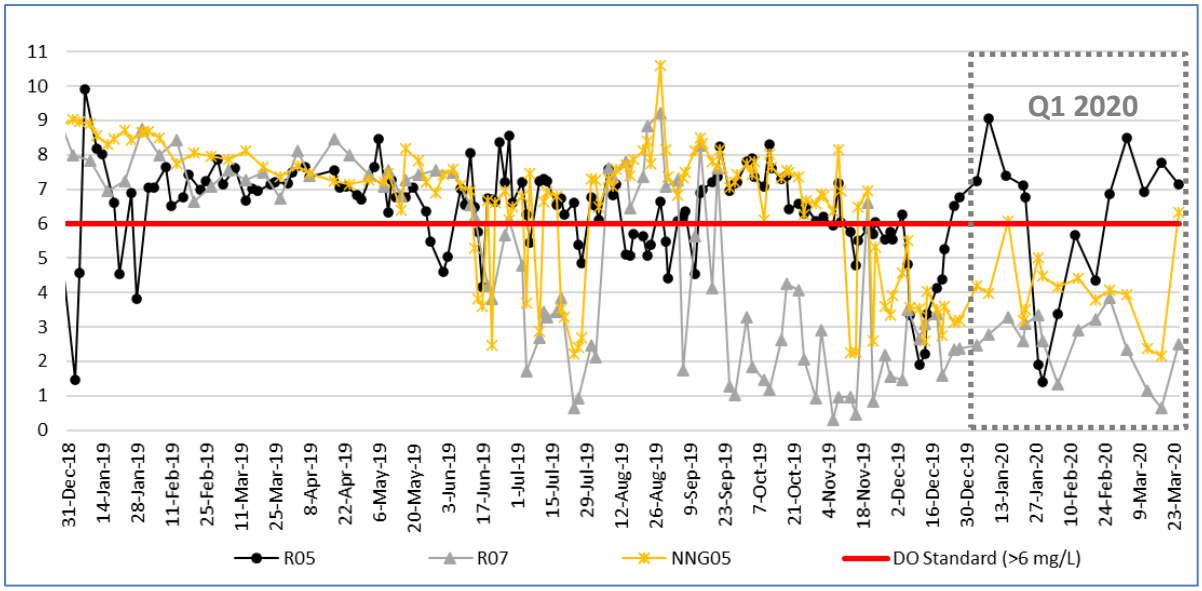
3.7.1 Surface Water (River) Quality

Descriptions of each monitoring station, surface water quality monitoring parameters and the location of sampling map can be found in ***Appendix 3*** and all surface water quality data for Q1 2020 are listed in ***Appendix 5.1***

Dissolved Oxygen (DO)

The results of DO measurements for the stations immediately upstream and downstream of the main dam are presented in ***Figure 3-8,*** and the full set of surface water quality data are shown in ***Table 3-8.***

FIGURE 3-8: *DISSOLVED OXYGEN IMMEDIATELY UPSTREAM AND DOWNSTREAM OF THE MAIN DAM*



During the Q1 2020, the DO concentrations at the depth 0.2 m in R05 (Main Reservoir immediately upstream of the main dam), was more than 6 mg/L in early January and decreased to 1.4 mg/L at the end of month. The DO concentration was more than 6 mg/L again at the end of February to end of March.

The DO concentrations at the depth 0.2 m in the re-regulation reservoir (R07) were between 0.6 – 4.8 mg/L. Monitoring during the period with gate and/or spillway discharge on 16 January and 25 March 2020, showed DO concentrations in the downstream stations above 6 mg/L due to the aeration generated by the gate/weir discharge.

Monitoring of the downstream stations during periods with turbine discharge in the remaining part of Q1 2020, showed DO levels below 6 mg/L in the stations. NNP1PC is in the process of compilating all monitoring information for the design of additional aeration system to improve the DO level at downstream.

The Nam Ngiep Upstream station (NNG01), Nam Chian (NCH01), Nam Phouan (NPH01) and Main Reservoir (R01) had DO levels above 6 mg/L. However, DO concentration in the Main Reservoir at R02, R03 and R04 fluctuated between 2.7 – 9.8 mg/L. The concentration of DO in Nam Xao (except on 12 and 18 March 2020) and Nam Houay Soup (except 08 January and 18 March 2020) were above 6 mg/L.

The Water Temperature and DO depth profiles in the main reservoir at R05 during Q1 2020 and Q1 2019 are presented in Figure 3-9 to Figure 3-11.

During Q1 2020, the oxycline in R05 was generally observed at depths between 15 m to 25 m and during a cold spell from the end of January 2020 to the beginning of February 2020, the thermal stratification disappeared which allowed mixing of oxygen rich epilimnic water with oxygen deficient hypolimnic water resulting in DO levels below 2 mg/L in the entire water column. This is similar to observations in December 2019. The relatively deep oxycline combined with lowering of the water level in the main reservoir moved the epilimnion closer to the dam intake at 280 m asl. (centreline). This may have contributed to generally higher DO levels in the re-regulation reservoir as compared to the previous quarter with mean DO levels in R6 of about 1.5 mg/L (entire water column) during Q4 2019 and about 3 mg/L in R6 during Q1 2020. Figure 3-11 presents the monthly average depth profiles in the Main Reservoir since September 2018 to March 2020, the graphs clearly shown that: (i) the annual mixing period in December 2019 to February 2020 led the water column at the upper layer to a lower DO level as a consequence of a decrease of water temperature at the surface which resulted in a stronger mixing and contributed to a deeper epilimnion layer compared to the same period of last year; and (ii) the stable stratification with a deeper oxyclines were observed in March 2020 compared to March 2019, globally shows that DO at the deeper levels after mixing period gradually improved over a year.

The depth profiles monitoring during the period indicates formation of oxyclines and clear thermal stratification in the main reservoir at all stations at depths between 1.0 – 32.0 m, except R01 which had DO levels above 6 mg/L in the entire water column throughout the period.

There is no indication of a thermocline at R06 and R07 in the re-regulation reservoir. On 30 January 2020, some dead fish were observed in the main reservoir, and specimens were collected at R05 for fish species identification.

FIGURE 3-9: ***MAIN RESERVOIR DISSOLVED OXYGEN AT THE END OF Q1 2020***

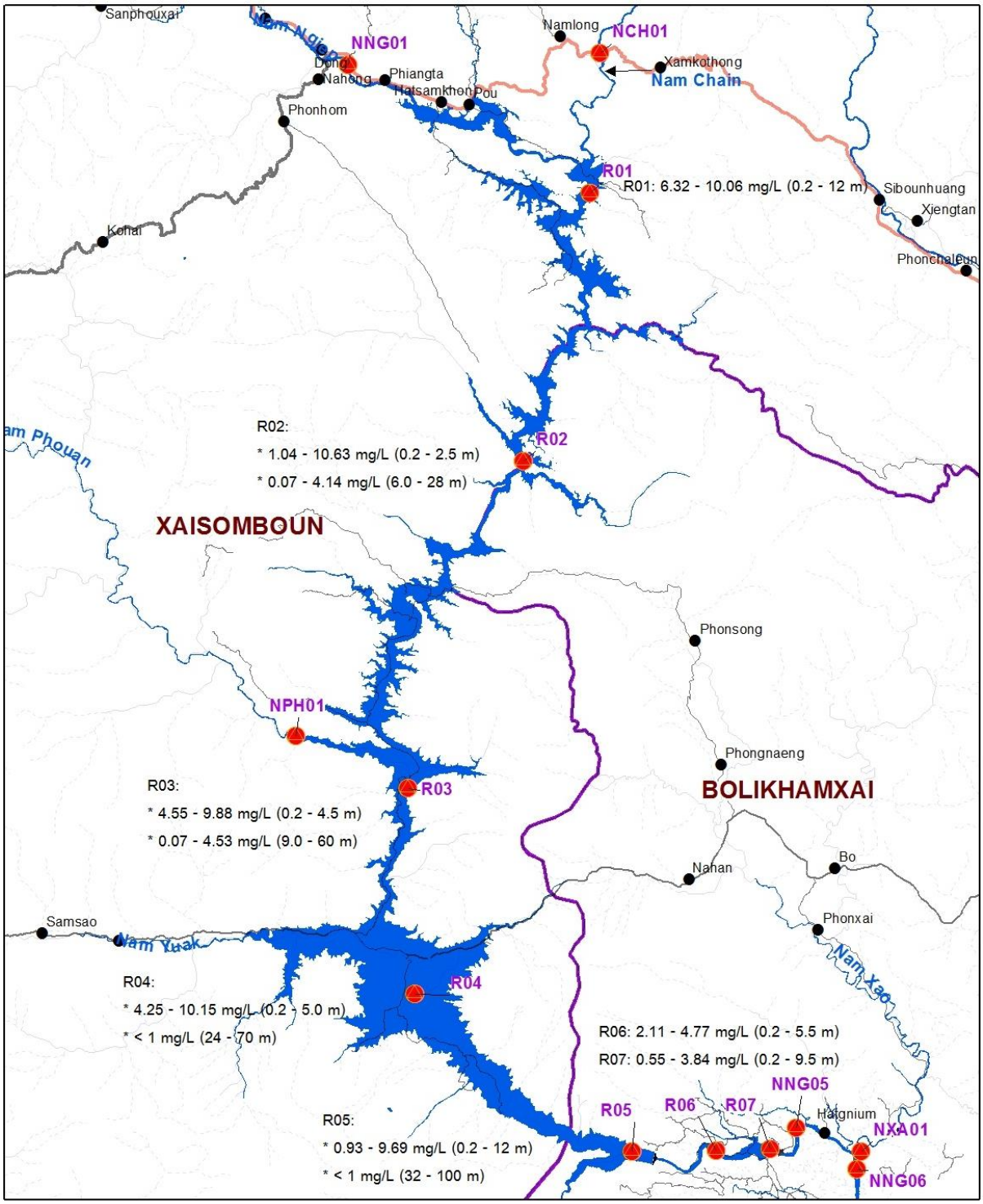
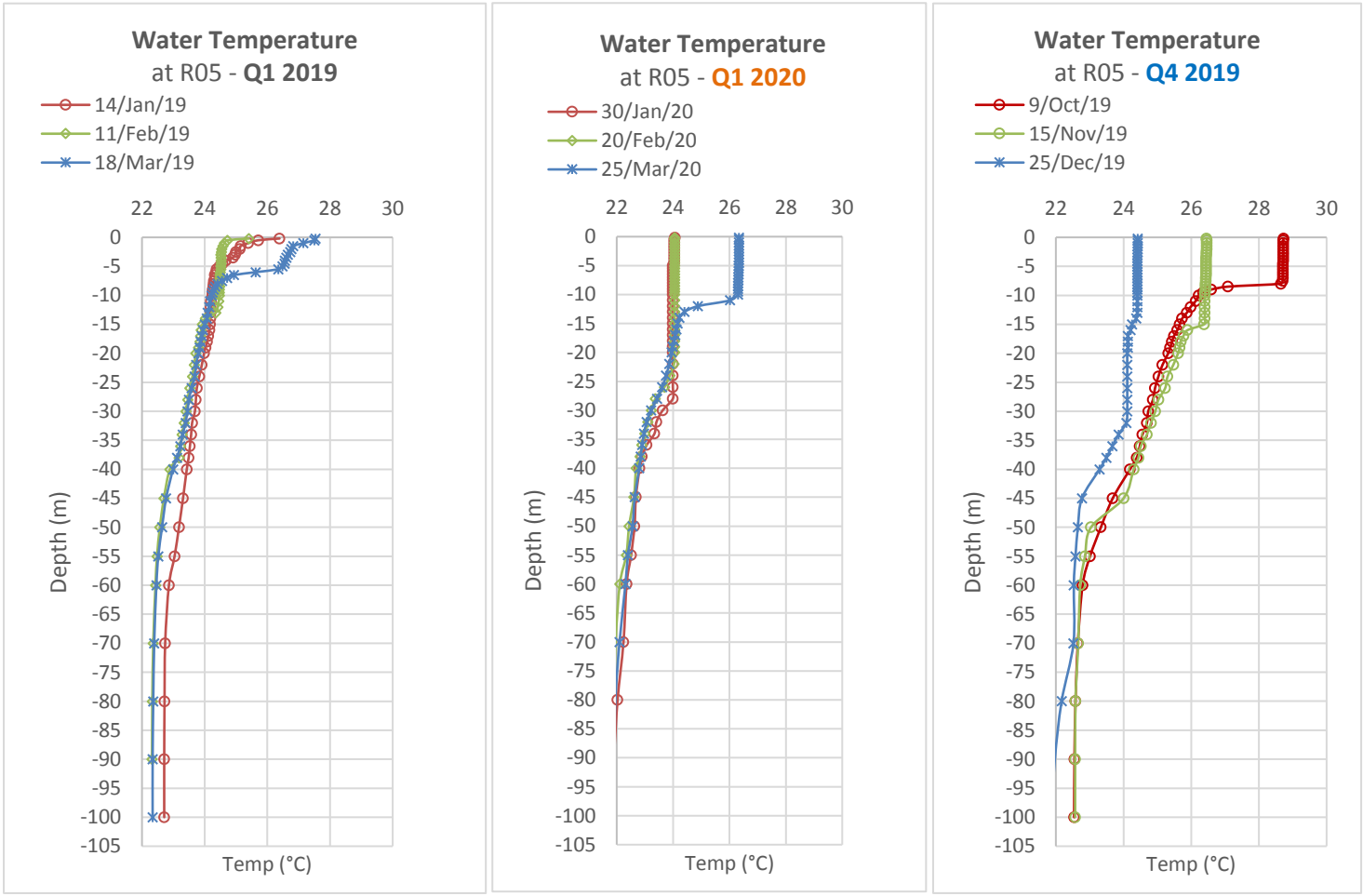
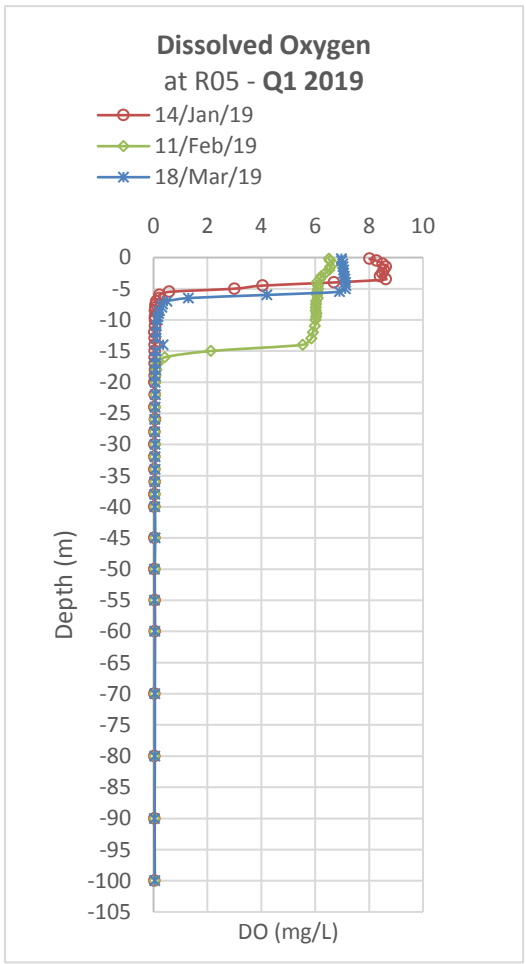
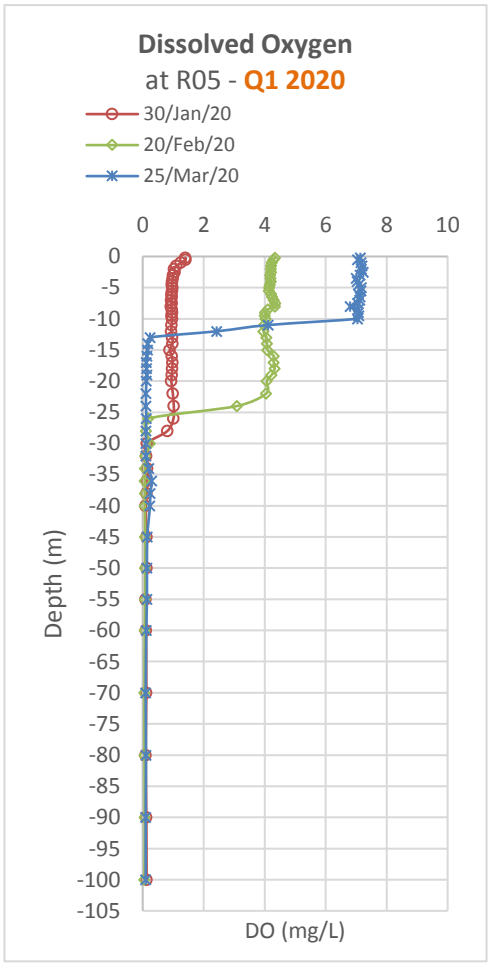


FIGURE 3-10: ***WATER TEMPERATURE AND DISSOLVED OXYGEN – DEPTH PROFILES IN THE MAIN RESERVOIR IMMEDIATELY UPSTREAM OF THE MAIN DAM (R05)***



11 January 2021





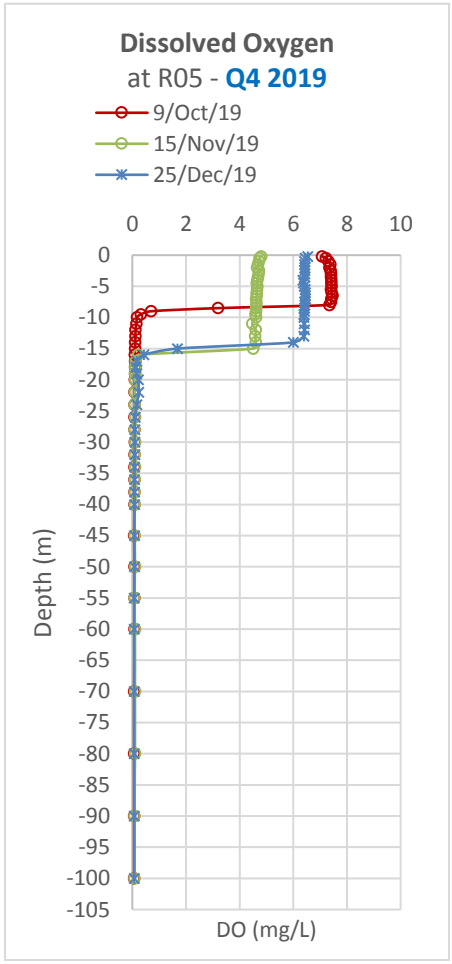


FIGURE 3-11: ***MONTHLY AVERAGE OF WATER TEMPERATURE AND DO DEPTH PROFILES IN THE MAIN RESERVOIR (R01 - R05), WITH POSITION OF INTAKE AT THE ACTUAL WATER LEVEL DURING SEPTEMBER 2018 - MARCH 2020***

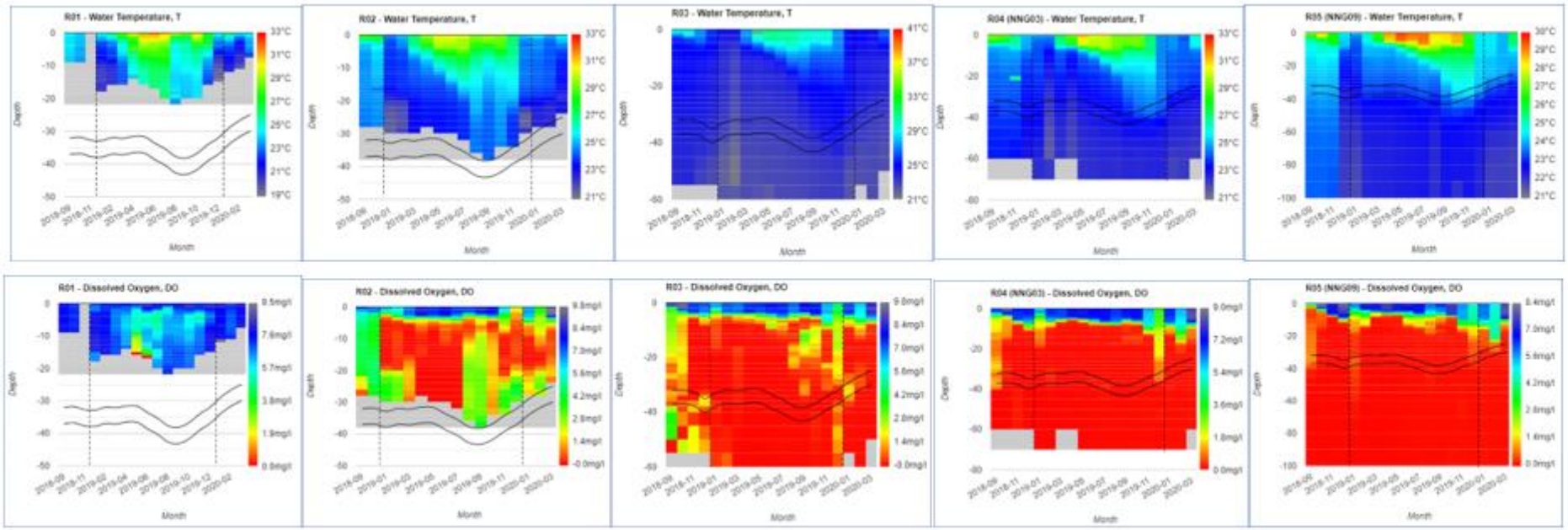


TABLE 3-8: *DO (MG/L) RESULTS OF SURFACE WATER IN MAIN RESERVOIR, RE-REGULATION RESERVOIR, NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 2020*

Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
3-Jan-20						7.24	4.23	2.46	4.18	3.62	5.57	6.23			7.61	6.2
7-Jan-20		8.63	8.25	8.52	8.32									9.32		
8-Jan-20						9.07	3.42	2.79	3.97	3.63	5	5.53			6.23	5.62
13-Jan-20	8.54												8.15			
14-Jan-20		8.41	6.98	7.35										6.68		
15-Jan-20					8.32	7.39										
16-Jan-20							4.04	3.3	6.09	6.21	6.04	6.29			6.53	6.31
21-Jan-20		6.32	6.26	6.4	7.1									7.36		
22-Jan-20						7.1	2.78	2.58	3.18	3.14	4.63	5.16			6.14	6.03
23-Jan-20						6.76	3.32	3.1	3.51	3.77	4.61	5.18			6.17	6.46
27-Jan-20	8.63												8.27			
28-Jan-20						1.91	3.16	3.34	5.01	4.83	5.65	6.11			6.23	6.1
29-Jan-20		7.01	4.02	5.44	4.87									7.79		
30-Jan-20						1.4	2.56	2.6	4.49	4.35	5.23	6.22			6.84	6.12
4-Feb-20		9.61	2.7	6.18	4.72									7.99		
5-Feb-20						3.38	3.58	1.34	4.17	3.67	5.58	6.13			6.21	6.05
11-Feb-20	8.54	9.85	3.62	5.73									8.91	7.81		
12-Feb-20					5.63	5.68										
13-Feb-20							3.33	2.91	4.43	4.13	5.06	5.24			6.31	6.09
19-Feb-20		7.72	4.92	6.69	6.44									7.35		
20-Feb-20						4.34	3.35	3.22	3.8	3.88	5.49	5.64			7.03	6.67
24-Feb-20	8.69												8.47			
25-Feb-20		8.5	5.76	6.44	6.73									7.84		
26-Feb-20						6.86	4.77	3.84	4.08	4.09	5.22	5.63			6.06	6.23
3-Mar-20		7.85	9.68	9.25	9.4									8.64		
4-Mar-20						8.5	2.71	2.34	3.94	4.8	5.12	5.76			6.28	6.4
10-Mar-20	8.3	7.25	6.74	7.89									8.22	9.07		
11-Mar-20					6.72	6.92										
12-Mar-20							2.67	1.14	2.38	2.62	4.85	5.54			4.75	6.98
17-Mar-20		8.66	9.75	8.78	8.74									7.85		

11 January 2021

Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
18-Mar-20						7.77	2.39	0.64	2.16	2.69	4.02	5.11			4.85	5.5
23-Mar-20	8.38												8.52			
24-Mar-20		7.62	9.83	7.75	7.45									8.37		
25-Mar-20						7.14	3.75	2.49	6.34	6.35	7.02	6.09			6.86	6.17

Ammonia Nitrogen

Since 2014, the Ammonia Nitrogen concentration in the Nam Ngiep River and its tributaries have been below the detection limit (<0.2 mg/L). In Q1 2020, Ammonia Nitrogen complied with the National Surface Water Quality Standard (<0.2 mg/L) in all monitored stations.

TABLE 3-9: *AMMONIA NITROGEN (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 2020*

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

Station Code	NNG 01	R01	R02	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH0 1	NXA 01	NHS 01
13-Jan-20	<0.2															
14-Jan-20		<0.2		<0.2	<0.2									<0.2		
15-Jan-20						<0.2										
11-Feb-20	<0.2	<0.2		<0.2									<0.2	<0.2		
12-Feb-20					<0.2	<0.2										
10-Mar-20	<0.2	<0.2		<0.2									<0.2	<0.2		
11-Mar-20						<0.2										
11-Feb-20 Hypolimnion				<0.2												
12-Feb-20 Hypolimnion					<0.2	<0.2										
10-Mar-20 Hypolimnion				<0.2												
11-Mar 20 Hypolimnion					<0.2	<0.2										

Biochemical Oxygen Demand (BOD_5)

Since 2014, the Biochemical Oxygen Demand (BOD_5) values in the Nam Ngiep River and its tributaries have generally been below the detection limit (< 1 mg/L) with some measurements exceed the National Surface Water Quality Standard (< 1.5 mg/L). The results for Q1 2020 indicate some exceedances and noteworthy are the elevated BOD levels in the hypolimnion in the main reservoir representing water that is transferred downstream. NNP1PC is in the process of compiling all monitoring information for the design of additional aeration systems to improve the BOD level downstream

TABLE 3-10: *BOD_5 (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES MONITORED IN Q1 2020*

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

Station Code	NNG 01	R01	R0 2	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
13-Jan-20	<1.0												<1.0			
14-Jan-20		1.29		1.9										<1.0		
15-Jan-20					<1.0	<1.0										
16-Jan-20							6.36	5.26	1.17	2.63	3.35	1.04			1.84	2.03
11-Feb-20	<1.0	3.1		<1.0									<1.0	<1.0		
12-Feb-20					<1.0	<1.0										
13-Feb-20							<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			1.87	2.12
10-Mar-20	<1	<1		<1									<1	<1		
11-Mar-20					<1	<1	5.32	6.72	<1	<1	<1	<1			<1	<1
11-Feb-20 Hypolimnion				<1.0												
12-Feb-20 Hypolimnion					5.9	2.1										
10-Mar-20 Hypolimnion				2.2												

Station Code	NNG 01	R01	R0 2	R03	R04	R05	R06	R07	NNG 05	NNG 06	NNG 07	NNG 08	NCH 01	NPH 01	NXA 01	NHS 01
11-Mar-20 Hypolimnion					5	4.3										

Chemical Oxygen Demand (COD)

The COD measurements in Q1 2020 are presented in ***Table 3-11***.

TABLE 3-11: ***COD (MG/L) RESULTS FOR THE SURFACE WATER IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q1 2020***

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

Station Code	NNG0 1	R01	R02	R0 3	R0 4	R05	R06	R07	NNG0 5	NNG0 6	NNG 07	NNG0 8	NCH 01	NPH0 1	NXA 01	NHS0 1
13-Jan-20	7.9												<5.0			
14-Jan-20														9.1		
16-Jan-20							9.1	6.2	8.3	7.5	5.6	6.3			5.6	5.2
11-Feb-20	8.4												8.4			
13-Feb-20							6.8	7.6	<5.0	<5.0	5	6.6			13.2	12.2
10-Mar-20	7.2												8	8.8		
12-Mar-20							9.8	8.8	8.6	9	9	12			13.8	12.8

Faecal Coliform Bacteria (FCB)

The results of the faecal coliform analyses in Q1 2020 are presented in **Table 3-12**.

There were no exceedances of the National Surface Water Quality Standard (<1,000 MPN/100 ml) for faecal coliform bacteria and all stations from R03 to NNG08 had concentrations below 50 MPN/100 ml.

TABLE 3-12: ***FAECAL COLIFORMS (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q1 2020***

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

Station Code	NNG0 1	R01	R0 2	R0 3	R0 4	R0 5	R0 6	R0 7	NNG0 5	NNG0 6	NNG0 7	NNG0 8	NCH0 1	NPH0 1	NXA0 1	NHS 01
13-Jan-20	79												11			
14-Jan-20		2		0										14		
15-Jan-20					2	0										
16-Jan-20							0	0	5	2	17	33			14	23
11-Feb-20	170	26		0									33	14		
12-Feb-20					14	0										
13-Feb-20							2	2	5	11	46	46			5	17
10-Mar-20	170	920		0									79	33		
11-Mar-20					0	0										
12-Mar-20							0	0	7	8	11	27			17	27
11-Feb-20 Hypolimnion				0												
12-Feb-20 Hypolimnion					2	0										
10-Mar-20 Hypolimnion				0												
11-Mar-20 Hypolimnion					0	0										

Total Coliform Bacteria (TCB)

The results of measurements for total coliform bacteria are presented in **Table 3-13.** 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 3-13: ***TOTAL COLIFORMS (MPN/100 ML) RESULTS IN NAM NGIEP AND ITS MAIN TRIBUTARIES IN Q1 2020***

(NATIONAL SURFACE WATER QUALITY STANDARD FOR TOTAL COLIFORMS: <5,000 MPN/100 ML)

Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
13-Jan-20	170												240			
14-Jan-20		1,600		350										130		
15-Jan-20					240	27										
16-Jan-20							130	27	220	350	540	920			920	1,600
11-Feb-20	920	1,600		280									220	350		
12-Feb-20					1,600	280										
13-Feb-20							27	47	430	280	1,600	280			1,600	170
10-Mar-20	1,600	1,600		22									240	920		
11-Mar-20					33	350										
12-Mar-20							79	350	220	130	920	920			540	1,600
11-Feb-20 Hypolimnion				17												
12-Feb-20 Hypolimnion					170	140										
10-Mar-20 Hypolimnion				21												
11-Mar-20 Hypolimnion					13	40										

3.7.2 Compliance Monitoring of Effluents from Camps

A total of 04 effluent camps including OSOV were in use during Q1 2020 and the effluents were monitored in 2 camps (OSOV and ESD Camp) and one Wastewater Treatment System of the Main Powerhouse**.** The sampling site locations are indicated in ***Figure 3-12.***

The results are described in ***Table 3-14*** and the full data set is in ***Appendix 5.2***.

The status of compliance as of 31 March 2020 can be summarized as follows:

- Non-compliance with total coliform bacteria and COD for the Main Powerhouse (EF19) on 03 February 2020;
- Many Instances of non-compliance with several parameters in EF19;
- All sites (except OSOV (EF01)) have experienced varied degree of non-compliance with ammonia and total nitrogen.

FIGURE 3-12: *MAP OF EFFLUENT MONITORING LOCATIONS DURING Q1 2020*

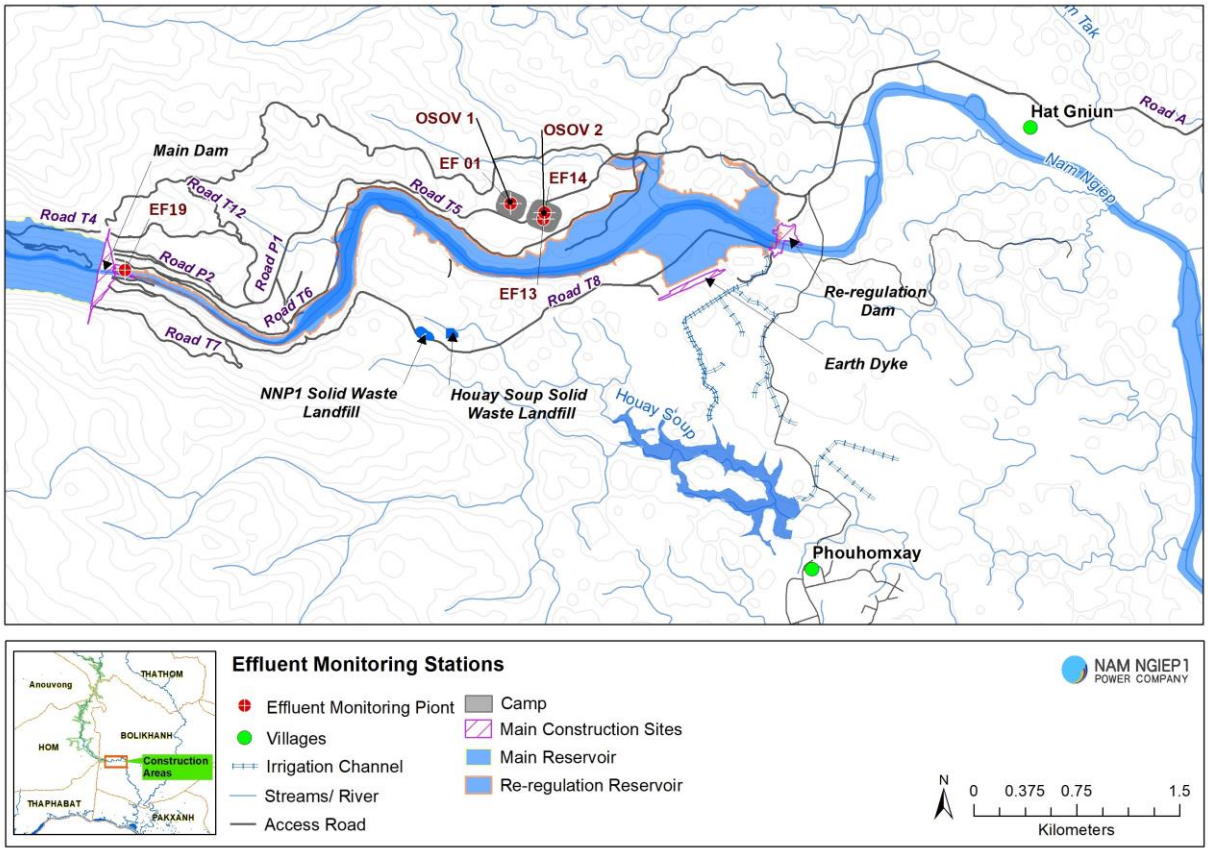


TABLE 3-14: *RESULTS OF THE EFFLUENT WATER QUALITY MONITORING OF THE CAMPS IN Q1 2020*

		Site Name	Owner's Site Office and Village	ESD Camp (Former HM Camp)	ESD Camp (Former IHI Camp)	Main Powerhouse
		Station Code	EF01	EF13	EF14	EF19
Sampling Date	Parameter (Unit)	Guideline in the CA				
06-Jan-20	TSS (mg/L)	<50	<5	<5	<5	
20-Jan-20	TSS (mg/L)	<50	<5	6.66	7.8	34.04
03-Feb-20	TSS (mg/L)	<50	<5	11.02	10.36	57.65
17-Feb-20	TSS (mg/L)	<50	<5	9.76	7.31	56.56
02-Mar-20	TSS (mg/L)	<50	<5	6.77	17.14	58.23
16-Mar-20	TSS (mg/L)	<50	<5	9.3		
06-Jan-20	COD (mg/L)	<125	<25	<25	68	
20-Jan-20	COD (mg/L)	<125	<25	36.4	50.8	102
03-Feb-20	COD (mg/L)	<125	<25	34	60.8	156
17-Feb-20	COD (mg/L)	<125	<25	53.4	<25	98.4
02-Mar-20	COD (mg/L)	<125	<25	96.6	47.2	118
16-Mar-20	COD (mg/L)	<125	<25	55.6		
06-Jan-20	NH_3-N (mg/L)	<10	2	6.5	7.5	
20-Jan-20	NH_3-N (mg/L)	<10	<1.5	19.6	15.1	56.7
03-Feb-20	NH_3-N (mg/L)	<10	4	20.5	16.4	66
17-Feb-20	NH_3-N (mg/L)	<10	<1.5	22	<1.5	63.7
02-Mar-20	NH_3-N (mg/L)	<10	<2	21.6	11.1	59.5
16-Mar-20	NH_3-N (mg/L)	<10	<2	27.8		
06-Jan-20	Total Nitrogen (mg/L)	<10	0.89	11	12.9	
20-Jan-20	Total Nitrogen (mg/L)	<10	15.6	20.3	21	154
03-Feb-20	Total Nitrogen (mg/L)	<10	5.48	25.6	21.3	72.8
17-Feb-20	Total Nitrogen (mg/L)	<10	2.14	31.8	4.44	73.6
02-Mar-20	Total Nitrogen (mg/L)	<10	1.07	25.8	17.8	63.8
16-Mar-20	Total Nitrogen (mg/L)	<10	1.34	31.6		
06-Jan-20	Total Phosphorus (mg/L)	<2	1.37	0.69	0.76	
20-Jan-20	Total Phosphorus (mg/L)	<2	1.54	1.67	1.36	2.92
03-Feb-20	Total Phosphorus (mg/L)	<2	1.21	1.46	1.25	2.66
17-Feb-20	Total Phosphorus (mg/L)	<2	1.35	1.47	0.61	2.55
02-Mar-20	Total Phosphorus (mg/L)	<2	0.87	1.02	0.51	1.82
16-Mar-20	Total Phosphorus (mg/L)	<2	1.23	1.49		
06-Jan-20	Total coliform (MPN/100 mL)	<400	79	0	0	
20-Jan-20	Total coliform (MPN/100 mL)	<400	140	0	0	33

11 January 2021

		Site Name	Owner's Site Office and Village	ESD Camp (Former HM Camp)	ESD Camp (Former IHI Camp)	Main Powerhouse
		Station Code	EF01	EF13	EF14	EF19
Sampling Date	Parameter (Unit)	Guideline in the CA				
03-Feb-20	Total coliform (MPN/100 mL)	<400	23	0	0	540
17-Feb-20	Total coliform (MPN/100 mL)	<400	11	0	0	350
02-Mar-20	Total coliform (MPN/100 mL)	<400	26	170	0	280
16-Mar-20	Total coliform (MPN/100 mL)	<400	350	0		
06-Jan-20	Faecal Coliform (MPN/100 mL)	<400	13	0	0	
20-Jan-20	Faecal Coliform (MPN/100 mL)	<400	6.8	0	0	33
03-Feb-20	Faecal Coliform (MPN/100 mL)	<400	4.5	0	0	350
17-Feb-20	Faecal Coliform (MPN/100 mL)	<400	0	0	0	350
02-Mar-20	Faecal Coliform (MPN/100 mL)	<400	14	70	0	79
16-Mar-20	Faecal Coliform (MPN/100 mL)	<400	7.8	0		

TABLE 3-15: *COMPLIANCE STATUS OF EFFLUENT DISCHARGE FROM THE CAMPS IN Q1-2020*

Site	ID	WWTS	Key Non-Compliance Issues in Q1-2020	Corrective Actions
Owner's Site Office and Village (NNP1PC)	EF01	Septic tanks (kitchen and black water) and wetland (grey water), discharge: 70 m^3/day	- Total nitrogen (<10 mg/L): Non-compliance in 1 out of 6. Mean of Q1 is 4.4 mg/L.	A short-term consultant is being recruited to assess the current wastewater treatment system and make suggestions for long-term improvements. However, due to the country lockdown, he can only provide a desk review of the provided designs and drawings.
ESD Camp (Former HMH Main Camp)	EF13	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Ammonia (<10 mgL): Non-compliance in 5 out of 6. Mean of Q1 is 19.7 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 6 out of 6. Mean of Q1 is 24.4 mg/L.	As above.
ESD Camp (Former IHI Camp)	EF14	Septic tanks (kitchen and black water) and wetland with chlorination system (grey water)	- Ammonia (<10 mgL): Non-compliance in 4 out of 5. Mean of Q1 is 12.5 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 4 out of 5. Mean of Q1 is 15.5 mg/L.	As above.
Main Powerhouse	EF19	Septic tanks (grey and black water), biofilm tank and chlorination tank.	- TSS (<50 mg/L): Non-compliance in 3 out of 4. Mean of Q1 is 51.6 mg/L. - COD (<125 mg/L): Non-compliance in 1 out of 4. Mean of Q1 is 118.6 mg/L. - Ammonia (<10 mgL): Non-compliance in 4 out of 4. Mean of Q1 is 61.5 mg/L. - Total nitrogen (<10 mg/L): Non-compliance in 4 out of 4. Mean of Q1 is 91 mg/L. - Total phosphorus (<2.0 mg//L): Non-compliance in 3 out of 4. Mean of Q1 is 2.5 mg/L.	As above.

Site	ID	WWTS	Key Non-Compliance Issues in Q1-2020	Corrective Actions
			- Total coliform (<400 MPN/100 mL): Non-compliance in 1 out of 4. Mean of Q1 is 300 MPN/100 mL.	

3.7.3 Compliance Monitoring of Discharges from Construction Sites

During Q1 2020, only discharges from Spoil Disposal Area No.2 (DS04) was monitored. The results complied with the water quality standard for Total Suspended Solids (50 mg/L), except one sampling mission during a rain event. The full set of data is presented in ***Appendix 5.3***.

The compliance status is summarized in **Table 3-16**.

FIGURE 3-13: *LOCATION OF DISCHARGE POINTS OF KEY CONSTRUCTION SITES*

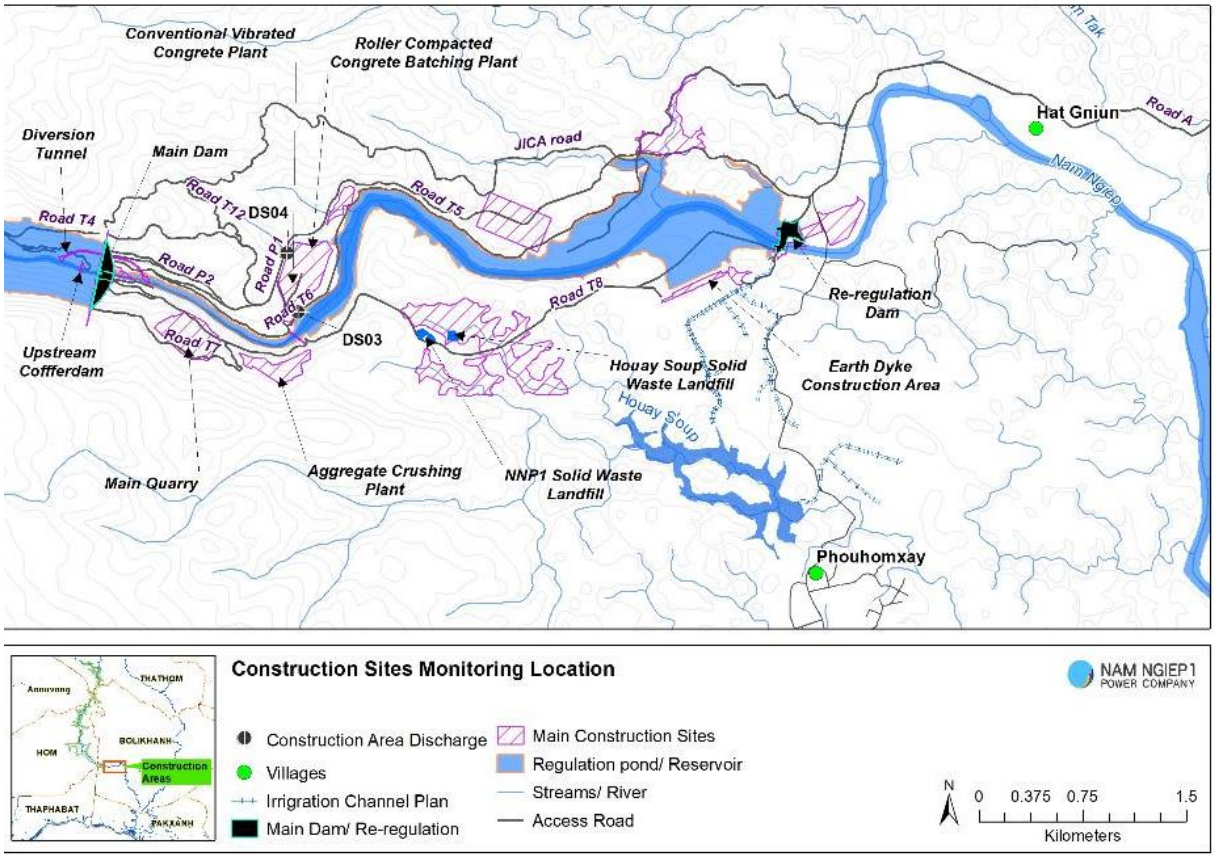


TABLE 3-16: *COMPLIANCE STATUS OF EFFLUENT DISCHARGE AND CORRECTIVE ACTION IN Q1 2020*

Site	ID	Treatment System	Key Non-Compliance Issues in Q1-2020	Corrective Actions
Spoil Disposal No.2	DS04	Sediment pond	Non-compliance in TSS, on 04 March 2020, and pH.	Not applicable (sediment runoff during sampling in a rain event)

3.7.4 Groundwater Quality Monitoring

During the Q1 2020, a total of four boreholes at Somseun, Nam Pa, Thong Noy and Pou Villages (one borehole in each village) have been monitored for the following parameters:

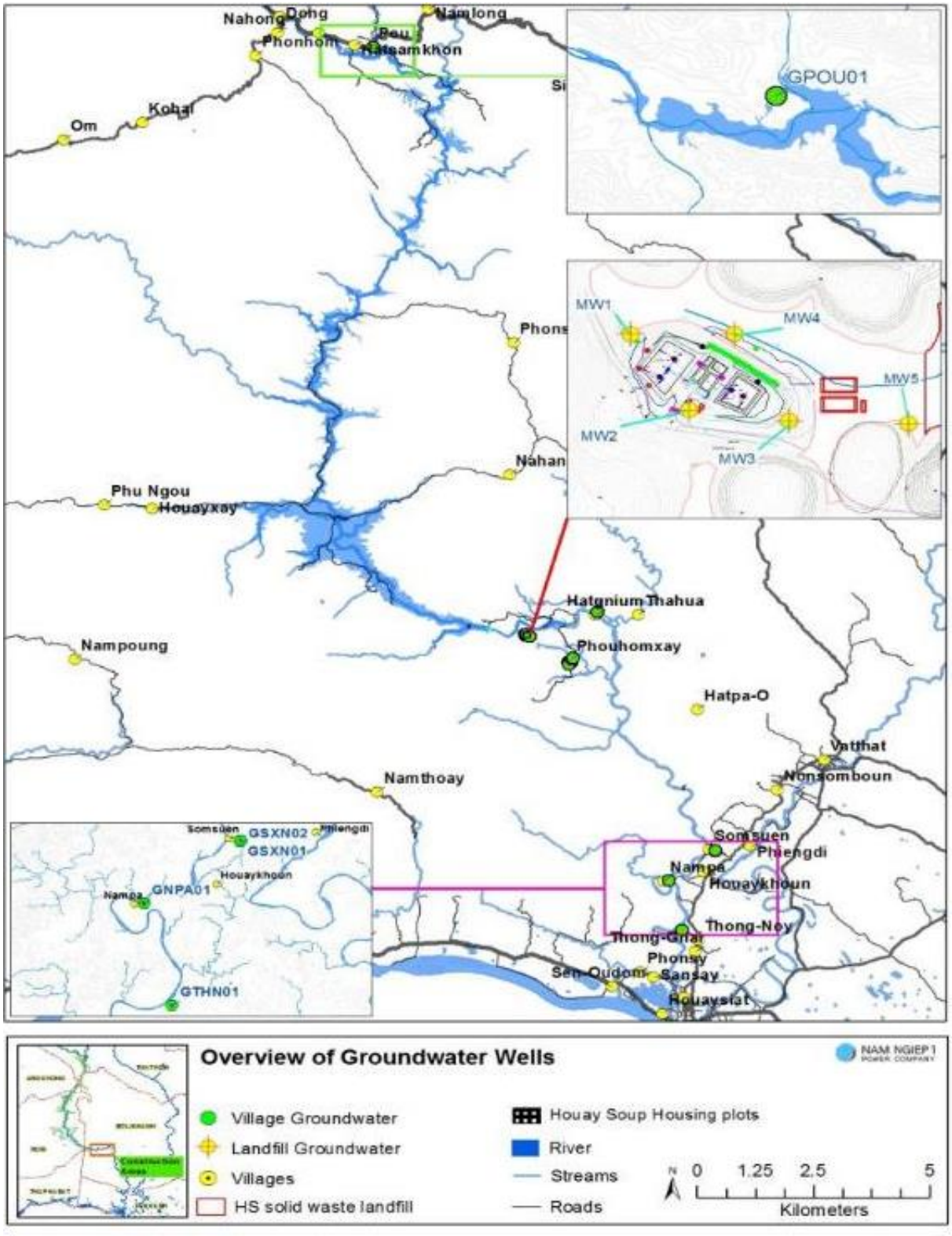
a. *Monthly:* pH, DO (%), DO (mg/L), Conductivity (µs/cm), TDS (mg/L), Temperature (°C), Turbidity (NTU), Faecal Coliform (MPN/100 mL) and E. coli (MPN/100 mL);

b. *A*nnually: 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).

In addition, there was a quarterly monitoring of landfill groundwater from three monitoring wells (MW01, MW03 and MW04) at NNP1 Landfill and one monitoring well (MW05) at Houay Soup Landfill in March 2020.

The groundwater sampling locations are displayed in ***Figure 3-14*** and the groundwater monitoring data is presented in ***Appendix 5.4.***

FIGURE 3-14*: GROUNDWATER SAMPLING LOCATIONS*



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

Somsuen Village: All monitored parameters complied with the standard, except faecal coliform and E.coli in January 2020.

Nam Pa Village and **Thong Noy Village:** All monitored parameters complied with the standard, except faecal coliform and E.coli in all Q1 2020 samples.

Pou Village: All monitored parameters complied with the standard in all samples.

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. NNP1PC – ESD has planned to investigate the source of contamination in Q3 2020 and the results will be provided in Q3 2020 Report.

During the Q1 2020, 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 presence 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.

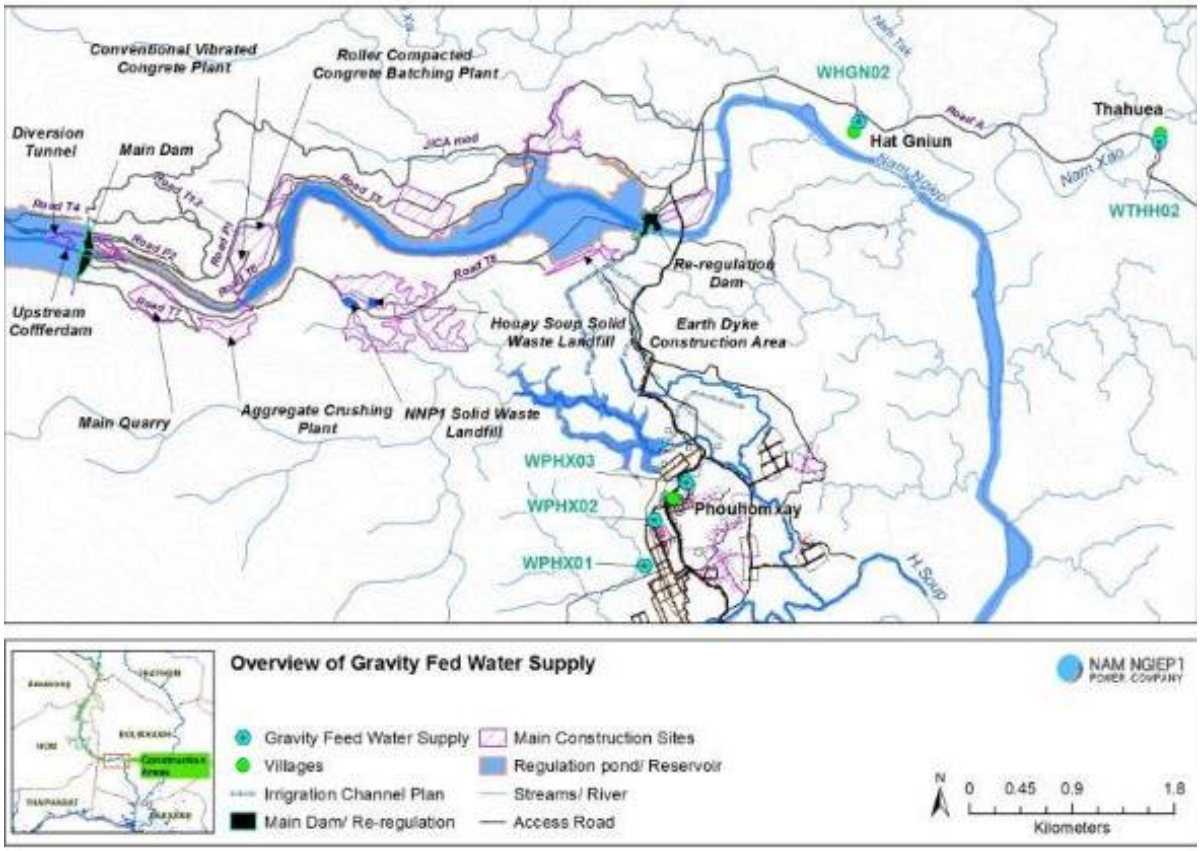
TABLE 3-17: ***LANDFILL GROUNDWATER QUALITY MONITORING RESULTS IN NNP1 AND HOUAY SOUP LANDFILLS***

		Site Name	NNP1 Landfill			Houay Soup Landfill
		Station	MW1	MW3	MW4	MW5
Date	Parameter (Unit)	Guideline				
16-Mar-20	pH		6.57	7.53	7.35	7.65
16-Mar-20	Sat. DO (%)		60.8	37.1	27.5	41
16-Mar-20	DO (mg/L)		4.37	2.72	2	2.94
16-Mar-20	Conductivity (µS/cm)		85	93.1	36.5	87
16-Mar-20	Temperature (°C)		30.9	29.8	30.4	31.2
16-Mar-20	Turbidity (NTU)		1.27	2.35	2.96	2.51
16-Mar-20	Total Nitrogen (mg/L)		0.48	0.61	0.85	0.7
16-Mar-20	Lead (mg/L)	<0.01	0.196	2.1	0.076	0.402
16-Mar-20	Faecal Coliform (MPN/100mL)		0	2	0	0
16-Mar-20	Total Coliform (MPN/100 mL)		2	2	0	0
16-Mar-20	NH_3-N (mg/L)		0.05	0.07	0.12	0.13
16-Mar-20	Copper (mg/L)	<1	<0.003	0.024	ND	ND
16-Mar-20	Total Petroleum (mg/L)		<3	<3	<3	<3
16-Mar-20	Water level (m)		29.05	26.40	25.04	15.45

3.7.5 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, Thaheua and Phouhomxay villages. The gravity fed water supply system at Phouhomxay Village has been in use since December 2017.

FIGURE 3-15: *OVERVIEW OF GRAVITY FED WATER SUPPLY*



Water samples were taken from the taps for analysis during the reported period and selected results are shown in ***Table 3-18***. The full set of data is presented in ***Appendix 5.5.***

TABLE 3-18*: THE GFWS MONITORING RESULT IN Q1 2020*

Date	Parameter (Unit)	Site Name	Tha Heua Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
		Guideline					
21-Jan-20	E. Coli Bacteria (MPN/100 mL)	0	6.8	49	49	170	170
07-Feb-20		0	33	13	79	49	170
06-Mar-20		0	7.8	110	34	130	170
21-Jan-20	Faecal coliform (MPN/100 mL)	0	11	110	79	170	220
07-Feb-20		0	33	13	130	70	170
06-Mar-20		0	13	110	170	350	540

Thaheua 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.

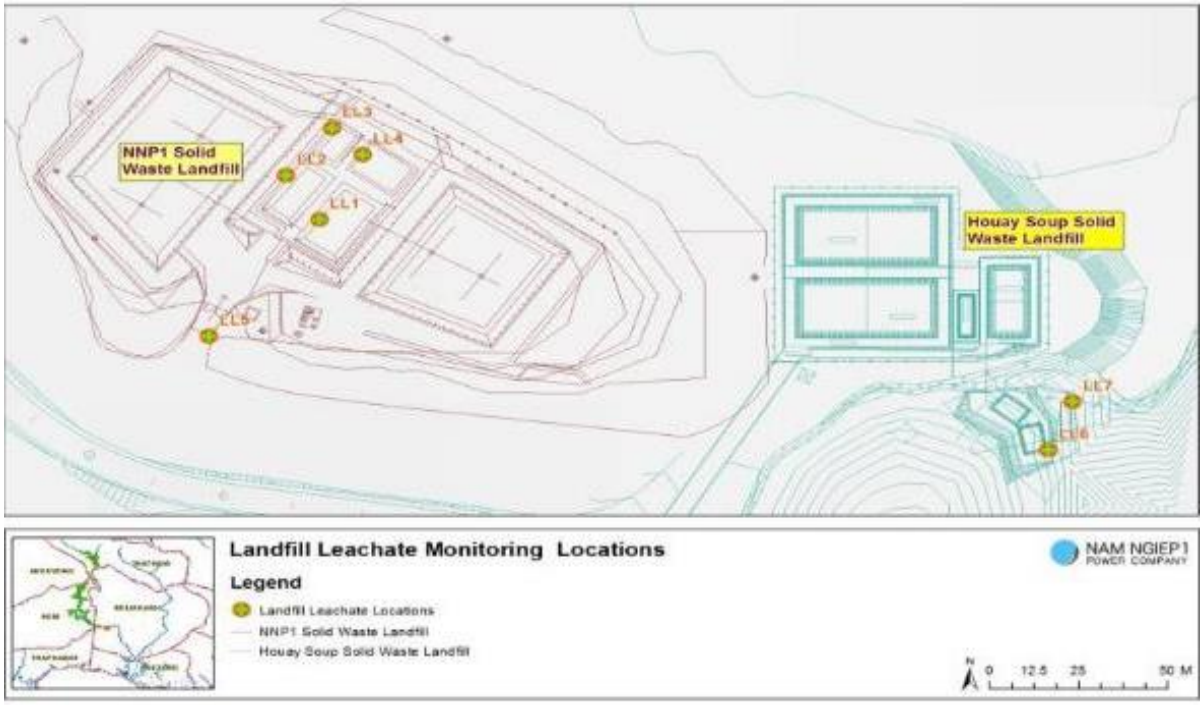
Phouhomxay Village (WPHX01-raw water in the head tank before filtration; **WPHX02**-tap water at primary school; and **WPHX03**-tap water at the villager's house**):** all parameters complied with the standard, except faecal coliform and E.coli.

As observed in the field during water sample collection, the livestock activities in the water intake areas may 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. In addition, the NNP1PC is planning to improve the water quality of this GFWS system in Phouhomxay in 2020 using a borehole system to eliminate the surface water contamination from agricultural practices nearby the source. A bidding to select a qualified consulting firm has been started and planned to be completed by end of April 2020.

3.7.6 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 3-16***.

FIGURE 3-16: *LANDFILL LEACHATE MONITORING LOCATION*



The monitoring results in Q1 2020 indicate compliance with the applicable standards for all monitored parameters, except COD at the last pond of Houay Soup Landfill. All leachate was

contained and treated in the ponds with no discharge to the environment. The monitoring data can be found in ***Appendix 5.6***.

4 WATERSHED AND BIODIVERSITY MANAGEMENT

4.1 WATERSHED MANAGEMENT

4.1.1 Implementation of Watershed Management Plan

NNP1PC is purchasing three aluminium boats that will be handed over to GOL (Bolikhamxay and Xaysomboun Provincial WRPOs) to conduct reservoir patrolling under the approved AIP2019. The purchase order was issued in February 2020, but due to the pandemic of COVID-19, the delivery of these boats will be delayed. In addition, NNP1PC is also purchasing office and field equipment under the approved AIP2019 using the fund provided from NNP1PC additional No Net Loss (NNL) commitments. The purchase order was issued at the end of March 2020 and the delivery of some equipment to the WRPO office is expected by the end of April 2020.

Bolikhamxay Provincial WRPO commenced forest patrolling activity in January 2020 but did not continue forward because they were focussing on the development of Bolikhamxay Provincial Regulation for Watershed Management. A technical discussion on the first draft of the regulation was organized on 20-21 February 2020 and the village level consultations on the draft regulation was conducted during 16-23 March 2020. The WRPO also confirmed that most of the activities under AIP2019 will be postponed until the country lockdown for COVID-19 outbreak is over and the Bolikhamxay Provincial Regulation for Watershed Management is ready.

Xaysomboun Provincial WRPO prepared a plan for field verification of the Total Protected Zones (TPZs) boundary in Anouvong and Hom Districts, but the activity was delayed due to internal supervision and communication issue. NNP1PC-EMO Management proposed to the Chair of the Xaysomboun Provincial WRPC to have a workshop to brief all the WRPC-WRPO members on the planned activities approved including budget to avoid further delay in the implementation of activities under the AIP2019.

Bolikhamxay Provincial WRPO completed the draft of AIP2020 in January 2020 and the plan was reviewed by NNP1PC-EMO team and management between February - March 2020. Xaysomboun Provincial WRPO started the preparation of AIP2020 in the middle of January 2020 through many joint working sessions with NNP1PC-EMO team. NNP1PC-EMO team had further discussion on 26 March 2020 to encourage the WRPO to complete the plan. NNP1PC-EMO Management requested the WRPO to submit an official progress report and status of plan preparation as a reference to obtain further support and guidance from Xaysomboun Provincial WRPC.

NNP1PC-EMO together with a Consultant (FishBio) is preparing a Fishery Co-management Plan. After a series of internal reviews and discussions in NNP1PC-EMO, the draft Plan was discussed with the Consultant on 24 January 2020. The improved draft was submitted on 13 February 2020 and further discussed with NNP1PC-EMO team on 24 February 2020. The Consultant submitted a further improved draft and the first draft of Fishery regulation on 04 March and 16 March 2020 respectively. The documents were reviewed by NNP1PC-EMO management at the end of March 2020.

NNP1PC-EMO together with a consultant (Elixir) conducted an assessment of options for sustainable livelihood opportunities focussing on nine watershed villages in Xaysomboun Province. The Consultant submitted a draft inception report on 06 January 2020 and discussed with NNP1PC-EMO team on 24 January 2020. The improved report was submitted on 30 January 2020 and the field assessment was conducted between 04-11 March 2020. The first draft report in Lao version is expected to be ready in the first week of April 2020 for GOL review and consultation.

4.2 BIODIVERSITY OFFSET MANAGEMENT

4.2.1 Engagement of Biodiversity Service Provider (BSP)

NNP1PC was informed that the Minister of Ministry of Planning and Investment (MPI) has no objections to the proposed ADB Technical Assistance Project on Biodiversity Management on 15 January 2020.

A draft Memorandum of Understanding (MOU) to be signed between NNP1PC-ADB-WCS was prepared by the NNP1PC lawyer and circulated to ADB and WCS on 20 January 2020. ADB and WCS provided their feedback on 15 February 2020. The draft was finalized by NNP1PC Lawyer on 27 February 2020 and shared with ADB and WCS on 28 February 2020. There was no further feedback from ADB and WCS until the end of March 2020.

The Head of Bolikhamxay PAFO, who is also the vice chair of Bolikhamxay Provincial WRPO and NC-NX BOMC, requested WCS during the IAP Mission meeting held between Bolikhamxay Provincial team, NNP1PC, IAP, LTA and WCS on 25 February 2020 to coordinate with DOF-MAF to send an official letter from the central to the Bolikhamxay Province that is needed for further processing at the Provincial Department of Foreign Affairs. In addition, the Head also requested WCS to provide Bolikhamxay Provincial WRPO and NC-NX BOMU with an Annual Work Plan with details on the arrangement (office location/base stations) for each WCS member assigned to assist NNP1PC team and Bolikhamxay Provincial authority. The IAP Biodiversity Expert, NNP1PC-EMO and WCS discussed during the IAP Mission wrap-up on 28 February 2020 that a detailed working protocol should be further discussed and agreed amongst the parties.

The Department of Forestry (DOF) of Ministry of Agriculture and Forestry (MAF) issued an official notification to Xaysomboun and Bolikhamxay Provincial Agriculture and Forestry Offices (PAFO) on 18 March 2020 to inform them on the WCS engagement under the ADB Project through MAF and requested PAFOs to facilitate the attainment of necessary permits from relevant authorities for the WCS staff to work with NNP1PC staff and get access to the relevant sites. NNP1PC has not received any update from the PAFO by the end of March 2020.

NNP1PC-EMO and WCS also held a kick-off meeting between 04-06 March 2020 to further discuss the reporting protocol, priority activities that both can support GOL and other technical issues related to the No Net Loss recalculation as a result of a reduction of the NC-NX's TPZ area from the original BOM Plan based on GOL's consultations with the local villagers and ground truth surveys.

4.2.2 Implementation of Biodiversity Offset Management Plan

The AIP2020 was approved by ADB on 03 March 2020. The Bolikhamxay Provincial Biodiversity Offset Management Unit (BOMU) and NNP1PC-EMO have further refined the AIP2020 in both languages on 11 March 2020 addressing the ADB comments. The BOMU is preparing an official document to request for fund disbursement at the end of March 2020. In this regard, the BOMU has continued implementing the management activities in the NC-NX offset site using the remaining budget of AIP2019.

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

a. Component 1 - Spatial Planning and Regulation

Bolikhamxay Provincial BOMU procured 60 small signs (40x40 cm), 90 small signs for CUZ (40x40 cm), 50 concrete poles and six big signs (2x3 m) as part of standard GOL's method to inform villagers on the agreed boundary of NC-NX Total Protected Zone (TPZ). The installation was postponed to March 2020 due to logistic issue in transporting the signs to NC-NX BOMU office at Viengthong District.

The BOMU installed the signage at Vangphieng Village during 23-30 March 2020. There are 12 poles for TPZ boundary being installed around Vangphieng Village. The signage installation in other villages have to be postponed until the GoL lifts the COVID-19 preventive measures which prohibit the meeting of more than 10 people.

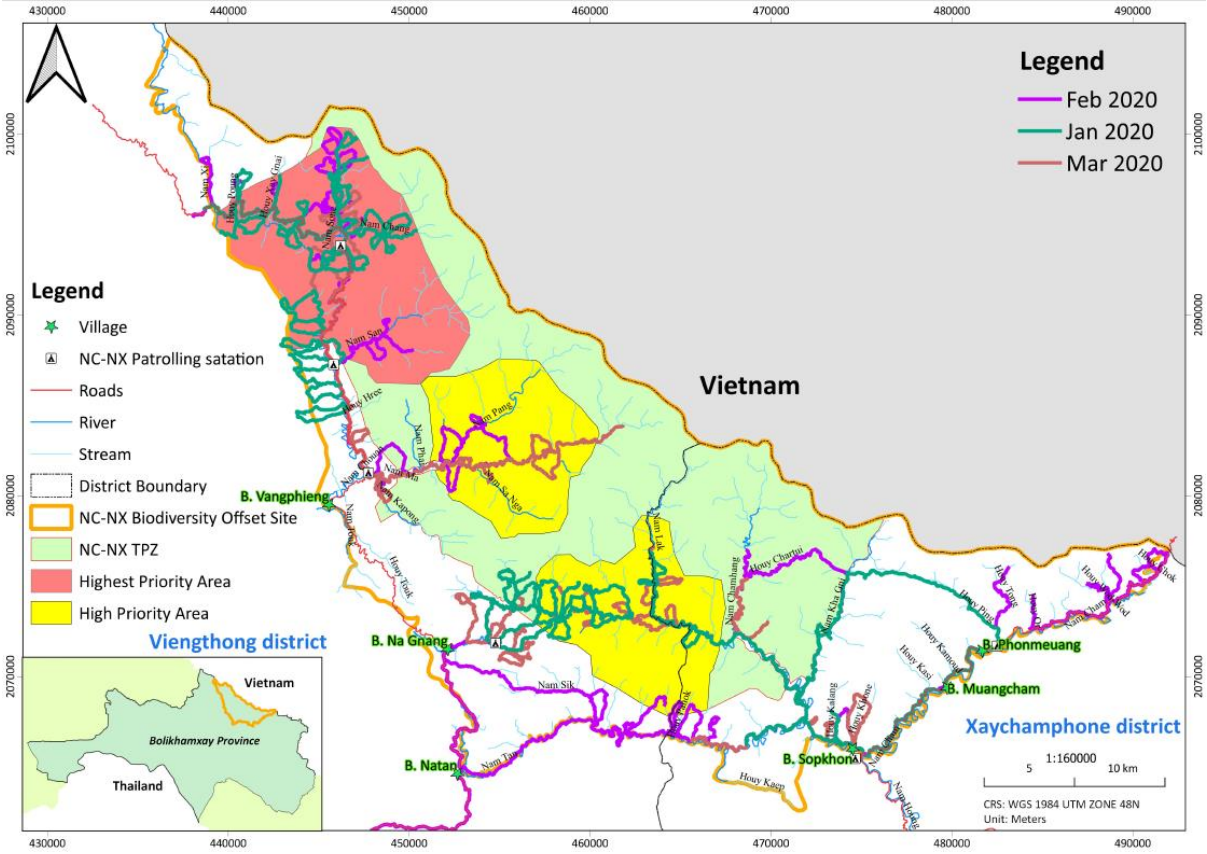
b. Component 2 – Law Enforcement

During 10-30 January 2020, four patrolling teams continued with patrolling activities. The first team carried out patrolling at TPZ High Priority Area around Nam Houng, Nam Lak, Nam Kha Gni, Nam Tan, Houy Khone, Houy Ping and Houy Kalang. The second team carried out patrolling at Nam Houng TPZ High Priority Area. The third team carried out patrolling at the TPZ Highest Priority Area around Nam Chang, Nam Sone, Houy Xaynoi, Houy Xaignai and Houy Poung. The fourth team carried out patrolling at the TPZ Highest Priority Area around Nam Chouan, Nam Xi and the tributaries at the north-west of Nam Chouan.

During 15 February – 05 March 2020, four patrolling teams continued with patrolling activities. The first team carried out patrolling at TPZ High Priority Area in Xaychamphone District – Houay Ping, Houay Wod-Wod, Houay Choak, Houay Khone, Nam Kha Gni, Nam Xam Hang and Nam Chamtui. The second team carried out patrolling at TPZ High Priority Area around Ban Natan area including Nam Tan, Houay Kaengkouang, Houay Nongsen, Houay Hok, Houay San, Houay Ka Nang and Nam Sik. The third team carried out patrolling at the TPZ Highest Priority Area around Nam Sone and the TPZ High Priority Area around Nam Ma and Nam Plang. The fourth team carried out patrolling at the TPZ Highest Priority Area, around Thongnachang Area including Nam Sone, Nam San, Nam Xi, Nam Chang, Houay Xai Yai, Houay Xai Noi and Houay Poung.

During 15 – 30 March, four patrolling teams continued with patrolling activities. The first team carried out patrolling at the TPZ highest priority area including Nam Sone, Nam Chang and Nam Chouane. The second team carried out patrolling at Nam Ma TPZ high priority area including Nam Ma, Nam Chouane, Nam Kapong and Nam Sa Nga. The third team carried out patrolling at Xaychamphone District side including Nam Houng, Nam Tan, Nam Lak, Nam Chamhung and Houykhone. The fourth team carried out patrolling at Nam Houng TPZ high priority area.

FIGURE 4-1: *MAP OF PATROLLING TRACK FROM JANUARY - MARCH 2020*



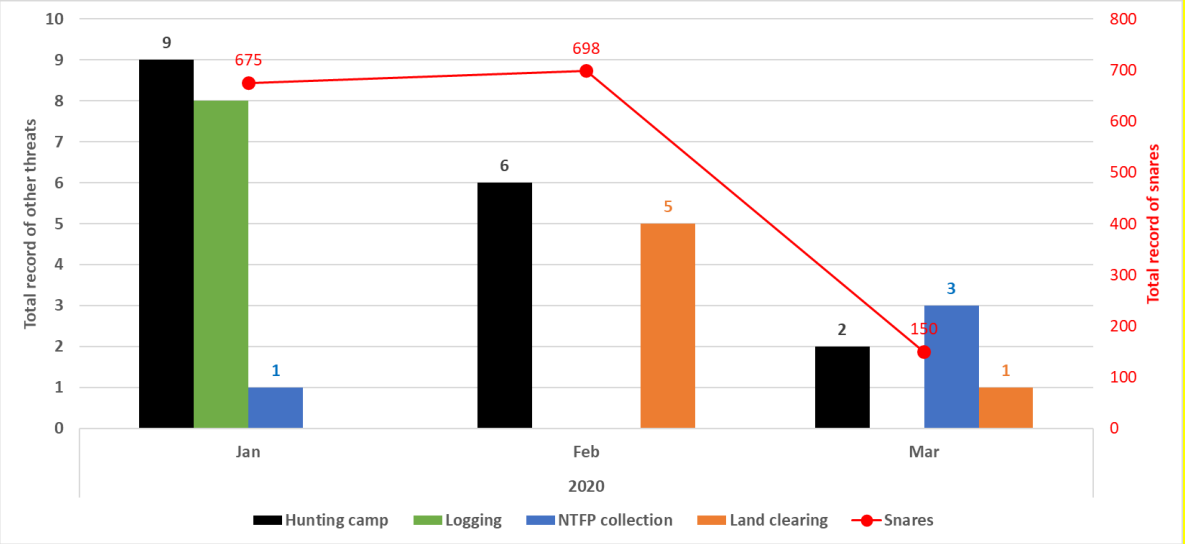
The record of threats from patrolling work in 2020 can be seen from **Figure 4-2**. The team confiscated a total of 300 small wire snares from Nam Sone TPZ highest priority area in January 2020; 156 small wire snares and 82 large wire snares are from Nam San TPZ high priority area in February 2020; 375 and 460 small wire snares from Nam Kha Gni area in January and February 2020 respectively; and 150 small wire snares from Nam Houng TPZ high priority area in March 2020. The team noted that the snares in Nam Sone TPZ highest priority area were newly set likely by Vietnamese poacher.

The patrolling team destroyed the total of nine hunting camps in January 2020, six hunting camps in February 2020, and two hunting camps in March 2020. The hunting related activity in this quarter mostly recorded around Nam Kha Gni area but outside TPZ priority areas and around Xaychamphone District but outside the TPZ area.

The patrolling team recorded logging related activity in January 2020 which is mostly from Na Gnang village close to Nam Hung TPZ high priority area. A total of five logging camps were destroyed and two old logging tracks and uncollected timber were observed around the area. The team have informed the village and district authorities so they can take action against illegal logging as agreed during consultations in December 2019.

The patrolling team also recorded local people collecting NTFPs in January 2020 around Houay Kasae in TPZ high priority area and in March 2020 within and outside Nam Chouane TPZ highest priority area, five locations of land clearing for agriculture in February 2020 around Ban Natan and Ban Nagnang but outside TPZ area and one location of land clearing for agriculture in March 2020 around Ban Vangphiang.

FIGURE 4-2: *OVERALL RECORD OF THREATS IN NC-NX OFFSET SITES IN 2020*



The record of wildlife observed from patrolling work in 2020 could be seen from **Table 4-1**. There is total 783 wildlife recorded through direct observation between January-March 2020.

TABLE 4-1: *LIST OF WILDLIFE RECORDED FROM DIRECT OBSERVATION IN Q1 2020*

No.	Common Name	Species (Scientific name)	Total Number
01	Black Giant Squirrel	*Ratufa bicolor*	40
02	Brown Hornbill	*Aceros nipalensis* *Anorrhinus tickelli*	14 55
03	Eagle	*Aquila heliacal*	3
04	East Asian Porcupine	*Hystrix brachyura*	3
05	Great Hornbill	*Buceros bicornis*	26
06	Hog Badger	*Arctonyx collaris*	5
07	Indochinese Serow	*Naemorhedus caudatus*	1
08	Macaque	*Cercopithecus nictitans*	394
09	Muntjac	*Muntiacus vuquangensis*	18
10	Otter	*Lutra lutra*	31
11	Phayre's Leaf Monkey	*Trachypithecus phayrei*	73
12	Red-shanked Douc Langur	*Pygathrix nemaeus*	34
13	Sambar	*Rusa unicolor*	1
14	Silver Pheasant	*Lophura nycethemera*	3
15	White-cheecked gibbon	*Hylobates agilis*	39
16	Wild Pig	*Sus scrof*	25
17	Crab eating mongoose		4
18	Hoopoe	*Upupa epops*	1
19	Rock Python	*Python molurus*	2
20	Mongoose	*Herpestes sp.*	1
21	Drongo Species	*Dicrurus adsimilis*	6
22	Red Junglefowl	*Gallus gallus*	4
Grand Total			**783**

FIGURE 4-3: *MUNTJAC*

FIGURE 4-4: *INDOCHINESE SEROW AT NAM SONE*

FIGURE 4-5: *MONGOOSE*

FIGURE 4-6: *GREAT HORNBILL AT NAM MA*

FIGURE 4-7: *SMALL WIRE SNARES AT NAM KHA GNI AREA*

FIGURE 4-8: *SMALL WIRE SNARES AROUND HOUAY SAN AT TPZ HIGH PRIORITY AREA*

FIGURE 4-9: *LAND CLEARANCE FOR AGRICULTURE OUTSIDE TPZ HIGH PRIORITY AREA*

FIGURE 4-10: *FISHING CAMP WITH THE DRY RACK AT THONGNACHANG AREA*

c. Component 4 – Conservation linked livelihood

NNP1PC-EMO together with a Consultant is preparing a Community Development Plan (CDP) for the six NC-NX villages as part of the biodiversity conservation. The consultant submitted a draft Inception Report on 16 January 2020 and discussed with NNP1PC-EMO on 24 January 2020. The revised Inception Report was submitted on 31 January 2020. The Consultant further improved the Inception Report and re-submitted the report on 13 February 2020. NNP1PC-EMO has provided further comments on 18 February 2020 and the Consultant re-submitted the improved report on 21 February 2020. However, the third re-submission is still unsatisfactory. NNP1PC-EMO has agreed with the Consultant on 03 March 2020 to discontinue the consulting service due to unsatisfactory result of their performance and the first deliverable of a draft inception report.

NNP1PC has processed another procurement with two potential candidates using a direct engagement method. NNP1PC received technical and financial proposals from these candidates on 23 March 2020 and concluded the technical review on 26 March 2020. Based on the careful review and assessment of proposals submitted by the two companies, an existing company who has been working with the NNP1PC on sustainable livelihood assessment at NNP1 sub-catchment was found to be qualified for the assignment. A discussion with the selected Consultant was organized on 30 March 2020 to further clarify the scope of work and negotiate a draft contract which is expected to be settled in April 2020. Following the GOL instruction on the preventive measures for COVID-19 during April 2020, the work is expected to start from May 2020.

5 BIOMASS CLEARANCE / FLOATING DEBRIS REMOVAL

NNP1PC-EMO conducted regular monitoring and removal of floating materials/logs from the temporary log-boom as needed. NNP1PC-EMO together with local contractor also manage the cutting and burning of debris and logs at the log-landing site close to the temporary log-boom between February-March 2020. Permanent log booms are being installed at the main dam and the re-regulation dam by NNP1PC-TD and the contractor.

6 FISHERY MONITORING

The 5 type of species that dominated the fish catch by weight in Q1 2020 are listed in ***Table 6-1.*** This includes two species and three species group that are classified as Least Concern

(LC) according to the IUCN Red List of Threatened Species, except *Tor sinensis* is classified as Vulnerable (VU) and *Sikukia gudgeri* is classified as Data Deficient (DD).

TABLE 6-1: *FISH SPECIES DOMINATING THE FISH CATCH IN Q1 2020*

Species	Lao Name	Fish Catch in Q1 2020 (kg)	IUCN Red List Classification
Poropuntius normani, Poropuntius slaoensis, Poropuntius carinatus	ปาจาด	529.3	LC
Hampala dispar, Hampala macrolepidota	ปาสูด	359.9	LC
Channa striata	ปาถ่ำ	215.4	LC
Sikukia gudgeri, Amblyrhynchichthys truncatus	ปาฮาอฮาย	145.7	DD, LC
Tor sinensis	ปาแดง	131.5	VU

The recorded catch of Threatened species (IUCN Red List classification) in the Q1 2020 fish catch is presented in ***Table 6-2***. The list includes four Vulnerable species (VU) and three Near Threatened species (NT).

TABLE 6-2: *THREATENED AND NEAR THREATENED SPECIES OF THE FISH CATCH IN Q1 2020*

Species	Lao Name	Fish Catch in Q1 2020 (kg)	IUCN Red List Classification
Cirrhinus cirrhosus	ปามอมจัม/ปาแมง	8	VU
Cirrhinus molitorella	ปาแมง	5.3	NT
Cyprinus carpio	ปาไม	4	VU
Neolissochilus stracheyi	ปาสอง	2.5	NT
Onychostoma gerlachi	ปาถิง	18.2	NT
Scaphognathops bandanensis	ปาอวมไฟ/ปาป่วม	13.5	VU
Tor sinensis	ปาแดง	131.5	VU

The occurrence of Threatened and Near Threatened species in the fish catch by Quarter since the start of species identification in Q3 2015 is displayed in ***Table 6-3***.

TABLE 6-3: *OCCURRENCE OF THREATENED AND NEAR 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
Bagarius bagarius (NT)			+	+	+	+	+	+	+	+	+	+	+	+	+				
Bagarius yarrelli (NT)	+			+					+					+					
Bangana behri (VU)	+	+	+	+	+	+	+	+	+			+	+	+	+	+			
Chitala blanci (NT)														+					
Cirrhinus cirrhosus (VU)	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+		+
Cirrhinus molitorella (NT)	+	+										+	+	+	+	+	+	+	+
Cyprinus carpio (VU)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+
Epalzeorhynchos munense (VU)												+							
Hypophthalmichthys molitrix (NT)	+				+									+		+			
Laubuca caeruleostigmata (EN)																	+		
Luciocyprinus striolatus (EN)	+	+	+	+			+	+	+	+			+	+		+			
Mekongina erythrospila (NT)	+	+	+	+	+	+	+	+	+			+	+	+			+	+	
Neolissochilus stracheyi (NT)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Ompok bimaculatus (NT)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+				
Onychostoma gerlachi (NT)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Pangasianodon hypophthalmus (EN)	+																		
Probarbus jullieni (EN)	+	+	+			+		+	+	+		+		+			+	+	
Probarbus labeamajor (EN)				+	+			+							+	+			
Scaphognathops bandanensis (VU)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Syncrossus beauforti (NT)		+	+	+	+	+					+			+		+	+	+	
Tor sinensis (VU)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
Wallago attu (NT)	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	
Yasuhikotakia splendida (VU)																		+	

The total recorded monthly fish catch from July 2015 to February 2020 for the downstream, upstream (upper reservoir until upstream of the reservoir) and Mekong control group fishing households involved in the monitoring programme is presented in ***Figure 6-1***. Note that the upstream fish catch excludes the fish catch from the fishing households in Zone 2LR because these households were resettled during Q4-2017.

FIGURE 6-1: *TOTAL MONTHLY FISH CATCH JULY 2015 – FEBRUARY 2020*

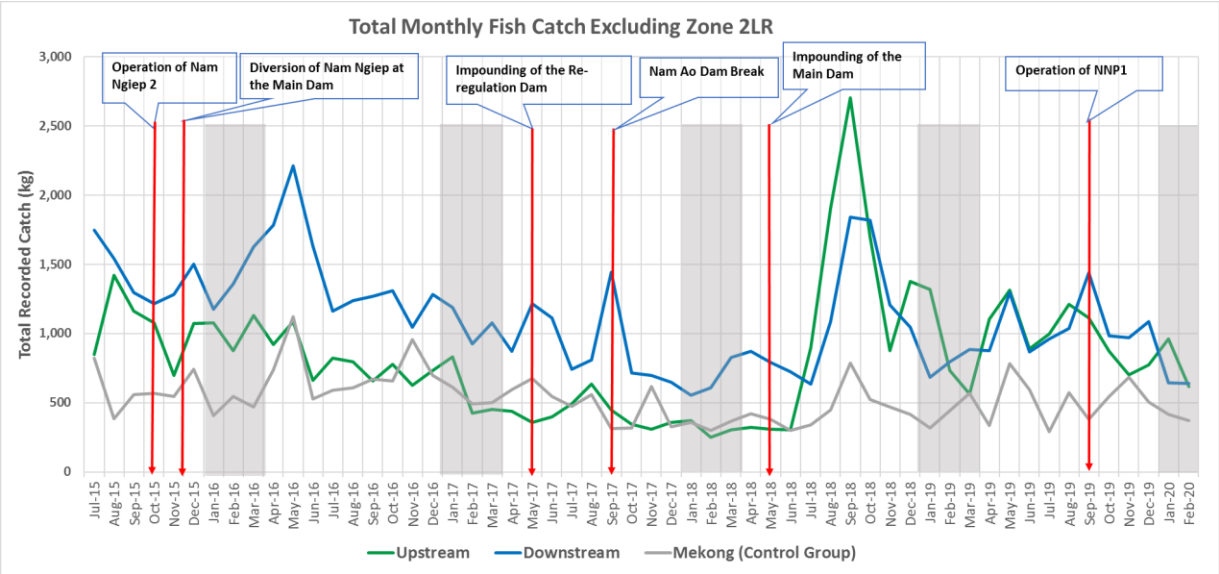


Table 6-4 and ***Figure 6-2*** show the total recorded fish catch for Q1 from 2016 to 2020 by the upstream (excluding Zone 2LR), downstream and the Mekong control group fishing households. Note that the recording days was reduced from 30 days/month to only seven days/month starting from February 2019 due to Company financial constraint. However, redesigning the sampling program have been carefully discussed with fishery expert and noted that NNP1PC needs to continue the monitoring and the long trend data analysis should carefully consider the different sampling programs that were implemented.

TABLE 6-4: *TOTAL FISH CATCH FOR Q1 FROM 2016 TO 2020 BY UPSTREAM (EXCLUDING ZONE 2LR), DOWNSTREAM AND MEKONG CONTROL GROUP FISHING HOUSEHOLDS*

Fishing Zone	Q1 2016 (kg)	Q1 2017 (kg)	Q1 2018 (kg)	Q1 2019 (kg)	Q1 2020 (kg)
Upstream	3,083.7	1,708.2	928.8	2,612.3	1,577.8
Downstream	4,156.6	3,189.7	1,986.6	2,364.5	1,283.8
Mekong Control Group	1,422.1	1,605.4	1,027.7	1,325.7	785.6

FIGURE 6-2: *TOTAL FISH CATCH IN Q1 2020 BY UPSTREAM (EXCLUDING ZONE 2LR), DOWNSTREAM AND MEKONG CONTROL GROUP FISHING HOUSEHOLDS*

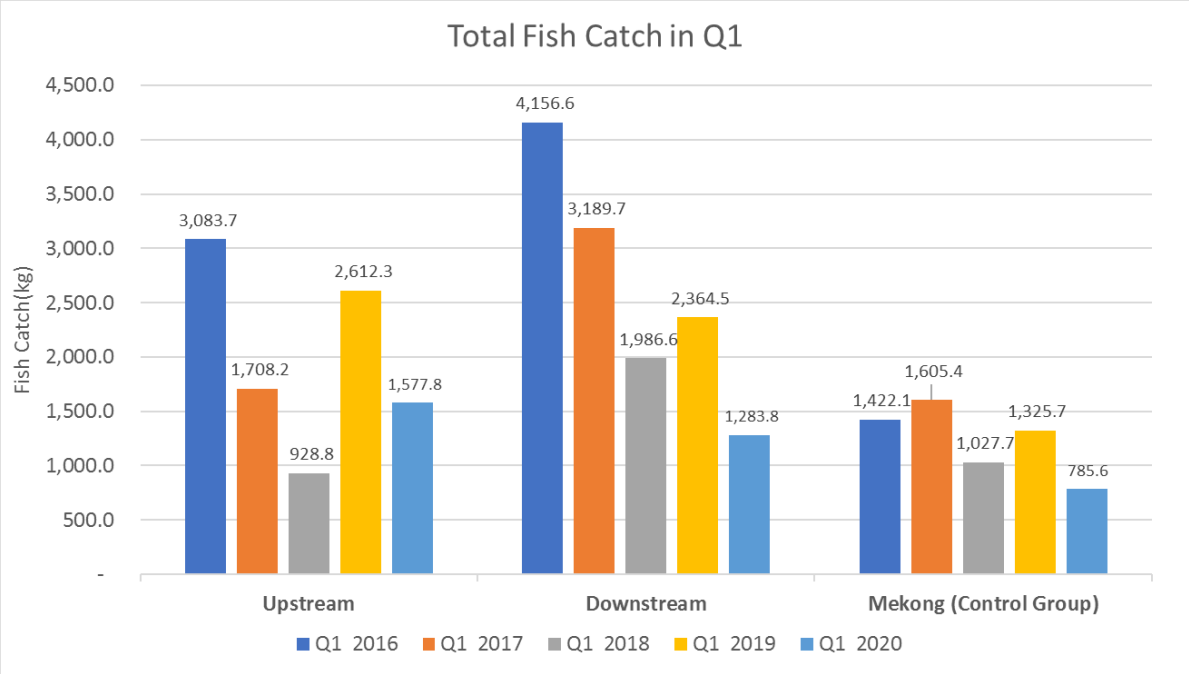
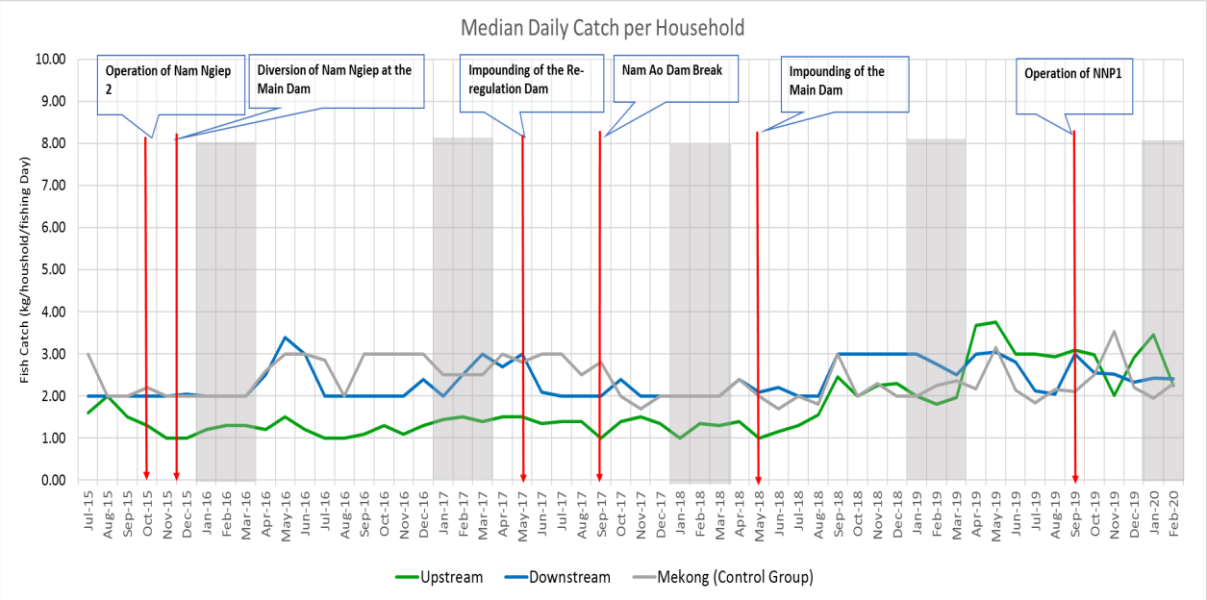


Table 6-5 presents the median household fish catch per fishing day for Q1 from 2016 to 2020 in the upstream (excluding Zone 2LR), downstream and the Mekong Control Group, and ***Figure 6-3*** shows the median monthly household fish catch per fishing day from July 2015 to February 2020.

TABLE 6-5: *MEDIAN HOUSEHOLD FISH CATCH PER FISHING DAY FOR Q1 FROM 2016 TO 2020*

Fishing Zone	Q1 2016 (kg)	Q1 2017 (kg)	Q1 2018 (kg)	Q1 2019 (kg)	Q1 2020 (kg)
Upstream (Excluding Zone 2LR)	1.27	1.45	1.22	1.92	2.85
Downstream	2.00	2.50	2.00	2.75	2.42
Mekong (Control Group)	2.00	2.50	2.00	2.21	2.12

FIGURE 6-3: *MEDIAN MONTHLY HOUSEHOLD FISH CATCH PER FISHING DAY (EXCLUDING ZONE 2LR)*



To test whether there are any significant differences among the quarterly mean household fish catch per fishing day for each fishing zone, one-way ANOVA (analysis of variance) statistical tests have been performed on the data from each fishing zone. The null-hypothesis is that the sample means are equal, and the alternative hypothesis is that at least one of the means is statistically different. The level of significance is set to 0.05 (5%). The results of the one-way ANOVA tests are presented in **Table 6-6.**

TABLE 6-6: *RESULTS OF ONE-WAY ANOVA TESTS ON MEAN HOUSEHOLD FISH CATCH IN Q1 2020*

Fishing Zone	F-Statistic	*P*-value	F-Critical	Significance
Upstream	43.93	$8.13*10^{-36}$	2.37	Highly Significant
Downstream	4.92	$5.9*10^{-4}$	2.37	Highly Significant
Mekong Control Group	12.55	$4.43*10^{-10}$	2.38	Highly Significant

The rule for interpreting the results of an ANOVA test is that if the F-statistic is lower than the F-Critical value then this supports that the null-hypothesis cannot be rejected (same if the *p*-value is greater than the significance level). The results of the ANOVA tests in ***Table 6-6*** indicates that upstream, downstream and Mekong area are highly significant different.

7 Health and Safety

A summary of the safety incidents reported since the start of the Civil Works to the end of March 2020 are provided in ***Table 7-1*** and ***Figure 7-1*** below.

TABLE 7-1: SAFETY INCIDENTS REPORTED IN Q1 2020

Type of Incidents	LTI	RI	NM	PD	FI	MVI	Total
No. of Incidents in Q1 2020	0	0	0	0	0	0	0
Cumulative Total Incidents to 31 March 2020	20	18	22	23	9	62	**154**

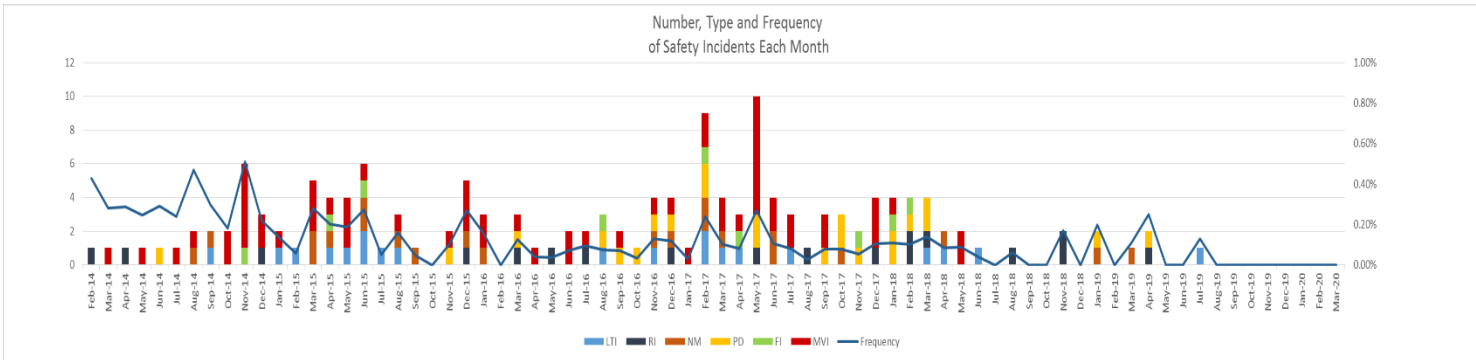
LEGEND:
- LTI - Lost Time Incident
- RI - Recordable Injury
- NM - Near Miss
- PD - Property Damage
- FI - Fire Incident
- MVI - Motor Vehicle Incident

There were no incidents or accidents reported during Q1 2020.

The histogram below in ***Figure 7-1*** shows the number of reported incidents occurring in each month since the start of the Civil Works Contract with the colour indicating the type of incident including near misses. Up to the end of December 2015, all incidents related to the Civil Contractor and from 01 January 2016, those of the other three principal Contractors have been included. The graph superimposed on the histogram shows the frequency of incidents, including reported near misses, with the number of incidents occurring each month expressed as a percentage of the total number of Project workers employed in each month being the total man-months.

All reported incidents that have involved the Owner and its Contractors and Subcontractors are included in the histogram and shown graphically below.

FIGURE 7-1: NUMBER, TYPE AND FREQUENCY OF SAFETY INCIDENTS TO MARCH 2020



APPENDICES

APPENDIX 1: STATUS OF SS-ESMMPS REVIEW AND APPROVAL IN Q1 2020

No	Site name	Document Name	Contractor / subcontractor	Approval Status by EMO/NNP1 (date)	Detailed Site Information	Monthly Construction & Operation Status as of 31 March 2020
1	Song Da5 camp No.1	**Site Decommissioning and Rehabilitation for Song Da5 camp No.1**	Song Da5 Joint Stock	No objection with no further comment on 30 January 2020; 2nd submission on 06 January 2020		On-going of site re-vegetation and after-care
2	Song Da5 temporary CVC Batching Plant & Stockyard	**Site Decommissioning & Rehabilitation Plan for SD5, Temporary CVC Batching Plant & Stockyard**	Song Da5 Joint Stock	No objection with no further comment on 04 March 2020; 2nd submission on 06 January 2020		On-going of site re-vegetation and after-care
3	Main Dam left bank	**DWP&SS-ESMMP for installation of double corrosion protection rock bolts at the left bank slope**	Song Da5 Joint Stock	No objection with no further comment on 17 July 20202nd submission on 07 February 2020		Completed, site was closed
4	Main dam reservoir and re-regulation dam reservoir	**DWP & SS-ESMMP for Supply and Installation of Log Booms at the Main Dam and Re-Regulation Dam" Nam Ngiep 1 Hydropower Project**	TLEC company	No objection with no further comment on 17 July 20202nd submission on 12 February 2020		Completed, site was closed
5	Main dam left bank	**DWP&SS-ESMMP for Supply and installation of Transmission Line Tower No.1**	Powergrid Company	No objection with comment on 09 January 2020; First submission on 06 January 2020		On-going

No	Site name	Document Name	Contractor / subcontractor	Approval Status by EMO/NNP1 (date)	Detailed Site Information	Monthly Construction & Operation Status as of 31 March 2020
6	Main Irrigation canal for Houy Soup Resettlement Area	**Site Decommissioning and Rehabilitation Plan for VSP camp and Spoil Disposal Area**	VSP road, bridge company,	No objection with comment on 29 January 2020 for the 1st submission.		Completed
7	Intake of main Irrigation canal for Houy Soup Resettlement Area	**DWP&SS-ESMMP for Remove the Stump and Clean Irrigation Canal**	PKC road and bridge company	No objection with comment on 17 March 2020, 1st submission on 13 March 2020		On-going
8	Irrigation canal for Houy Soup Resettlement Area	**DWP&SS-ESMMP for Construction of Irrigation Sub-Canal in Phouhomxay Resettlement Village**	PKC road and bridge company	No objection with comment on 17 March 2020, 1st submission on 13 March 2020		On-going

APPENDIX 2: ENVIRONMENTAL MONITORING CORRECTIVE ACTIONS IN Q1-2020

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
ONC_OC-0326	22.10.2019	Former RT camp	Incomplete site decommissioning and rehabilitation: - Some part of concrete slab was remained; the area was not levelled properly which post high risk of surface runoff and soil erosion; - No removal of concrete water tanks; - No provision cut-off drains around the site to protect soil erosion and sediment transport to the re-regulation reservoir.	The contractor was instructed to take the following actions by specified deadline: - Completely break and remove the concrete slap and level the area properly; - Break the concrete water tanks and landscape the area properly; - Provide proper cut-off drain around the site to divert the run-off during the wet season.	30.11.2019	17.01.2020	Resolved
ONC_VSP-0013	12.11.2019	Irrigation canal of HSRA	As a long time facing on difficulty of rock blasting and delaying. During this bi-weekly joint site inspection the Contractor informed that: - The canal rock blasting and spoil/rock disposal activity work shall be completed by November 2019;	The Contractor is required to prepare the Site Decommissioning and Rehabilitation Plan of the camp area and spoil / rock disposal area and submit the plan to NNP1-EMO's for review and approval at least 15 business days before work completion:	25.11.2019	31.01.2020	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
			- The camp operation was expected to be extended and operated for other two more months after completion of rock blasting and excavation work for other concrete works. In accordance to the construction site decommissioning and rehabilitation requirements, the Contractor is obliged to decommission and rehabilitate all their belonging sites (camp, construction supporting areas) properly before leaving the project.	- The camp facilities shall be decommissioned, treated and clean up properly; - The spoil/rock disposal area could be landscaped, cover with topsoil and re-vegetated to protect soil erosion and restore original site condition as much as possible. Please note that: EMO is only to participate the Final Inspection when the site decommissioning and rehabilitation work is completed.			
ONC_OC-0344	28.01.2020	CVC Plant	- As far as the decommissioning of the construction sites and supporting facilities occupied by CWC are almost completed and the site rehabilitation/ revegetation is ongoing during the defect liability period.	The contractor was instructed to take appropriate corrective action as the following: - Update the list of sites that are fully seeded and provide the information of (Total revegetated sites and quantity of local grass seeds	14.02.2020	17.03.2020	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
			- EMO has verbally requested the contractor since last three joint-biweekly inspection to provide the update information of: 1) Total revegetated sites; and 2) Quantity of local grass seeds and local seedling that was sown/planted per sites. So far, EMO did not receive such update information and it was not clear which areas have FULLY seeded due to very slow seed germination found during the monitoring period from October 2019 to presence. - Since 06 January 2020, NNP1PC-EMO has been carried out the watering of the revegetated sites for CVC plant, RCC plant and SongDa5 former Batching Plant. - It was found that the installed water sprinklers were not regularly rotated to provide proper site watering. This can be evaluated by the	and local seedling that were sown and planted per sites); - Ensure that the entire bare areas are seeded; - Provide enough water sprinklers on sites or rotate the water sprinklers regularly to ensure successful revegetation by the defect liability period. **Note:** During this join bi-weekly inspection, the contractor's representative argued that the contractor did not focus on area to be getting wet, the green cover is the key expectation, but NNP1PC-EMO was concerned that without wet area, the bare area could never turn green.			

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
			percentage of water areas which are under 50% of the entire areas. NNP1PC-EMO understood that the entire areas of the CVC plant yard was fully seeded. Therefore, during this joint site inspection EMO instructed the contractor to install more water sprinklers or rotate the water sprinklers for the entire revegetated areas on regular basis, but the contractor's representative informed that the three sites (CVC plant yard, RCC plant lower part and Song Da5's former Batching Plant and stock yard) were not yet fully seeded, only partial seeding where the existing water sprinklers were standing.				
ONC_OC-0345	12.02.2020	Song Da5 Camp No.1	EMO has inspected and followed up the Contractor's implementation of site decommissioning and rehabilitation activities for a few months. So far, EMO	The contractor was instructed to take appropriate corrective action as the following: - Any tree (seedling) or grass seed plants and sown on site shall be well selected for the	14.02.2020	17.03.2020	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
			inspector can assume that the contractor has either lacked of re-vegetation skill personnel or inadequate taken account in term of site re-vegetation successful by the end of liability period. Of course, the contractor and sub-contractor paid much enough effort to get the works done as much and as quickly as possible. But EMO still observed: - Insufficient well selection of native vegetation species to get the high percentage of re-vegetation successful; - Continue planting of local natural trees by directly collects from the site surrounding without nursery which already been dried up after one day planted.	possibility of growing up and survival to minimize of waste time and waste expenditures; - Avoid a directly collecting of natural young trees (seedling), and plants on site without nursery and / or trial planting. In additional, the source of collecting from shall need to be prior agreed and approved by NNP1 to prevent of further impaction on other site location as well as avoiding a grievance by the local villagers.			
ONC_OC-0346	12.02.2020	Song Da5 Camp No.1 Stock yard	- Incomplete decommissions of facility on site. The former recycling storage with some recycle waste was remaining on site.	- Segregate and collect the remaining recycle waste for proper disposal and decommission the recycling storage structure properly.	20.02.2020	21.02.2020	Resolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
			- Concrete waste, wooden waste, concrete bricks and garbage are scattered on the stock yard. - A partial of former TCM camp which was previously scratched in aiding of natural growth was later disturbed/used by Song Da5 as trailers parking area during the demobilization activities. Without scratch of bare compacted ground surface, it looked hardly for a natural growth.	- Collect and clean up the scattered discards material (garbage, wooden and concrete waste) for proper disposal. The concrete bricks can be collected and stockpile on site to allows local villager to comes and collect. - Use backhoe scratch the occupy access road and disturbance area of former TCM camp in adding future easy natural growth.			
ONC_VSP-0014	28.02.2020	Rock/spoil disposal of HSRA's Irrigation Canal	On 19-Nov-19, EMO was invited to joint site inspection to check and verify the contractor's action on the spoil/rock disposal rehabilitation work. After inspection, it was noted that the rehabilitation work was not accepted due insufficient topsoil covering on the surface of the rock disposal area to enhance natural regrowth and/or	The Contractor is required to accomplish corrective action for rehabilitation work of the spoil/rock disposal area as per NNP1PC-EMO comments and environmental measures as proposed in the contractor's Site Decommissioning and Rehabilitation Plan (SDRP) by the specified deadline. **Note:** This Site Inspection Report	07.03.2020	17.03.2020	Unresolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
			revegetation. EMO, therefore, recommended the Contractor for more topsoil covering work in apparel with a preparation and submission of the Site Decommissioning and Rehabilitation Plan (SDRP) for NNP1PC review and approval. In Dec-19, the previous ADB & IAP mission raised the same concern on insufficient topsoil covering for this spoil/rock disposal site. On 29-Jan-20, the contractor submitted the SDRP with proposed management measures to be cover with more appropriate topsoil as well as planting some native trees/seedlings. On 19-Feb-20, EMO was invited to join the final inspection. However, there was no further action on the rehabilitation of the spoil/rock disposal area as	(SIR) will be automatically escalated to the Non-Compliance Report Level 2 (NCR02) following a failure to accomplish the pending rehabilitation work.			

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
			per EMO's comments and the proposed SDRP.				
ONC_AM-0003	28.02.2020	OSOV	With reference to the LTA's recommendation made during the mission on in August 2019 to improve the OSOV's WWTS, ADM has informed that the proposed improvement cost of $ 20,000 by the INFRA was not possible and therefore asked EMO to check if simple/basic improvement of the 2nd wetland pond, similarly to what has been done for the 1st wetland pond during March 2019, is enough. - On 27 January 2020, EMO conducted water sampling at three points (influent and effluent of the first wetland pond and effluent of the second wetland pond) to verify the functioning of each wetland pond; - ADM also cleaned up vegetation from the second	As per the justification, ADM shall carry out a basic improvement of the second wetland pond similarly to the first wetland pond. However, ADM was requested to provide a list and descriptions of necessary improvement work items for EMO's record and inspection reference.	12.03.2020	17.03.2020	Unresolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
			wetland pond. Progress: - Based on the monitoring result, there was a significant reduction of BOD and Coliform after treating by the first wetland pond. - The existing second wetland pond is still doing its job, but could not bring coliform to the constant compliance level.				
ONC_OC-0347	17.03.2020	Spoil Disposal No.6	Since the landscaping work for spoil disposal no.6 (area 6.3) was completed in the middle of February 2020, no revegetation work is being carried out for this area, it was observed that the covered soil layer on the sloping area started to erode after the first rain. Without a proper prevention measures, this has a high potential risk of massive slope erosion and collapse. It is noted that, NNP1PC-TD has allowed the PowerGrid contractor to	The contractor was instructed to take appropriate corrective action as the following: - Provide/install cut-off drain on the top of slopes to reduce the amount vertical run-off through the sloping areas. - Conduct slope trimming and compaction using excavator's bucket where the cracks of soil layer are visible. - Conduct seeding work on the sloping area to aid vegetation cover. This can assist on quicker slope	27.03.2020	31.03.2020	Unresolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
			dispose spoil from the excavation of tower no. 1 at the middle slope of this area. Therefore, this additional disturbed area by the PowerGrid contractor can be excluded from CWC's occupied area because this newly disposed spoil area will be treated and revegetated by the PowerGrid contractor at later stage.	stabilization and soil erosion minimization.			
ONC_OC-0348	17.03.2020	Spoil Disposal No.6	Most of the trees planted in December 2019 were totally dried up. EMO has instructed the contractor to remove the dead trees and replace with proper native trees/seedling as well as conduct a grass seed sowing for quicker green cover. In early January 2020, a number of local flowers have been planted and replaced the dead trees. Then, no further revegetation work is implemented.	The contractor was instructed to continue seeding/ planting works at this area (no adding of additional flowers).	27.03.2020	31.03.2020	Unresolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
ONC_OC-0349	24.03.2020	OC camp	**Background:** On 30 January 2020, NNP1PC approved the Contractor's Site Decommissioning and Rehabilitation Plan (SDRP), the plan proposed a total of 100 local fruit trees (three species) to be planted at OC camp. Later, this revegetated area was dominated with flowers rather trees. Therefore, ESD management has suggested a jointly tree-count at OC camp and that some commercial trees need to be added if any replacement of the dead trees. **Finding:** On 03 March 2020, NNP1PC (TD and EMO) and OC's representative conducted the jointly tree-count at OC camp. Surprisingly, a total of 120 trees/seedlings from 11 fruit trees species have planted on site (whilst, accordingly to the approved	Without an official notification (the SIR), it has a potential risk that the un-approved tree species are to be added/replaced. Therefore, the contractor was instructed to take appropriate corrective action as the following: - Commercial trees need to be added if any future replacement of the dead and weak trees; - No further flowers, fruit trees are allowed to be additional planted/replaced.	Actions needed through the Liability Period	31.03.2020	Unresolved

Issue ID	Inspection Date	Site Name	Issue/Description	Action Required/Recommendation	Deadline	Latest Follow-up Date	Status
			SDRP, only tree fruit three species were approved). Out of these, 18 trees have died and need replacement with commercial and/or local tree species. Also, it is likely that some small and weak trees are not surviving. **Corrective Action Done:** On 24 March 2020, during this week joint site inspection, two commercial species (06 Mai Sack and 04 Mai Du and one local soft tree species (04 Mai samsara) have replaced the dead trees.				
ONC_OC-0350	24.03.2020	Sand stock yard	Landscaping of the Temporary Sand Stock Yard was completed on 08 November 2019, but no revegetation work is performed. It is noted that this area remained sandy condition (thin soil surface, but thick sand layer underneath) that posts difficulty for revelation work and natural regrowth.	The contractor was instructed to take the following actions: - Assess and treat this landscaped area to aid revegetation work and natural regrowth condition. - The revegetation work needs to catch up with this year wet season which is considerably staring now.	27.03.2020	31.03.2020	Unresolved

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

SITE CODES AND LOCATION STATION FOR SURFACE WATER QUALITY MONITORING

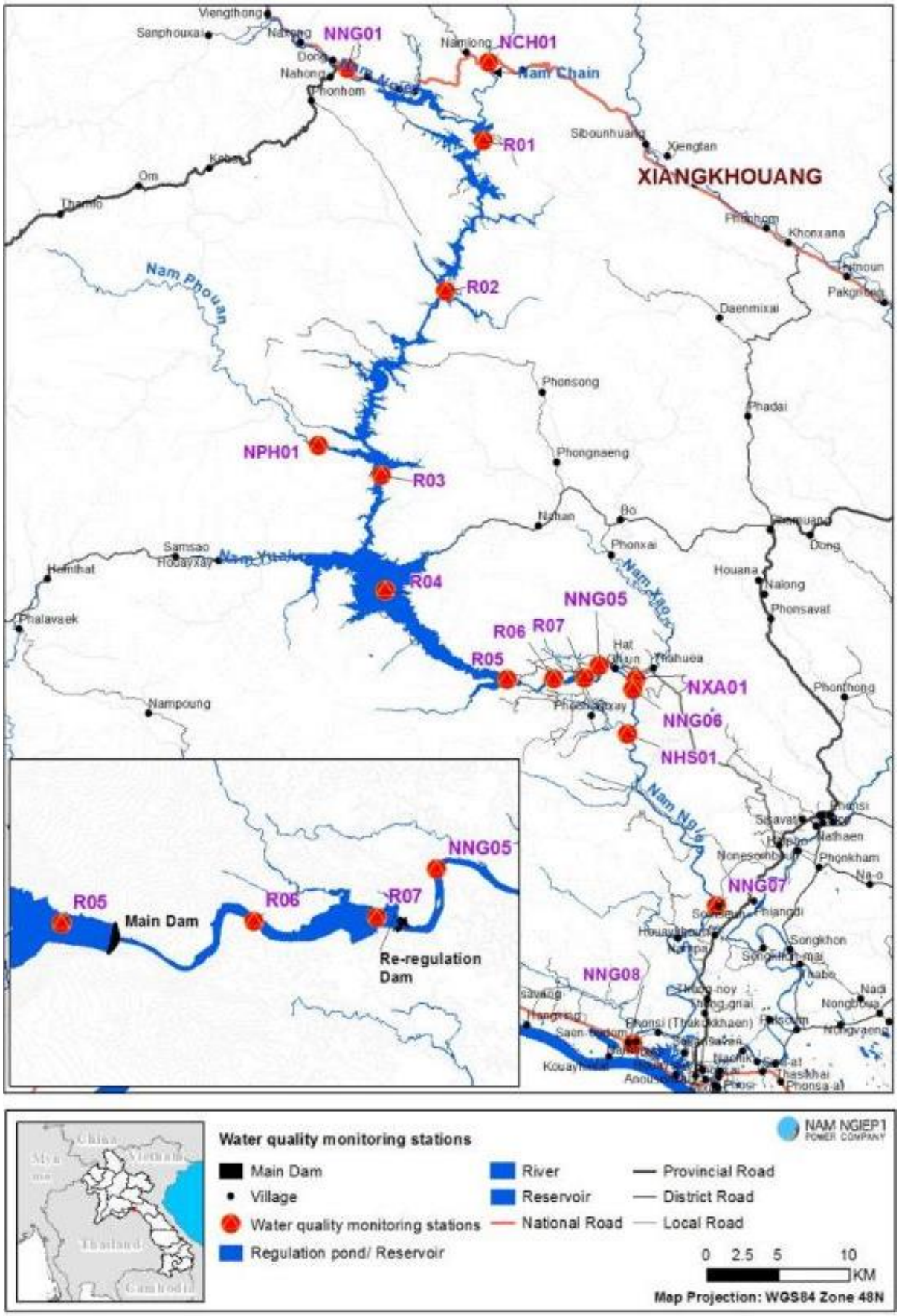
Site Code	Location station	Zone
NNG01	Nam Ngiep Upstream of Ban Phiengta	Upstream Project Construction Site
R01	Main reservoir upstream main dam approx. 50 Km.	
R02	Main reservoir upstream main dam approx. 35 Km.	
NNG02/R03	Nam Ngiep Upstream of Nam Phouan Confluence / Main reservoir upstream main dam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

MONITORING FREQUENCY FOR SURFACE WATER QUALITY PARAMETERS

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

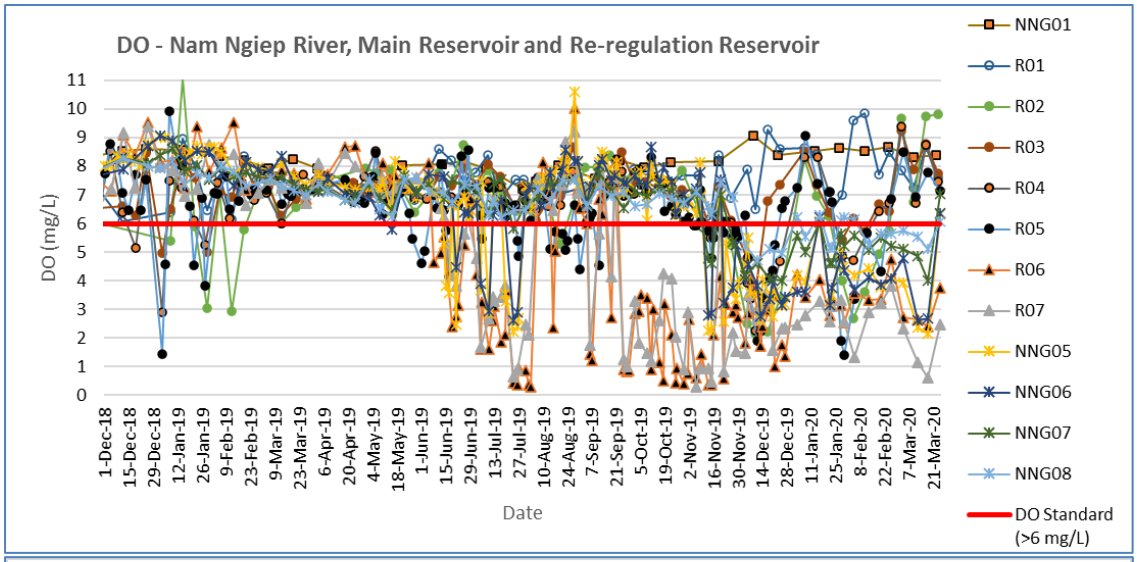
Frequency of Monitoring	Parameters (Unit)	Monitoring Sites
Fortnightly	pH, DO (%), DO (mg/L), Conductivity (µs/cm), TDS (mg/L), Temperature (°C), Turbidity (NTU)	All stations
Monthly	TSS (mg/L), BOD_5 (mg/L), COD (mg/L), NH_3-N (mg/L), NO_3-N (mg/L), total coliform (MPN/100 mL), faecal coliform (MPN/100 mL), Hydrogen sulphide (mg/L), Phytoplankton biomass, TOC and TKN.	As per ESMMP-OP.

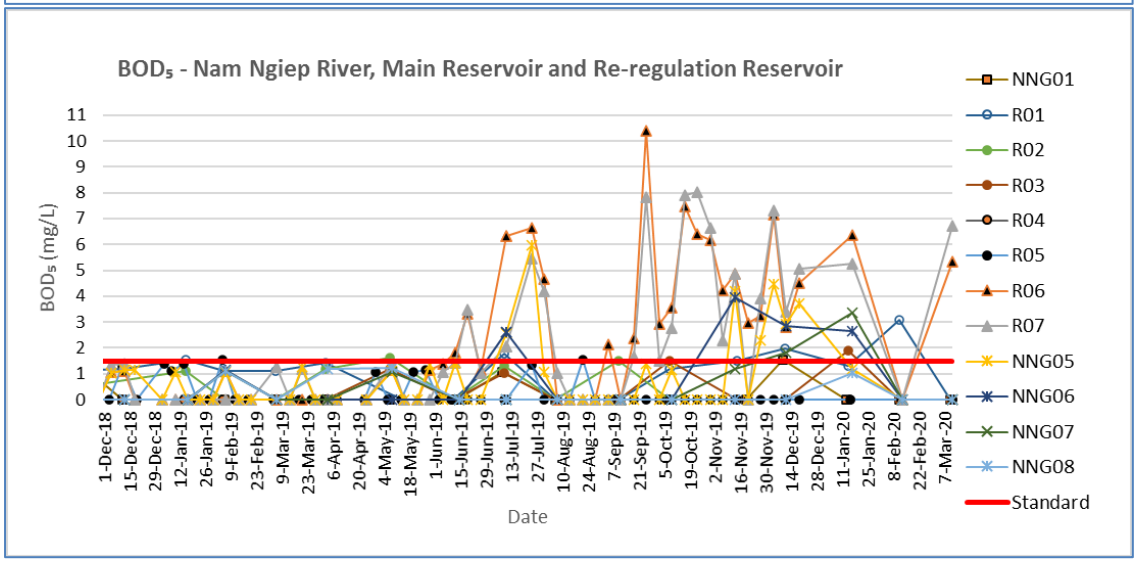
SURFACE WATER QUALITY MONITORING LOCATIONS

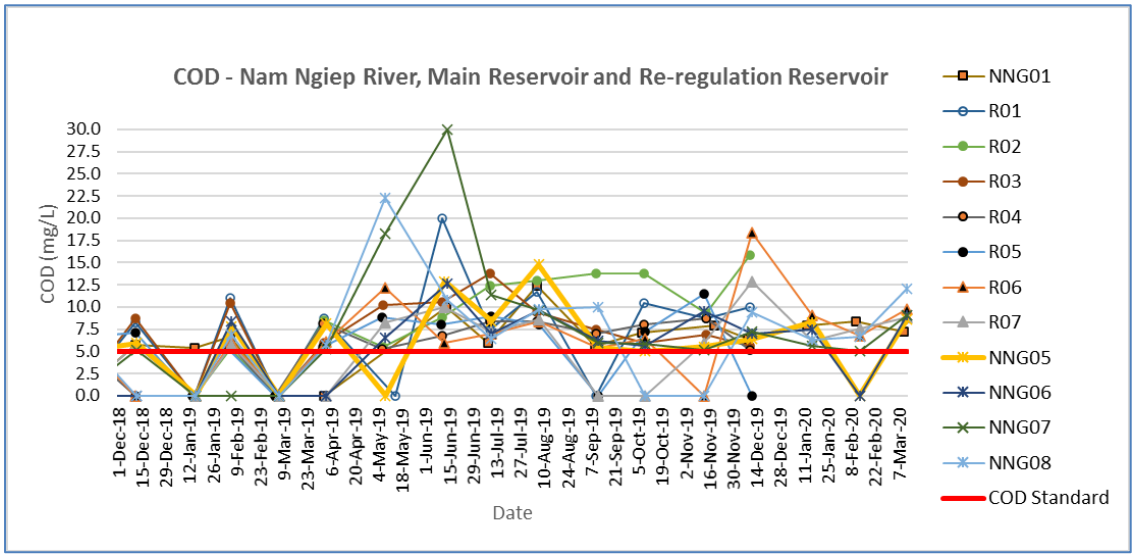


APPENDIX 4: KEY TRENDS OF WATER QUALITY MONITORING FROM DECEMBER 2018 TO END OF MARCH 2020 (ONLY PARAMETERS THAT EXCEEDED THE STANDARDS)

Nam Ngiep Surface Water







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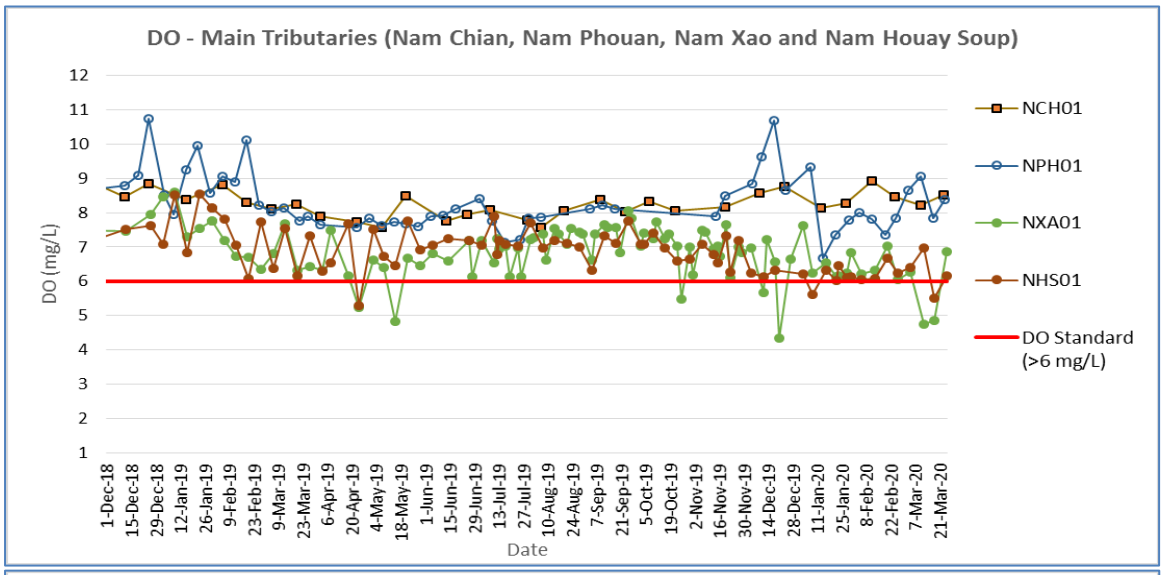
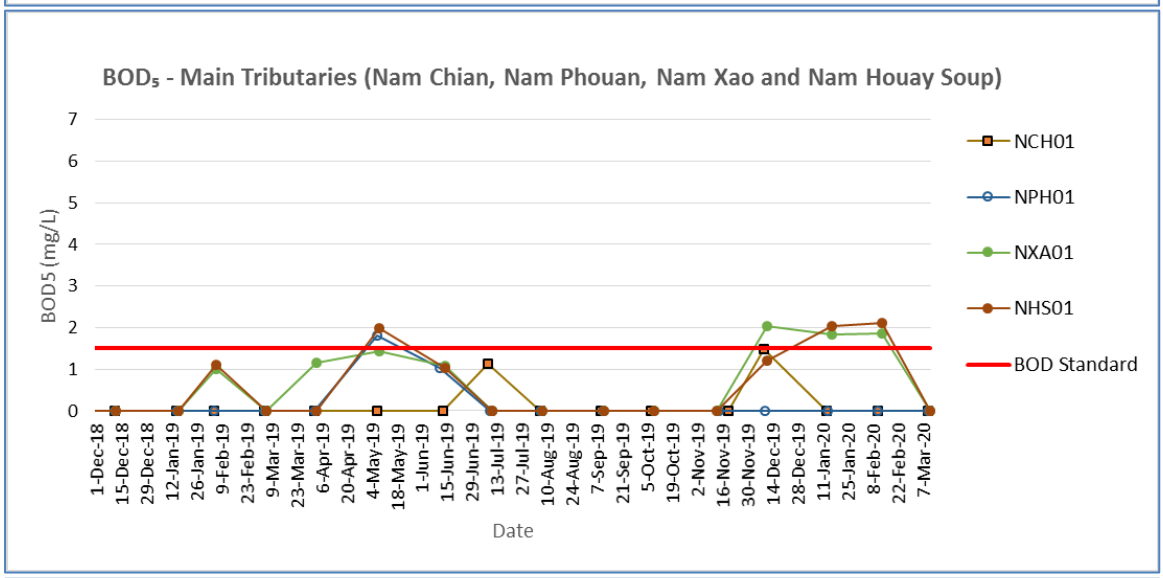
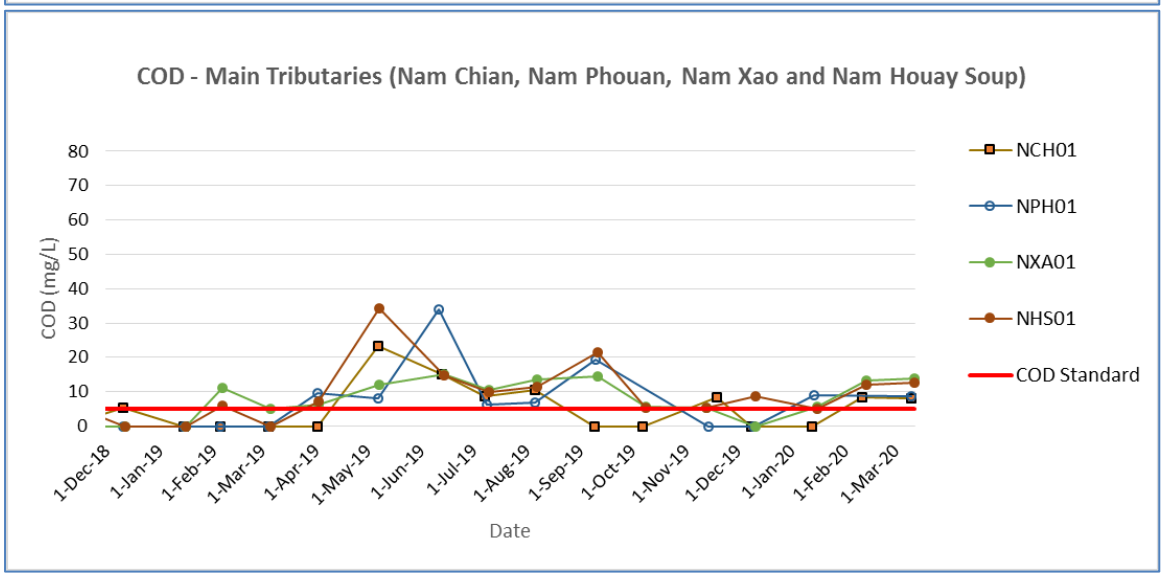
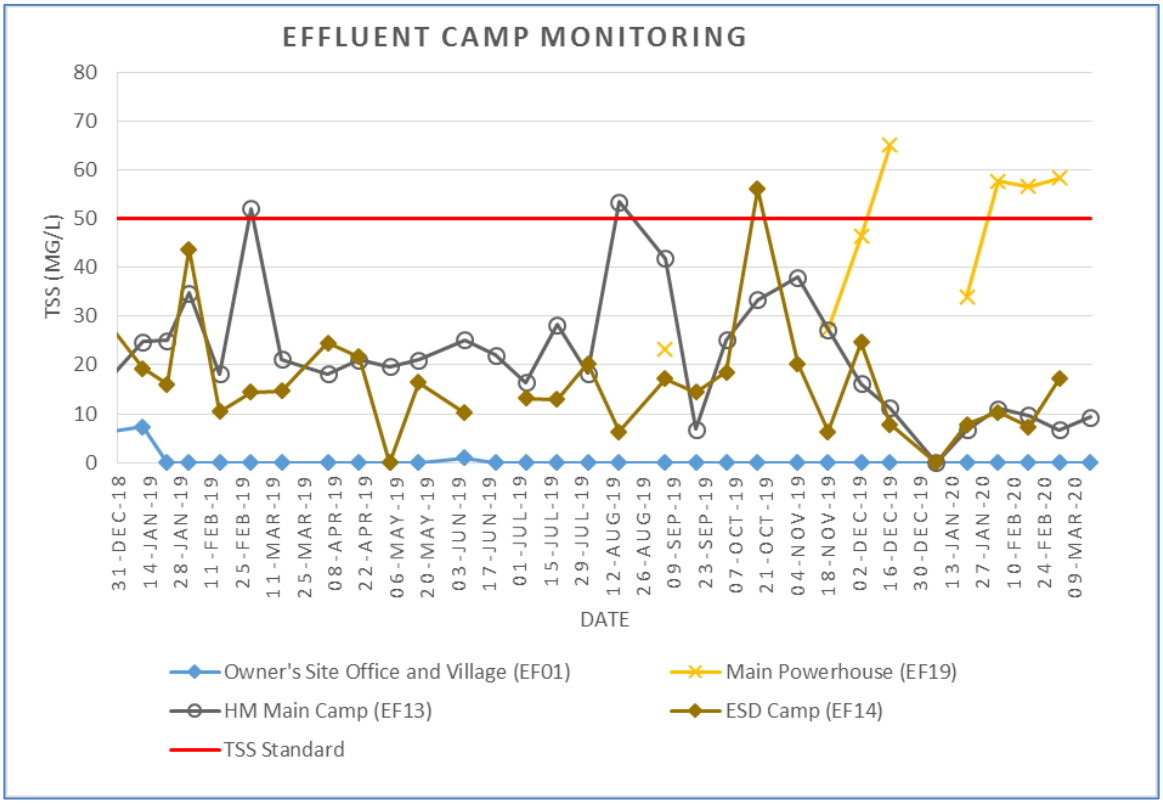
Key Water Quality Parameters for the Nam Ngiep Tributaries: Nam Chian, Nam Phouan, Nam Xao, Nam Houay Soup

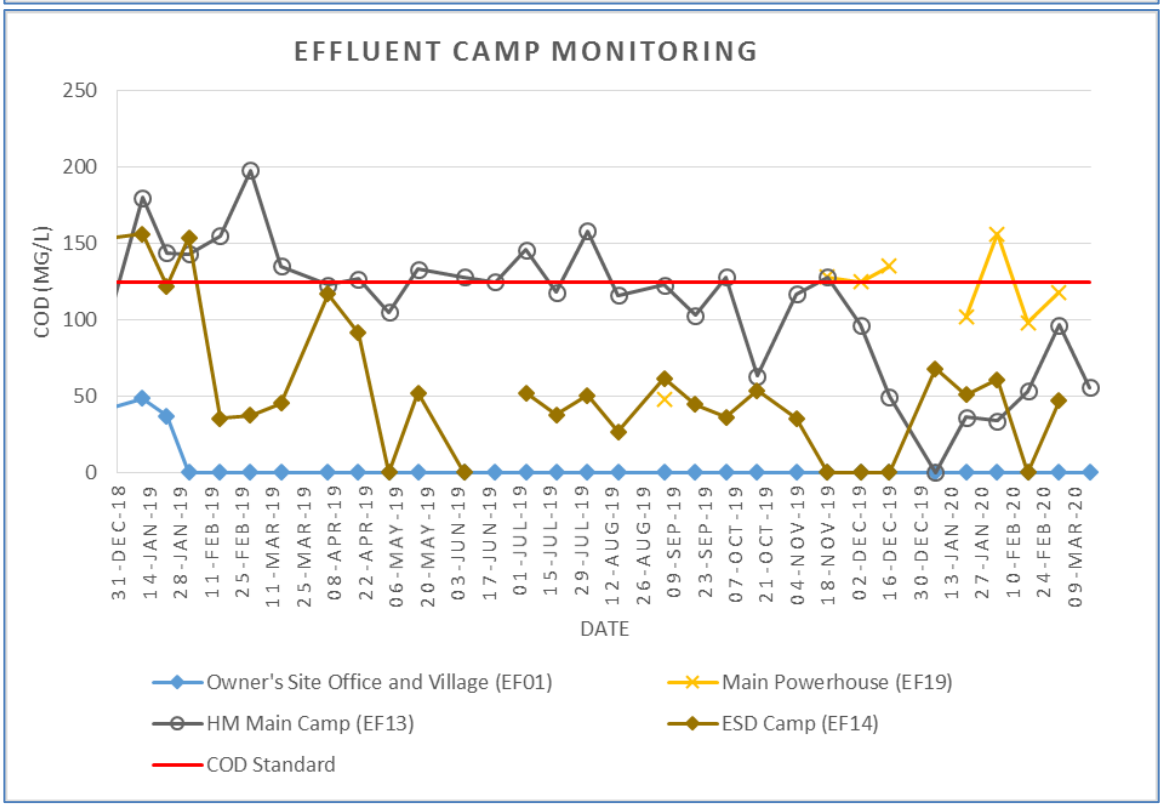


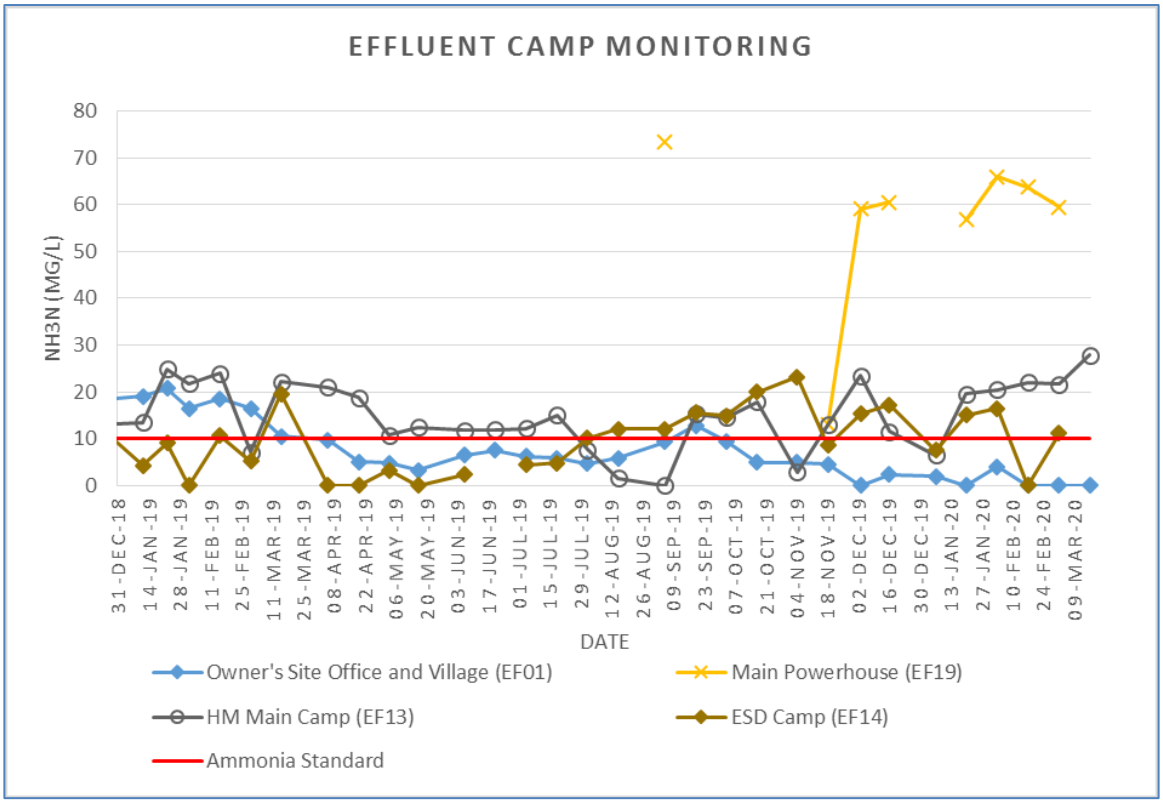


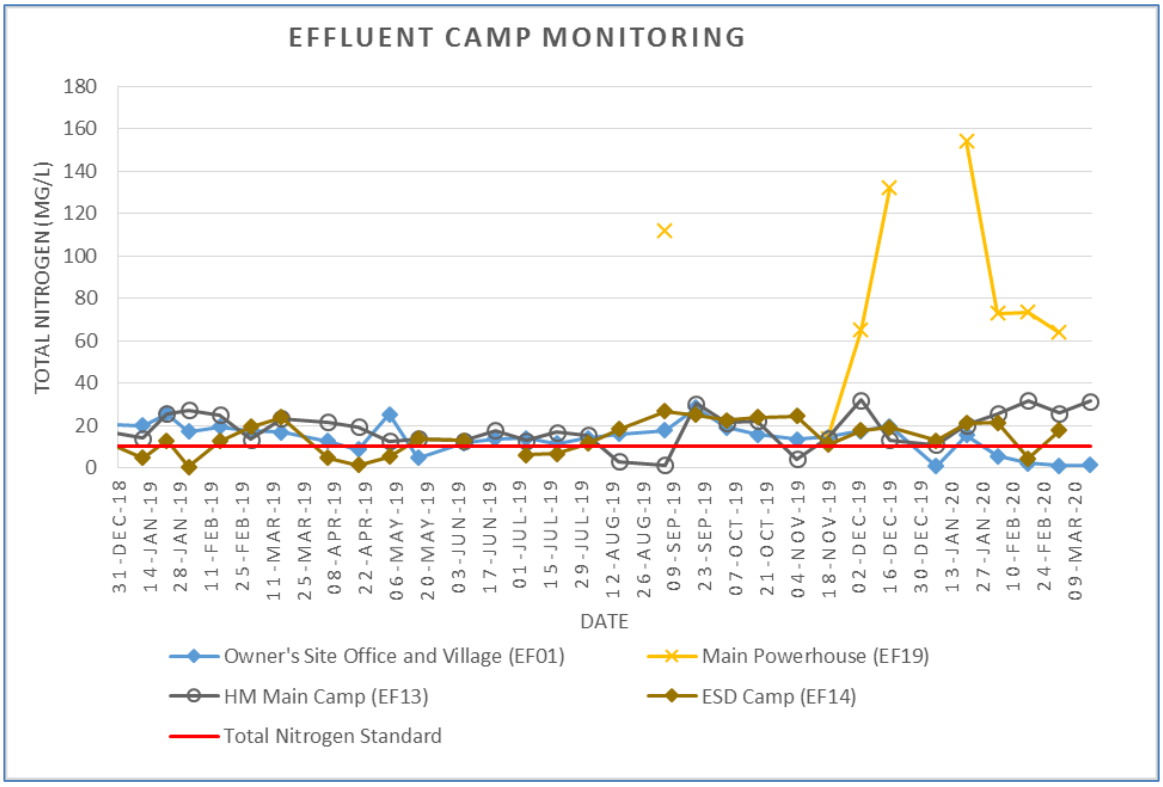


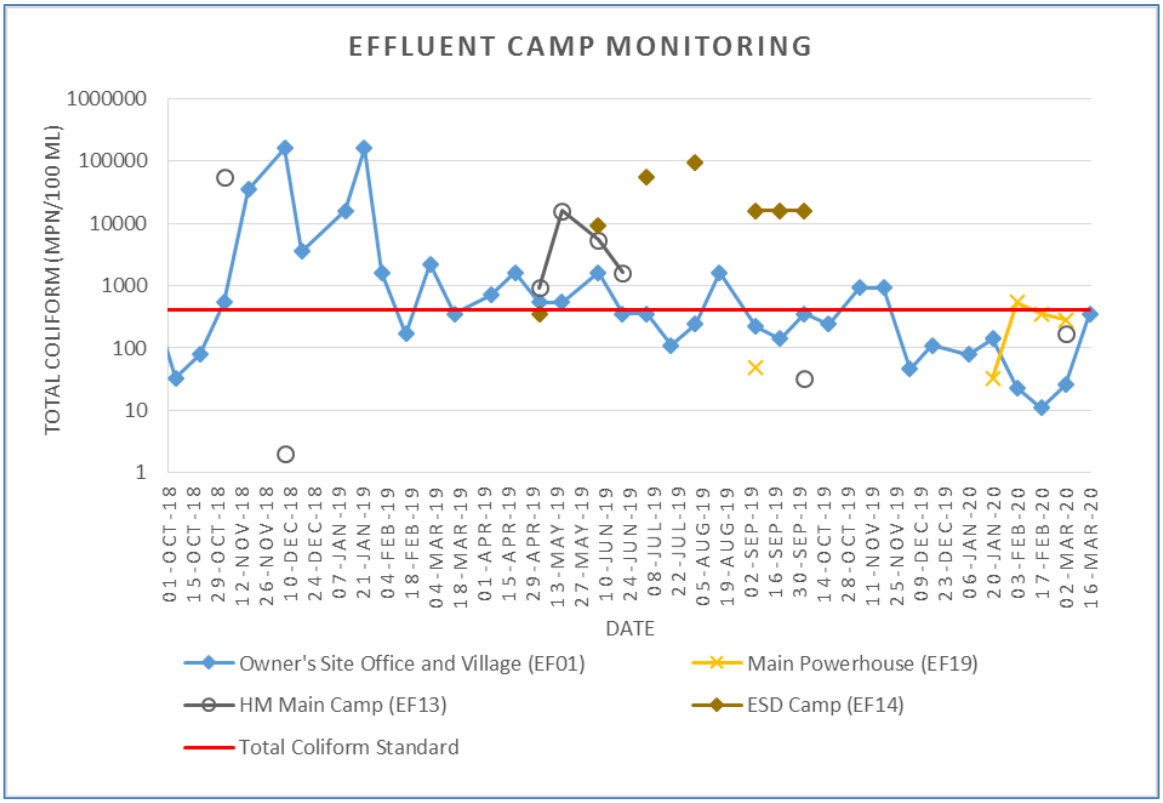
Camps' Effluent Water Quality Trends (Since December 2018 – March 2020)






EFFLUENT CAMP MONITORING
NH3N (MG/L)
80
70
60
50
40
30
20
10
0
31-DEC-18
14-JAN-19
28-JAN-19
11-FEB-19
25-FEB-19
11-MAR-19
25-MAR-19
08-APR-19
22-APR-19
06-MAY-19
20-MAY-19
03-JUN-19
17-JUN-19
01-JUL-19
15-JUL-19
29-JUL-19
12-AUG-19
26-AUG-19
09-SEP-19
23-SEP-19
07-OCT-19
21-OCT-19
04-NOV-19
18-NOV-19
02-DEC-19
16-DEC-19
30-DEC-19
13-JAN-20
27-JAN-20
10-FEB-20
24-FEB-20
09-MAR-20
DATE
Owner's Site Office and Village (EF01)
Main Powerhouse (EF19)
HM Main Camp (EF13)
ESD Camp (EF14)
Ammonia Standard


EFFLUENT CAMP MONITORING
TOTAL NITROGEN (MG/L)
180
160
140
120
100
80
60
40
20
0
31-DEC-18
14-JAN-19
28-JAN-19
11-FEB-19
25-FEB-19
11-MAR-19
25-MAR-19
08-APR-19
22-APR-19
06-MAY-19
20-MAY-19
03-JUN-19
17-JUN-19
01-JUL-19
15-JUL-19
29-JUL-19
12-AUG-19
26-AUG-19
09-SEP-19
23-SEP-19
07-OCT-19
21-OCT-19
04-NOV-19
18-NOV-19
02-DEC-19
16-DEC-19
30-DEC-19
13-JAN-20
27-JAN-20
10-FEB-20
24-FEB-20
09-MAR-20
DATE
Owner's Site Office and Village (EF01)
Main Powerhouse (EF19)
HM Main Camp (EF13)
ESD Camp (EF14)
Total Nitrogen Standard


EFFLUENT CAMP MONITORING
TOTAL COLIFORM (MPN/100 ML)
1000000
100000
10000
1000
100
10
1
01-OCT-18
15-OCT-18
29-OCT-18
12-NOV-18
26-NOV-18
10-DEC-18
24-DEC-18
07-JAN-19
21-JAN-19
04-FEB-19
18-FEB-19
04-MAR-19
18-MAR-19
01-APR-19
15-APR-19
29-APR-19
13-MAY-19
27-MAY-19
10-JUN-19
24-JUN-19
08-JUL-19
22-JUL-19
05-AUG-19
19-AUG-19
02-SEP-19
16-SEP-19
30-SEP-19
14-OCT-19
28-OCT-19
11-NOV-19
25-NOV-19
09-DEC-19
23-DEC-19
06-JAN-20
20-JAN-20
03-FEB-20
17-FEB-20
02-MAR-20
16-MAR-20
DATE
Owner's Site Office and Village (EF01)
Main Powerhouse (EF19)
HM Main Camp (EF13)
ESD Camp (EF14)
Total Coliform Standard

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APPENDIX 5: *WATER QUALITY MONITORING DATA*

APPENDIX 5-1: SURFACE WATER QUALITY MONITORING – Q1 2020

		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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
3-Jan-20	pH	5.0 - 9.0						6.55	7.03	7.21	7.29	6.18	6.9	6.33			6.28	6.65
7-Jan-20	pH	5.0 - 9.0		7.72	7.9	7.72	7.21									7.92		
8-Jan-20	pH	5.0 - 9.0						7.1	7.01	6.96	7.02	6.92	7.29	7.15			7.21	6.19
13-Jan-20	pH	5.0 - 9.0	6.42												6.45			
14-Jan-20	pH	5.0 - 9.0		6.72	7.3	7.76										7.05		
15-Jan-20	pH	5.0 - 9.0					7.21	7.37										
16-Jan-20	pH	5.0 - 9.0							6.27	6.22	6.49	6.97	6.82	7.04			6.6	6.94
21-Jan-20	pH	5.0 - 9.0		7.71	7.6	7.85	7.09									7.73		
22-Jan-20	pH	5.0 - 9.0						7.66	7.16	6.68	7.07	7.53	7.59	7.74			7.41	7.61
23-Jan-20	pH	5.0 - 9.0						7.39	7.25	7.12	7.22	7.5	7.54	7.7			7.54	7.32
27-Jan-20	pH	5.0 - 9.0	7.42												7.82			
28-Jan-20	pH	5.0 - 9.0						6.8	7.17	7	7.23	7.51	7.8	7.92			7.74	7.18
29-Jan-20	pH	5.0 - 9.0		7.61	7.6	7.49	7.24									7.68		
30-Jan-20	pH	5.0 - 9.0						6.74	6.81	6.93	7.32	7.55	7.63	7.76			7.5	7.78
4-Feb-20	pH	5.0 - 9.0		7.73	7.6	7.25	7.47									7.54		
5-Feb-20	pH	5.0 - 9.0						7.41	7.28	7.27	7.38	7.55	7.82	7.93			7.48	7.71
11-Feb-20	pH	5.0 - 9.0	7.77	7.87	7.8	7.64									8.35	7.95		

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
12-Feb-20	pH	5.0 - 9.0					7.35	7.57										
13-Feb-20	pH	5.0 - 9.0							7.32	7.33	7.32	7.62	7.9	8.04			7.69	7.32
19-Feb-20	pH	5.0 - 9.0		8.09	8.2	7.82	7.7									8.04		
20-Feb-20	pH	5.0 - 9.0						7.69	7.5	7.62	7.69	7.98	8.09	8.24			7.86	7.9
24-Feb-20	pH	5.0 - 9.0	7.33												7.48			
25-Feb-20	pH	5.0 - 9.0		6.81	6.5	6.39	6.71									6.65		
26-Feb-20	pH	5.0 - 9.0						6.59	6.7	6.68	6.8	6.91	7.18	7.34			6.98	7.2
3-Mar-20	pH	5.0 - 9.0		7.22	7.3	7.33	6.9									7.35		
4-Mar-20	pH	5.0 - 9.0						6.98	6.58	6.6	6.57	6.88	7.03	7.16			6.96	6.94
10-Mar-20	pH	5.0 - 9.0	8.18	7.31	7.6	6.9									8.8	7.35		
11-Mar-20	pH	5.0 - 9.0					7.07	7.51										
12-Mar-20	pH	5.0 - 9.0							6.24	6.46	6.43	6.64	6.91	7.02			6.75	6.82
17-Mar-20	pH	5.0 - 9.0		6.86	6.9	6.8	6.48									6.92		
18-Mar-20	pH	5.0 - 9.0						6.69	6.46	6.36	6.38	6.76	7.1	7.3			6.68	6.86
23-Mar-20	pH	5.0 - 9.0	6.65												8.46			
24-Mar-20	pH	5.0 - 9.0		7.11	7.9	6.78	7.19									7.32		
25-Mar-20	pH	5.0 - 9.0						7.55	6.68	6.95	6.36	6.55	6.62	6.75			6.61	6.52
3-Jan-20	Sat. DO (%)							86.4	50.1	29	50.5	45	69.9	78.1			97.1	74.4
7-Jan-20	Sat. DO (%)			110.8	101	103.4	100.5									104.2		
8-Jan-20	Sat. DO (%)							109.3	40.5	32.5	46.8	45	65.4	69.3			74.8	67.9

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
13-Jan-20	Sat. DO (%)		107.9												102.6			
14-Jan-20	Sat. DO (%)			103.5	87	92.6										77		
15-Jan-20	Sat. DO (%)						100.5	89.9										
16-Jan-20	Sat. DO (%)								47.1	36.7	71.02	73.4	71.6	74			76.8	74.3
21-Jan-20	Sat. DO (%)			79.8	78	77.9	85.8									88.7		
22-Jan-20	Sat. DO (%)							85.3	33	30.8	38.1	37.6	56	63.1			77.2	73.6
23-Jan-20	Sat. DO (%)							24.72	23.9	24.03	42.2	45.2	55.4	62.9			74.5	78
27-Jan-20	Sat. DO (%)		105.2												98.6			
28-Jan-20	Sat. DO (%)							22.5	37.4	39.7	59.4	56.4	66.2	72.6			75.2	71.1
29-Jan-20	Sat. DO (%)			86	49	65.5	58.4									86.9		
30-Jan-20	Sat. DO (%)							16.6	30.2	31.2	53.3	51.3	62.7	74.5			80.9	74.6
4-Feb-20	Sat. DO (%)			117.7	33	74.3	56.3									91.4		
5-Feb-20	Sat. DO (%)							40.3	42.3	15.7	49.2	43.8	67.2	74.4			72.9	64.9
11-Feb-20	Sat. DO (%)		109.7	123.6	45	69									108.2	88.2		
12-Feb-20	Sat. DO (%)						67.5	68.1										
13-Feb-20	Sat. DO (%)								39.1	34.4	52.9	49.7	61.2	64.2			78	76.2
19-Feb-20	Sat. DO (%)			95.5	60	80.7	77.2									86.2		
20-Feb-20	Sat. DO (%)							51.5	39.4	37.9	45.7	46.6	66.6	68.8			87.8	78
24-Feb-20	Sat. DO (%)		109.5												100.9			
25-Feb-20	Sat. DO (%)			105.9	70	77.5	80.5									88.5		

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
26-Feb-20	Sat. DO (%)							81.4	56.5	45	48.9	49.1	62.9	68			73.9	76.2
3-Mar-20	Sat. DO (%)			92.2	119	113.5	114.5									102.7		
4-Mar-20	Sat. DO (%)							103	32	27.3	46.4	58.4	60.8	69.1			75.4	75.7
10-Mar-20	Sat. DO (%)		108.7	85.4	85	97									101.3	98.1		
11-Mar-20	Sat. DO (%)						82.4	85.4										
12-Mar-20	Sat. DO (%)								31.4	13.3	28.3	31	58.9	67.8			59.1	84.1
17-Mar-20	Sat. DO (%)			113.2	124	110.3	108.5									94.8		
18-Mar-20	Sat. DO (%)							96.7	26.8	7.6	26.2	32.8	50.4	63.6			61.3	68.2
23-Mar-20	Sat. DO (%)		105.8												106.2			
24-Mar-20	Sat. DO (%)			90	116	97.1	93.2									95.4		
25-Mar-20	Sat. DO (%)							88.4	43.1	29.3	75.4	76.5	82	75.3			81.4	73.4
3-Jan-20	DO (mg/L)	>6.0						7.24	4.23	2.46	4.18	3.62	5.57	6.23			7.61	6.2
7-Jan-20	DO (mg/L)	>6.0		8.63	8.3	8.52	8.32									9.32		
8-Jan-20	DO (mg/L)	>6.0						9.07	3.42	2.79	3.97	3.63	5	5.53			6.23	5.62
13-Jan-20	DO (mg/L)	>6.0	8.54												8.15			
14-Jan-20	DO (mg/L)	>6.0		8.41	7	7.35										6.68		
15-Jan-20	DO (mg/L)	>6.0					8.32	7.39										
16-Jan-20	DO (mg/L)	>6.0							4.04	3.3	6.09	6.21	6.04	6.29			6.53	6.31
21-Jan-20	DO (mg/L)	>6.0		6.32	6.3	6.4	7.1									7.36		
22-Jan-20	DO (mg/L)	>6.0						7.1	2.78	2.58	3.18	3.14	4.63	5.16			6.14	6.03

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
23-Jan-20	DO (mg/L)	>6.0						6.76	3.32	3.1	3.51	3.77	4.61	5.18			6.17	6.46
27-Jan-20	DO (mg/L)	>6.0	8.63												8.27			
28-Jan-20	DO (mg/L)	>6.0						1.91	3.16	3.34	5.01	4.83	5.65	6.11			6.23	6.1
29-Jan-20	DO (mg/L)	>6.0		7.01	4	5.44	4.87									7.79		
30-Jan-20	DO (mg/L)	>6.0						1.4	2.56	2.6	4.49	4.35	5.23	6.22			6.84	6.12
4-Feb-20	DO (mg/L)	>6.0		9.61	2.7	6.18	4.72									7.99		
5-Feb-20	DO (mg/L)	>6.0						3.38	3.58	1.34	4.17	3.67	5.58	6.13			6.21	6.05
11-Feb-20	DO (mg/L)	>6.0	8.54	9.85	3.6	5.73									8.91	7.81		
12-Feb-20	DO (mg/L)	>6.0					5.63	5.68										
13-Feb-20	DO (mg/L)	>6.0							3.33	2.91	4.43	4.13	5.06	5.24			6.31	6.09
19-Feb-20	DO (mg/L)	>6.0		7.72	4.9	6.69	6.44									7.35		
20-Feb-20	DO (mg/L)	>6.0						4.34	3.35	3.22	3.8	3.88	5.49	5.64			7.03	6.67
24-Feb-20	DO (mg/L)	>6.0	8.69												8.47			
25-Feb-20	DO (mg/L)	>6.0		8.5	5.8	6.44	6.73									7.84		
26-Feb-20	DO (mg/L)	>6.0						6.86	4.77	3.84	4.08	4.09	5.22	5.63			6.06	6.23
3-Mar-20	DO (mg/L)	>6.0		7.85	9.7	9.25	9.4									8.64		
4-Mar-20	DO (mg/L)	>6.0						8.5	2.71	2.34	3.94	4.8	5.12	5.76			6.28	6.4
10-Mar-20	DO (mg/L)	>6.0	8.3	7.25	6.7	7.89									8.22	9.07		
11-Mar-20	DO (mg/L)	>6.0					6.72	6.92										
12-Mar-20	DO (mg/L)	>6.0							2.67	1.14	2.38	2.62	4.85	5.54			4.75	6.98

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
17-Mar-20	DO (mg/L)	>6.0		8.66	9.8	8.78	8.74									7.85		
18-Mar-20	DO (mg/L)	>6.0						7.77	2.39	0.64	2.16	2.69	4.02	5.11			4.85	5.5
23-Mar-20	DO (mg/L)	>6.0	8.38												8.52			
24-Mar-20	DO (mg/L)	>6.0		7.62	9.8	7.75	7.45									8.37		
25-Mar-20	DO (mg/L)	>6.0						7.14	3.75	2.49	6.34	6.35	7.02	6.09			6.86	6.17
3-Jan-20	Conductivity (µs/cm)							78	96	89	88	62.9	63.5	60.4			109.9	62.3
7-Jan-20	Conductivity (µs/cm)			94	92	82	77									83		
8-Jan-20	Conductivity (µs/cm)							78	100	90	89	62.2	83.6	61.6			84.4	49.9
13-Jan-20	Conductivity (µs/cm)		135.6												141.9			
14-Jan-20	Conductivity (µs/cm)			93	92	80										81		
15-Jan-20	Conductivity (µs/cm)						77	77										
16-Jan-20	Conductivity (µs/cm)								100	95	89	90	90	88			116	94
21-Jan-20	Conductivity (µs/cm)			93	92	80	78									83		
22-Jan-20	Conductivity (µs/cm)							77	100	97	95	93	90	88			121	80
23-Jan-20	Conductivity (µs/cm)							78	100	96	95	94	91	88			151	80
27-Jan-20	Conductivity (µs/cm)		83.6												26.2			
28-Jan-20	Conductivity (µs/cm)							81	96	94	91	91	90	89			116	69
29-Jan-20	Conductivity (µs/cm)			96	92	79	78									81		
30-Jan-20	Conductivity (µs/cm)							78	94	89	86	87	87	85			116	99
4-Feb-20	Conductivity (µs/cm)			95	91	81	78									81		

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
5-Feb-20	Conductivity (µs/cm)							78	91	88	86	87	85	84			99	66
11-Feb-20	Conductivity (µs/cm)		69.5	99	90	82									35.8	80		
12-Feb-20	Conductivity (µs/cm)						78	78										
13-Feb-20	Conductivity (µs/cm)								93	89	88	88	86	85			131	58
19-Feb-20	Conductivity (µs/cm)			104	90	82	78									81		
20-Feb-20	Conductivity (µs/cm)							78	91	89	90	88	88	86			168	93
24-Feb-20	Conductivity (µs/cm)		123.4												27.2			
25-Feb-20	Conductivity (µs/cm)			112	91	83	78									83		
26-Feb-20	Conductivity (µs/cm)							79	94	89	89	88	87	86			122	68
3-Mar-20	Conductivity (µs/cm)			103	89	85	79									88		
4-Mar-20	Conductivity (µs/cm)							79	97	94	93	95	89	88			174	71
10-Mar-20	Conductivity (µs/cm)		70.8	97	92	83									26.1	93		
11-Mar-20	Conductivity (µs/cm)						80	79										
12-Mar-20	Conductivity (µs/cm)								96	95	92	92	90	88			172	62
17-Mar-20	Conductivity (µs/cm)			99	92	81	79									74		
18-Mar-20	Conductivity (µs/cm)							78	94	93	101	96					168	68
23-Mar-20	Conductivity (µs/cm)		61.5												25			
24-Mar-20	Conductivity (µs/cm)			89	98	82	79									91		
25-Mar-20	Conductivity (µs/cm)							78	98	91	92	90	89	88			172	60
3-Jan-20	Temperature (°C)							24.41	23.96	23.96	24.65	24.54	26	25.9			26.9	25.4

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
7-Jan-20	Temperature (°C)			27.87	26	25.09	24.9									21.2		
8-Jan-20	Temperature (°C)							24.68	23.85	23.78	24.32	25	27.12	25.7			27	25.3
13-Jan-20	Temperature (°C)		25												24.5			
14-Jan-20	Temperature (°C)			25.75	26	26.66										22.41		
15-Jan-20	Temperature (°C)						24.9	24.94										
16-Jan-20	Temperature (°C)								23.76	23.53	24.15	24.08	24.66	25.23			23.82	23.77
21-Jan-20	Temperature (°C)			27.4	27	25.31	25.01									21.43		
22-Jan-20	Temperature (°C)							24.66	23.87	24.77	24.55	24.4	25.06	25.58			26.31	25.45
23-Jan-20	Temperature (°C)							24.72	23.9	24.03	24.62	24.45	24.79	25.2			24.84	24.6
27-Jan-20	Temperature (°C)		23												21.7			
28-Jan-20	Temperature (°C)							24.15	23.89	24.44	23.92	23.82	23.77	24.14			23.89	23.58
29-Jan-20	Temperature (°C)			25.89	25	24.82	24.51									20.5		
30-Jan-20	Temperature (°C)							24.06	23.64	24.62	24.04	23.74	24.48	24.24			23.77	23.22
4-Feb-20	Temperature (°C)			25.52	25	24.66	24.32									21.39		
5-Feb-20	Temperature (°C)							24.04	23.76	23.65	23.96	24.13	24.72	24.47			25.18	25.02
11-Feb-20	Temperature (°C)		26.1	27.1	25	24.71									23.1	21.38		
12-Feb-20	Temperature (°C)						24.59	24.52										
13-Feb-20	Temperature (°C)								23.74	23.78	24.24	24.19	25.04	25.64			26.1	25.33
19-Feb-20	Temperature (°C)			25.75	25	24.85	24.36									22.29		
20-Feb-20	Temperature (°C)							24.06	23.61	24.01	24.47	24.66	25.14	25.27			26.64	23.04

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
24-Feb-20	Temperature (°C)		25												21.8			
25-Feb-20	Temperature (°C)			26.82	26	24.83	24.41									21.4		
26-Feb-20	Temperature (°C)							24.17	23.77	23.78	24.46	24.27	24.76	25.23			25.58	25.53
3-Mar-20	Temperature (°C)			23.35	25	25.64	25.44									22.08		
4-Mar-20	Temperature (°C)							24.93	23.65	23.65	23.55	23.64	23.92	24.51			24.65	23.45
10-Mar-20	Temperature (°C)		26.9	24.36	27	25.86									23.4	18.4		
11-Mar-20	Temperature (°C)						25.57	25.93										
12-Mar-20	Temperature (°C)								23.73	23.66	24.17	24.26	25.06	25.81			26.65	24.78
17-Mar-20	Temperature (°C)			28.25	28	27.47	26.63									23.12		
18-Mar-20	Temperature (°C)							26.54	23.78	23.89	24.97	25.15	25.99	26.58			27.86	26.55
23-Mar-20	Temperature (°C)		25												23.9			
24-Mar-20	Temperature (°C)			23.8	24	27.24	26.98									22.01		
25-Mar-20	Temperature (°C)							26.33	22.58	24	24.32	24.89	23.78	26.27			26.48	24.13
3-Jan-20	Turbidity (NTU)							2.05	3.74	6.43	7.14	5.16	4.33	1.53			3.64	3.96
7-Jan-20	Turbidity (NTU)			5.1	2.3	2.26	2.03									11.43		
8-Jan-20	Turbidity (NTU)							2.26	4.41	7.7	9.58	11.77	7.35	7.23			7.13	6.52
13-Jan-20	Turbidity (NTU)		4.53												2.6			
14-Jan-20	Turbidity (NTU)			2.83	1.5	1.56										5.56		
15-Jan-20	Turbidity (NTU)						2.03	1.11										
16-Jan-20	Turbidity (NTU)								8.11	5.02	7.16	6.96	5.97	6.17			6.99	5.34

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
21-Jan-20	Turbidity (NTU)			4.91	2.2	2.23	2.18									5.83		
22-Jan-20	Turbidity (NTU)							2.18	3.75	3.27	5.51	8.47	6.9	7.02			5.67	5.8
23-Jan-20	Turbidity (NTU)							2.65	3.11	4.52	6.52	8.46	8.67	8.86			6.86	5.98
27-Jan-20	Turbidity (NTU)		2.74												1.65			
28-Jan-20	Turbidity (NTU)							2.48	2.81	4.18	8.88	8	9.64	7.3			6.65	6.31
29-Jan-20	Turbidity (NTU)			5.17	2.5	2.32	2.42									4.99		
30-Jan-20	Turbidity (NTU)							2.27	3.98	8.26	8.28	9.2	10.22	9.06			7.16	6.1
4-Feb-20	Turbidity (NTU)			5.51	3.6	2.35	2.57									4.56		
5-Feb-20	Turbidity (NTU)							2.62	3.31	6.47	6.99	7.57	6.62	7.68			7.02	6.1
11-Feb-20	Turbidity (NTU)		1.95	10.4	2.5	2.51									1.28	5.04		
12-Feb-20	Turbidity (NTU)						2.78	1.95										
13-Feb-20	Turbidity (NTU)								2.67	4.74	5.2	5.44	7.3	4.6			4.71	4.49
19-Feb-20	Turbidity (NTU)			8.84	2.7	2.68	2.26									4.99		
20-Feb-20	Turbidity (NTU)							2.5	4.83	4.7	5.07	7.18	6.12	8.66			5.08	5.42
24-Feb-20	Turbidity (NTU)		3.03												2.72			
25-Feb-20	Turbidity (NTU)			10.17	2.7	2.45	2.28									5.95		
26-Feb-20	Turbidity (NTU)							2.33	2.49	5.58	4.86	5.57	5.1	7.58			5.25	4.23
3-Mar-20	Turbidity (NTU)			30.49	2.9	2.32	2.14									6.02		
4-Mar-20	Turbidity (NTU)							2.16	3.15	4.87	5.16	6.89	11.15	8.69			148	9.02
10-Mar-20	Turbidity (NTU)		2.76	33.2	3.1	2.59									2	8.94		

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
10-Mar-20	Turbidity (NTU)-Hypolimnion					1.65												
11-Mar-20	Turbidity (NTU)						1.65	2.18										
11-Mar-20	Turbidity (NTU)-Hypolimnion						2.1	2.02										
12-Mar-20	Turbidity (NTU)								2.67	5.84	6.99	6.31	6.41	9.83			4.04	4.32
17-Mar-20	Turbidity (NTU)			40.5	2.2	2.25	2.01									4.08		
18-Mar-20	Turbidity (NTU)							2.01	2.8	4.7	5.27	5.43	5.35	6.62			4.78	3.89
23-Mar-20	Turbidity (NTU)		3.52												5.28			
24-Mar-20	Turbidity (NTU)			32.07	3.2	2.33	2.73									10.18		
25-Mar-20	Turbidity (NTU)							2.66	6.37	7.96	7.52	6.56	17.19	45.57			5.06	23.25
13-Jan-20	TSS (mg/L)		<5												<5			
14-Jan-20	TSS (mg/L)			5.86	<5	<5										34.08		
15-Jan-20	TSS (mg/L)						<5	<5										
16-Jan-20	TSS (mg/L)								28.53	8.13	6.04	10	<5	11.2			7.15	<5
11-Feb-20	TSS (mg/L)		<5	15.01		<5									<5	11.62		
11-Feb-20	TSS (mg/L)-Hypolimnion					<5												
12-Feb-20	TSS (mg/L)						<5	<5										
12-Feb-20	TSS (mg/L)-Hypolimnion						158.91	<5										
13-Feb-20	TSS (mg/L)								<5	<5	<5	<5	11.41	11.3			5.6	<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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
10-Mar-20	TSS (mg/L)		<5	71.2		<5									<5	49.49		
10-Mar-20	TSS (mg/L)-Hypolimnion					7.6												
11-Mar-20	TSS (mg/L)						<5	<5										
11-Mar-20	TSS (mg/L)-Hypolimnion						<5	5.2										
12-Mar-20	TSS (mg/L)								<5	6.27	5.06	<5	6.1	12.09			<5	<5
13-Jan-20	BOD_5 (mg/L)	<1.5	<1.0												<1.0			
14-Jan-20	BOD_5 (mg/L)	<1.5		1.29		1.91										<1.0		
15-Jan-20	BOD_5 (mg/L)	<1.5					<1.0	<1.0										
16-Jan-20	BOD_5 (mg/L)	<1.5							6.36	5.26	1.17	2.63	3.35	1.04			1.84	2.03
11-Feb-20	BOD_5 (mg/L)	<1.5	<1.0	3.1		<1.0									<1.0	<1.0		
11-Feb-20	BOD_5 (mg/L)-Hypolimnion	<1.5				<1.0												
12-Feb-20	BOD_5 (mg/L)	<1.5					<1.0	<1.0										
12-Feb-20	BOD_5 (mg/L)-Hypolimnion	<1.5					5.85	2.13										
13-Feb-20	BOD_5 (mg/L)	<1.5							<1.0	<1.0	<1.0	<1.0	<1.0	<1.0			1.87	2.12
10-Mar-20	BOD_5 (mg/L)	<1.5	<1	<1		<1									<1	<1		
10-Mar-20	BOD_5 (mg/L)-Hypolimnion	<1.5				2.2												
11-Mar-20	BOD_5 (mg/L)	<1.5					<1	<1	5.32	6.72	<1	<1	<1	<1			<1	<1

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
11-Mar-20	BOD_5 (mg/L)-Hypolimnion	<1.5					5	4.3										
13-Jan-20	COD (mg/L)	<5.0	7.9												<5.0			
14-Jan-20	COD (mg/L)	<5.0														9.1		
16-Jan-20	COD (mg/L)	<5.0							9.1	6.2	8.3	7.5	5.6	6.3			5.6	5.2
11-Feb-20	COD (mg/L)	<5.0	8.4												8.4			
13-Feb-20	COD (mg/L)	<5.0							6.8	7.6	<5.0	<5.0	5	6.6			13.2	12.2
10-Mar-20	COD (mg/L)	<5.0	7.2												8	8.8		
12-Mar-20	COD (mg/L)	<5.0							9.8	8.8	8.6	9	9	12			13.8	12.8
13-Jan-20	NH_3-N (mg/L)	<0.2	<0.2															
14-Jan-20	NH_3-N (mg/L)	<0.2		<0.2		<0.2	<0.2									<0.2		
15-Jan-20	NH_3-N (mg/L)	<0.2						<0.2										
11-Feb-20	NH_3-N (mg/L)	<0.2	<0.2	<0.2		<0.2									<0.2	<0.2		
11-Feb-20	NH_3-N (mg/L)-Hypolimnion	<0.2				<0.2												
12-Feb-20	NH_3-N (mg/L)	<0.2					<0.2	<0.2										
12-Feb-20	NH_3-N (mg/L)-Hypolimnion	<0.2					<0.2	<0.2										
10-Mar-20	NH_3-N (mg/L)	<0.2	<0.2	<0.2		<0.2									<0.2	<0.2		
10-Mar-20	NH_3-N (mg/L)-Hypolimnion	<0.2				<0.2												
11-Mar-20	NH_3-N (mg/L)	<0.2						<0.2										

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
11-Mar-20	NH_3-N (mg/L)-Hypolimnion	<0.2					<0.2	<0.2										
13-Jan-20	NO_3-N (mg/L)	<5.0	<0.02															
14-Jan-20	NO_3-N (mg/L)	<5.0		<0.02		<0.02	<0.02									<0.02		
15-Jan-20	NO_3-N (mg/L)	<5.0						<0.02										
11-Feb-20	NO_3-N (mg/L)	<5.0	<0.02	0.03		0.03									0.07	0.07		
11-Feb-20	NO_3-N (mg/L)-Hypolimnion	<5.0				0.03												
12-Feb-20	NO_3-N (mg/L)	<5.0		0.03			0.03	0.05										
12-Feb-20	NO_3-N (mg/L)-Hypolimnion	<5.0					<0.02	<0.02										
10-Mar-20	NO_3-N (mg/L)	<5.0	<0.02	<0.02		<0.02									0.07	<0.02		
10-Mar-20	NO_3-N (mg/L)-Hypolimnion	<5.0				<0.02												
11-Mar-20	NO_3-N (mg/L)	<5.0						<0.02										
11-Mar-20	NO_3-N (mg/L)-Hypolimnion	<5.0					<0.02	<0.02										
13-Jan-20	Faecal coliform (MPN/100 mL)	<1,000	79												11			
14-Jan-20	Faecal coliform (MPN/100 mL)	<1,000		2		0										14		
15-Jan-20	Faecal coliform (MPN/100 mL)	<1,000					2	0										
16-Jan-20	Faecal coliform (MPN/100 mL)	<1,000							0	0	5	2	17	33			14	23

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
11-Feb-20	Faecal coliform (MPN/100 mL)	<1,000	170	26		0									33	14		
11-Feb-20	Faecal coliform (MPN/100 mL)-Hypolimnion	<1,000				0												
12-Feb-20	Faecal coliform (MPN/100 mL)	<1,000					14	0										
12-Feb-20	Faecal coliform (MPN/100 mL)-Hypolimnion	<1,000					2	0										
13-Feb-20	Faecal coliform (MPN/100 mL)	<1,000							2	2	5	11	46	46			5	17
10-Mar-20	Faecal coliform (MPN/100 mL)	<1,000	170	920		0									79	33		
10-Mar-20	Faecal coliform (MPN/100 mL)-Hypolimnion	<1,000				0												
11-Mar-20	Faecal coliform (MPN/100 mL)	<1,000					0	0										
11-Mar-20	Faecal coliform (MPN/100 mL)-Hypolimnion	<1,000					0	0										
12-Mar-20	Faecal coliform (MPN/100 mL)	<1,000							0	0	7	8	11	27			17	27
13-Jan-20	Total Coliform (MPN/100 mL)	<5,000	170												240			

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
14-Jan-20	Total Coliform (MPN/100 mL)	<5,000		1,600		350										130		
15-Jan-20	Total Coliform (MPN/100 mL)	<5,000					240	27										
16-Jan-20	Total Coliform (MPN/100 mL)	<5,000							130	27	220	350	540	920			920	1,600
11-Feb-20	Total Coliform (MPN/100 mL)	<5,000	920	1,600		280									220	350		
11-Feb-20	Total Coliform (MPN/100 mL)-Hypolimnion	<5,000				17												
12-Feb-20	Total Coliform (MPN/100 mL)	<5,000					1,600	280										
12-Feb-20	Total Coliform (MPN/100 mL)-Hypolimnion	<5,000					170	140										
13-Feb-20	Total Coliform (MPN/100 mL)	<5,000							27	47	430	280	1,600	280			1,600	170
10-Mar-20	Total Coliform (MPN/100 mL)	<5,000	1,600	1,600		22									240	920		
10-Mar-20	Total Coliform (MPN/100 mL)-Hypolimnion	<5,000				21												
11-Mar-20	Total Coliform (MPN/100 mL)	<5,000					33	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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
11-Mar-20	Total Coliform (MPN/100 mL)-Hypolimnion	<5,000					13	40										
12-Mar-20	Total Coliform (MPN/100 mL)	<5,000							79	350	220	130	920	920			540	1,600
13-Jan-20	TKN (mg/L)		<1.5												<1.5			
14-Jan-20	TKN (mg/L)			<1.5		<1.5										<1.5		
15-Jan-20	TKN (mg/L)						<1.5	<1.5										
11-Feb-20	TKN (mg/L)		<1.5	<1.5		<1.5									<1.5	<1.5		
11-Feb-20	TKN (mg/L)-Hypolimnion					<1.5												
12-Feb-20	TKN (mg/L)						<1.5	<1.5										
12-Feb-20	TKN (mg/L)-Hypolimnion						<1.5	<1.5										
10-Mar-20	TKN (mg/L)		<1.5	<1.5		<1.5									<1.5	<1.5		
10-Mar-20	TKN (mg/L)-Hypolimnion					<1.5												
11-Mar-20	TKN (mg/L)							<1.5										
11-Mar-20	TKN (mg/L)-Hypolimnion						<1.5	<1.5										
13-Jan-20	TOC (mg/L)		1.02												0.72			
14-Jan-20	TOC (mg/L)					2.65										1.36		
15-Jan-20	TOC (mg/L)						1.6	1.72										

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
16-Jan-20	TOC (mg/L)								1.99	1.83	1.65	1.95	1.78	1.69			2.05	2.88
11-Feb-20	TOC (mg/L)		1.02												0.79	1.06		
13-Feb-20	TOC (mg/L)								1.54									
10-Mar-20	TOC (mg/L)		1.33												1.04	1.85		
12-Mar-20	TOC (mg/L)								1.73	1.74	1.7	1.62	1.82	1.61			3.16	2.9
14-Jan-20	Phytoplankton Biomass (g dry wt/m³)			5		2												
15-Jan-20	Phytoplankton Biomass (g dry wt/m³)						0.8	0.8										
11-Feb-20	Phytoplankton Biomass (g dry wt/m³)			13.2		1.8												
11-Feb-20	Phytoplankton Biomass (g dry wt/m³)-Hypolimnion					3.2												
12-Feb-20	Phytoplankton Biomass (g dry wt/m³)						0.4	0.6										
12-Feb-20	Phytoplankton Biomass (g dry wt/m³)-Hypolimnion						52	0.8										
10-Mar-20	Phytoplankton Biomass (g dry wt/m³)			50.6		2												
10-Mar-20	Phytoplankton Biomass (g dry wt/m³)-Hypolimnion					8.6												

		River Name	Nam Ngiep												Nam Chain	Nam Phouan	Nam Xao	Nam Houay Soup
		Zone	Location Refer to Construction Sites												Location Refer to Construction Sites			
			Upstream/Main Reservoir						Within / Re-regulation Reservoir						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
11-Mar-20	Phytoplankton Biomass (g dry wt/m³)							1.2										
11-Mar-20	Phytoplankton Biomass (g dry wt/m³)-Hypolimnion						5.6	2.6										
13-Jan-20	Total Phosphorus (mg/L)		0.03												<0.01			
14-Jan-20	Total Phosphorus (mg/L)			<0.01		<0.01										0.05		
15-Jan-20	Total Phosphorus (mg/L)						<0.01	<0.01										
11-Feb-20	Total Phosphorus (mg/L)		0.02	<0.01		<0.01									<0.01			
11-Feb-20	Total Phosphorus (mg/L)-Hypolimnion					<0.01												
12-Feb-20	Total Phosphorus (mg/L)						<0.01	<0.01								<0.01		
12-Feb-20	Total Phosphorus (mg/L)-Hypolimnion						0.02	0.02										
10-Mar-20	Total Phosphorus (mg/L)		<0.01	<0.01		<0.01									<0.01	<0.01		
10-Mar-20	Total Phosphorus (mg/L)-Hypolimnion					<0.01												
11-Mar-20	Total Phosphorus (mg/L)							<0.01										
11-Mar-20	Total Phosphorus (mg/L)-Hypolimnion						<0.01	<0.01										

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	Parameters (Unit)	Guideline																
13-Jan-20	Total Dissolved Phosphorus (mg/L)		0.02												<0.01			
14-Jan-20	Total Dissolved Phosphorus (mg/L)			<0.01		<0.01										0.05		
15-Jan-20	Total Dissolved Phosphorus (mg/L)						<0.01	<0.01										
11-Feb-20	Total Dissolved Phosphorus (mg/L)		<0.01	<0.01		<0.01									<0.01			
11-Feb-20	Total Dissolved Phosphorus (mg/L)-Hypolimnion					<0.01												
12-Feb-20	Total Dissolved Phosphorus (mg/L)						<0.01	<0.01								<0.01		
12-Feb-20	Total Dissolved Phosphorus (mg/L)-Hypolimnion						0.01	<0.01										
10-Mar-20	Total Dissolved Phosphorus (mg/L)		<0.01	<0.01		<0.01									<0.01	<0.01		
10-Mar-20	Total Dissolved Phosphorus (mg/L)-Hypolimnion					<0.01												
11-Mar-20	Total Dissolved Phosphorus (mg/L)							<0.01										
11-Mar-20	Total Dissolved Phosphorus (mg/L)-Hypolimnion						<0.01	<0.01										

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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						Tributaries Upstream		Tributaries Downstream	
		Station Code	NNG01	R01	R02	R03	R04	R05	R06	R07	NNG05	NNG06	NNG07	NNG08	NCH01	NPH01	NXA01	NHS01
Date	**Parameters (Unit)**	**Guideline**																
14-Jan-20	Hydrogen Sulfide (mg/L)			<0.02		<0.02												
15-Jan-20	Hydrogen Sulfide (mg/L)						<0.02	<0.02										
11-Feb-20	Hydrogen Sulfide (mg/L)					<0.02												
11-Feb-20	Hydrogen Sulfide (mg/L)-Hypolimnion					<0.02												
12-Feb-20	Hydrogen Sulfide (mg/L)						<0.02	<0.02										
12-Feb-20	Hydrogen Sulfide (mg/L)-Hypolimnion						0.21	0.57										
10-Mar-20	Hydrogen Sulfide (mg/L)			0.02		<0.02												
10-Mar-20	Hydrogen Sulfide (mg/L)-Hypolimnion					<0.02												
11-Mar-20	Hydrogen Sulfide (mg/L)							<0.02										
11-Mar-20	Hydrogen Sulfide (mg/L)-Hypolimnion						0.05	0.08										

APPENDIX 5-2: *EFFLUENT CAMP MONITORING RESULTS – Q1 2020*

		Site Name	Owner's Site Office and Village	ESD Camp (Former HM Camp)	ESD Camp (Former IHI Camp)	Main Powerhouse
		Station Code	EF01	EF13	EF14	EF19
Date	Parameter (Unit)	Guideline in the CA				
06-Jan-20	pH	6.0 - 9.0	7.09	6.57	6.81	
20-Jan-20	pH	6.0 - 9.0	7.06	7.15	7.4	6.88
03-Feb-20	pH	6.0 - 9.0	6.9	6.78	7.02	7.32
17-Feb-20	pH	6.0 - 9.0	6.9	7.19	6.36	7.6
02-Mar-20	pH	6.0 - 9.0	6.92	7.1	7.2	7.31
16-Mar-20	pH	6.0 - 9.0	6.46	7.27		
06-Jan-20	Sat. DO (%)		61.3	28.6	22.3	
20-Jan-20	Sat. DO (%)		75	49.9	31	39.7
03-Feb-20	Sat. DO (%)		46.4	20.9	16.1	40.9
17-Feb-20	Sat. DO (%)		47.6	55.7	78.5	59.7
02-Mar-20	Sat. DO (%)		40.7	45.8	21.6	58.9
16-Mar-20	Sat. DO (%)		58.3	50.1		
06-Jan-20	DO (mg/L)		4.74	2.25	1.64	
20-Jan-20	DO (mg/L)		5.92	3.93	2.44	3.05
03-Feb-20	DO (mg/L)		3.61	1.63	1.23	3
17-Feb-20	DO (mg/L)		3.71	4.41	6.11	4.5
02-Mar-20	DO (mg/L)		3.1	3.45	1.6	3.92
16-Mar-20	DO (mg/L)		4.39	3.65		
06-Jan-20	Conductivity (µs/cm)		351	352	433	
20-Jan-20	Conductivity (µs/cm)		336	464	348	991
03-Feb-20	Conductivity (µs/cm)		338	508	430	1016
17-Feb-20	Conductivity (µs/cm)		425	435	252	1050
02-Mar-20	Conductivity (µs/cm)		309	430	406	1006
16-Mar-20	Conductivity (µs/cm)		338	817		

		Site Name	Owner's Site Office and Village	ESD Camp (Former HM Camp)	ESD Camp (Former IHI Camp)	Main Powerhouse
		Station Code	EF01	EF13	EF14	EF19
Date	Parameter (Unit)	Guideline in the CA				
06-Jan-20	Temperature (°C)		27	25.9	30	
20-Jan-20	Temperature (°C)		25.9	26.1	26.3	27.6
03-Feb-20	Temperature (°C)		26.9	26.3	27.4	29.9
17-Feb-20	Temperature (°C)		26.9	26	27	28.9
02-Mar-20	Temperature (°C)		27.7	28.3	29.3	30.3
16-Mar-20	Temperature (°C)		28.6	29.4		
06-Jan-20	Turbidity (NTU)		0.98	5.87	8.91	
20-Jan-20	Turbidity (NTU)		1.07	14.25	16	11.29
03-Feb-20	Turbidity (NTU)		0.95	8.75	12.09	14.55
17-Feb-20	Turbidity (NTU)		0.73	9.1	9.32	11.41
02-Mar-20	Turbidity (NTU)		1.65	26.59	9.1	16.37
16-Mar-20	Turbidity (NTU)		0.69	11.18		
06-Jan-20	TSS (mg/L)	<50	<5	<5	<5	
20-Jan-20	TSS (mg/L)	<50	<5	6.66	7.8	34.04
03-Feb-20	TSS (mg/L)	<50	<5	11.02	10.36	57.65
17-Feb-20	TSS (mg/L)	<50	<5	9.76	7.31	56.56
02-Mar-20	TSS (mg/L)	<50	<5	6.77	17.14	58.23
16-Mar-20	TSS (mg/L)	<50	<5	9.3		
06-Jan-20	BOD_5 (mg/L)	<30	<6	<6	<6	
20-Jan-20	BOD_5 (mg/L)	<30	<6	<6	<6	<6
03-Feb-20	BOD_5 (mg/L)	<30	<6	<6	<6	26.92
17-Feb-20	BOD_5 (mg/L)	<30	<6	<6	<6	<6
02-Mar-20	BOD_5 (mg/L)	<30	<6	28.8	<6	12.18
16-Mar-20	BOD_5 (mg/L)	<30	7.38	<6		
06-Jan-20	COD (mg/L)	<125	<25	<25	68	

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		Site Name	Owner's Site Office and Village	ESD Camp (Former HM Camp)	ESD Camp (Former IHI Camp)	Main Powerhouse
		Station Code	EF01	EF13	EF14	EF19
Date	Parameter (Unit)	Guideline in the CA				
20-Jan-20	COD (mg/L)	<125	<25	36.4	50.8	102
03-Feb-20	COD (mg/L)	<125	<25	34	60.8	156
17-Feb-20	COD (mg/L)	<125	<25	53.4	<25	98.4
02-Mar-20	COD (mg/L)	<125	<25	96.6	47.2	118
16-Mar-20	COD (mg/L)	<125	<25	55.6		
06-Jan-20	NH_3-N (mg/L)	<10.0	2	6.5	7.5	
20-Jan-20	NH_3-N (mg/L)	<10.0	<1.5	19.6	15.1	56.7
03-Feb-20	NH_3-N (mg/L)	<10.0	4	20.5	16.4	66
17-Feb-20	NH_3-N (mg/L)	<10.0	<1.5	22	<1.5	63.7
02-Mar-20	NH_3-N (mg/L)	<10.0	<2	21.6	11.1	59.5
16-Mar-20	NH_3-N (mg/L)	<10.0	<2	27.8		
06-Jan-20	Total Nitrogen (mg/L)	<10.0	0.89	11	12.9	
20-Jan-20	Total Nitrogen (mg/L)	<10.0	15.6	20.3	21	154
03-Feb-20	Total Nitrogen (mg/L)	<10.0	5.48	25.6	21.3	72.8
17-Feb-20	Total Nitrogen (mg/L)	<10.0	2.14	31.8	4.44	73.6
02-Mar-20	Total Nitrogen (mg/L)	<10.0	1.07	25.8	17.8	63.8
16-Mar-20	Total Nitrogen (mg/L)	<10.0	1.34	31.6		
06-Jan-20	Total Phosphorus (mg/L)	<2	1.37	0.69	0.76	
20-Jan-20	Total Phosphorus (mg/L)	<2	1.54	1.67	1.36	2.92
03-Feb-20	Total Phosphorus (mg/L)	<2	1.21	1.46	1.25	2.66
17-Feb-20	Total Phosphorus (mg/L)	<2	1.35	1.47	0.61	2.55
02-Mar-20	Total Phosphorus (mg/L)	<2	0.87	1.02	0.51	1.82
16-Mar-20	Total Phosphorus (mg/L)	<2	1.23	1.49		
06-Jan-20	Oil & Grease (mg/L)	<10.0	<1	<1	<1	
20-Jan-20	Oil & Grease (mg/L)	<10.0				

		Site Name	Owner's Site Office and Village	ESD Camp (Former HM Camp)	ESD Camp (Former IHI Camp)	Main Powerhouse
		Station Code	EF01	EF13	EF14	EF19
Date	Parameter (Unit)	Guideline in the CA				
03-Feb-20	Oil & Grease (mg/L)	<10.0	<1	<1	<1	<1
17-Feb-20	Oil & Grease (mg/L)	<10.0				
02-Mar-20	Oil & Grease (mg/L)	<10.0	<1	<1	<1	<1
16-Mar-20	Oil & Grease (mg/L)	<10.0				
06-Jan-20	Total coliform (MPN/100 mL)	<400	79	0	0	
20-Jan-20	Total coliform (MPN/100 mL)	<400	140	0	0	33
03-Feb-20	Total coliform (MPN/100 mL)	<400	23	0	0	540
17-Feb-20	Total coliform (MPN/100 mL)	<400	11	0	0	350
02-Mar-20	Total coliform (MPN/100 mL)	<400	26	170	0	280
16-Mar-20	Total coliform (MPN/100 mL)	<400	350	0		
06-Jan-20	Faecal Coliform (MPN/100 mL)	<400	13	0	0	
20-Jan-20	Faecal Coliform (MPN/100 mL)	<400	6.8	0	0	33
03-Feb-20	Faecal Coliform (MPN/100 mL)	<400	4.5	0	0	350
17-Feb-20	Faecal Coliform (MPN/100 mL)	<400	0	0	0	350
02-Mar-20	Faecal Coliform (MPN/100 mL)	<400	14	70	0	79
16-Mar-20	Faecal Coliform (MPN/100 mL)	<400	7.8	0		
06-Jan-20	Effluent Discharge Volume (L/mn)		6			
20-Jan-20	Effluent Discharge Volume (L/mn)		7	4	3	
03-Feb-20	Effluent Discharge Volume (L/mn)			4	3.3	
17-Feb-20	Effluent Discharge Volume (L/mn)		4	4	3	
02-Mar-20	Effluent Discharge Volume (L/mn)		6	3	2	1650

		Site Name	Owner's Site Office and Village	ESD Camp (Former HM Camp)	ESD Camp (Former IHI Camp)	Main Powerhouse
		Station Code	EF01	EF13	EF14	EF19
Date	Parameter (Unit)	Guideline in the CA				
16-Mar-20	Effluent Discharge Volume (L/mn)		3	3		
06-Jan-20	Chlorination Dosing Rate (mL/mn)					
20-Jan-20	Chlorination Dosing Rate (mL/mn)			24	20	435
03-Feb-20	Chlorination Dosing Rate (mL/mn)			70	100	435
17-Feb-20	Chlorination Dosing Rate (mL/mn)			51	45	450
02-Mar-20	Chlorination Dosing Rate (mL/mn)			18	15	415
16-Mar-20	Chlorination Dosing Rate (mL/mn)			38		
06-Jan-20	Residual Chlorine (mg/L)	<1.0		0.96	0.81	
20-Jan-20	Residual Chlorine (mg/L)	<1.0		0.48	0.34	0.76
03-Feb-20	Residual Chlorine (mg/L)	<1.0		1.05	0.6	0.27
17-Feb-20	Residual Chlorine (mg/L)	<1.0		0.73	0.45	0.79
02-Mar-20	Residual Chlorine (mg/L)	<1.0		0.24	0.94	0.87
16-Mar-20	Residual Chlorine (mg/L)	<1.0		1.55		

APPENDIX 5-3: ***EFFLUENT CONSTRUCTION AREA DISCHARGED MONITORING RESULTS – Q1 2020***

Date	Site Name	Parameter (Unit)	pH	Sat. DO (%)	DO (mg/L)	Conductivity (µS/cm)	TDS (mg/L)	Temperature (°C)	Turbidity (NTU)	TSS (mg/L)
		Standard	6.0 - 9.0							<50
09-Jan-20	Spoil Disposal No.2	DS04	6.38	35.8	2.73	50.1	25.05	27.6	3.36	
16-Jan-20	Spoil Disposal No.2	DS04	5.6	63.7	5.32	63	31.5	24.88	1.83	2
31-Jan-20	Spoil Disposal No.2	DS04	6.32	43.9	3.52	56.7	28.35	25.3	3.92	
07-Feb-20	Spoil Disposal No.2	DS04	6.41	45.8	3.72	58	29	25	3.12	
14-Feb-20	Spoil Disposal No.2	DS04	6.35	50	3.94	55	27.5	25.5	3.13	
21-Feb-20	Spoil Disposal No.2	DS04	5.85	67.8	5.52	89	44.5	25.79	3.63	1.19
27-Feb-20	Spoil Disposal No.2	DS04	5.83	62.5	5.17	99	49.5	25.4	4.28	
04-Mar-20	Spoil Disposal No.2	DS04	6.3	76.5	6.37	188	94	24.62	613	217.5
12-Mar-20	Spoil Disposal No.2	DS04	5.65	52.2	4.22	102	51	26.48	3.73	
18-Mar-20	Spoil Disposal No.2	DS04	5.71	54.1	4.71	120	60	22.4	6.87	
25-Mar-20	Spoil Disposal No.2	DS04	5.5	40.5	3.32	95	47.5	25.52	6.51	

APPENDIX 5-4: ***GROUNDWATER QUALITY MONITORING RESULTS – Q1 2020***

Month Year	Parameter (Unit)	Site Name	Somseun Village	Nampa Village	Thongnoy Village	Pou Village
		Station	GSXN01	GNPA01	GTHN01	GPOU01
		Guideline				
21-Jan-20	pH	6.5 - 9.2	6.81	6.7	6.92	
07-Feb-20	pH	6.5 - 9.2	7.1	7.21	7	
11-Feb-20	pH	6.5 - 9.2				8.6
06-Mar-20	pH	6.5 - 9.2	7.11	7.16	7.24	
10-Mar-20	pH	6.5 - 9.2				7.66
21-Jan-20	Sat. DO (%)		80.4	82.8	78.8	
07-Feb-20	Sat. DO (%)			83	78.3	
11-Feb-20	Sat. DO (%)					87.7
06-Mar-20	Sat. DO (%)		80.3	89.6	70.4	
10-Mar-20	Sat. DO (%)					84.8
21-Jan-20	DO (mg/L)		6.51	6.66	6.41	
07-Feb-20	DO (mg/L)		6.56	6.45	5.94	
11-Feb-20	DO (mg/L)					6.83
06-Mar-20	DO (mg/L)		6.63	7.38	5.68	
10-Mar-20	DO (mg/L)					6.36
21-Jan-20	Conductivity (µS/cm)		301	310	308	
07-Feb-20	Conductivity (µS/cm)		296	276	344	
11-Feb-20	Conductivity (µS/cm)					19.93
06-Mar-20	Conductivity (µS/cm)		283	398	294	
10-Mar-20	Conductivity (µS/cm)					22.5
21-Jan-20	Temperature (°C)		23.7	23.2	24.8	
07-Feb-20	Temperature (°C)		28.4	27.1	28.5	
11-Feb-20	Temperature (°C)					26.2
06-Mar-20	Temperature (°C)		23.9	24.1	25.2	
10-Mar-20	Temperature (°C)					27.8
21-Jan-20	Turbidity (NTU)	<20	3.4	2.1	3.9	
07-Feb-20	Turbidity (NTU)	<20	0.68	0.71	0.82	
11-Feb-20	Turbidity (NTU)	<20				1.17
06-Mar-20	Turbidity (NTU)	<20	0.64	0.66	0.72	
10-Mar-20	Turbidity (NTU)	<20				3.9
21-Jan-20	Fecal coliform (MPN/100mL)	0	2	11	2	
07-Feb-20	Fecal coliform (MPN/100mL)	0	0	4.5	4.5	
11-Feb-20	Fecal coliform (MPN/100mL)	0				0
06-Mar-20	Fecal coliform (MPN/100mL)	0	0	11	22	
10-Mar-20	Fecal coliform (MPN/100mL)	0				0

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Month Year	Parameter (Unit)	Site Name	Somseun Village	Nampa Village	Thongnoy Village	Pou Village
		Station	GSXN01	GNPA01	GTHN01	GPOU01
		Guideline				
21-Jan-20	E.coli Bacteria (MPN/100mL)	0	2	11	2	
07-Feb-20	E.coli Bacteria (MPN/100mL)	0	0	4.5	2	
11-Feb-20	E.coli Bacteria (MPN/100mL)	0				0
06-Mar-20	E.coli Bacteria (MPN/100mL)	0	0	6.8	11	
10-Mar-20	E.coli Bacteria (MPN/100mL)	0				0
07-Feb-20	Arsenic (mg/L)	<0.05	0.001	0.0005	0.0018	
11-Feb-20	Arsenic (mg/L)	<0.05				0.001
07-Feb-20	Cadmium (mg/L)	<0.01	<0.003	<0.003	<0.003	
11-Feb-20	Cadmium (mg/L)	<0.01				<0.003
07-Feb-20	Total Iron (mg/L)	<1	0.02	<0.01	<0.01	
11-Feb-20	Total Iron (mg/L)	<1				0.021
07-Feb-20	Manganese (mg/L)	<0.5	<0.005	<0.005	<0.005	
11-Feb-20	Manganese (mg/L)	<0.5				0.053
07-Feb-20	Mercury (mg/L)	<0.001	<0.0002	<0.0002	<0.0002	
11-Feb-20	Mercury (mg/L)	<0.001				<0.0002
07-Feb-20	Lead (mg/L)	<0.05	<0.008	0.011	<0.008	
11-Feb-20	Lead (mg/L)	<0.05				<0.008

APPENDIX 5-5: *GRAVITY FED WATER SUPPLY MONITORING RESULTS – Q1 2020*

		Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline					
20-Jan-20	pH	6.5 - 8.6			6.69	6.21	6.18
21-Jan-20	pH	6.5 - 8.6	7.23	7.12			
07-Feb-20	pH	6.5 - 8.6	7.79	7.26	7.95	7.93	7.44
06-Mar-20	pH	6.5 - 8.6	7.78	7.58	7.85	7.9	7.88
20-Jan-20	Sat. DO (%)				92.7	94	91.7
21-Jan-20	Sat. DO (%)		101.5	99.9			
07-Feb-20	Sat. DO (%)		100.7	98.4	91.8	93.2	89
06-Mar-20	Sat. DO (%)		93.4	96.4	91.2	87.9	83
20-Jan-20	DO (mg/L)				7.67	7.37	7.16
21-Jan-20	DO (mg/L)		8.52	7.66			
07-Feb-20	DO (mg/L)		7.96	7.73	7.44	7.43	7.13
06-Mar-20	DO (mg/L)		7.82	8.17	7.86	7.49	7.05
20-Jan-20	Conductivity (µS/cm)	<1,000			18.2	13.13	12.58
21-Jan-20	Conductivity (µS/cm)	<1,000	40	70			
07-Feb-20	Conductivity (µS/cm)	<1,000	84.9	173.1	20.04	14.33	28.5
06-Mar-20	Conductivity (µS/cm)	<1,000	48.2	79	24.4	26.8	21.18
20-Jan-20	Temperature (°C)	<35			24.6	26.5	26.7
21-Jan-20	Temperature (°C)	<35	2.99	1.01			
07-Feb-20	Temperature (°C)	<35	26.3	26.7	24.8	25.8	25.5
06-Mar-20	Temperature (°C)	<35	23.3	22.7	21.8	22.3	22.4
20-Jan-20	Turbidity (NTU)	<10			1.27	1.16	1.36
21-Jan-20	Turbidity (NTU)	<10	2.99	1.01			
07-Feb-20	Turbidity (NTU)	<10	0.81	1.7	0.8	0.82	0.96
06-Mar-20	Turbidity (NTU)	<10	0.87	1.32	1.37	1.14	1.17
20-Jan-20	Faecal Coliform (MPN/100 mL)	0			79	170	220
21-Jan-20	Faecal Coliform (MPN/100 mL)	0	11	110			
07-Feb-20	Faecal Coliform (MPN/100 mL)	0	33	13	130	70	170
06-Mar-20	Faecal Coliform (MPN/100 mL)	0	13	110	170	350	540
20-Jan-20	E.coli Bacteria (MPN/100 mL)	0			49	170	170

		Site Name	Thaheua Village	Hat Gnuin Village	Phouhomxay Village		
		Station	WTHH02	WHGN02	WPHX01	WPHX02	WPHX03
Date	Parameter (Unit)	Guideline					
21-Jan-20	E.coli Bacteria (MPN/100 mL)	0	6.8	49			
07-Feb-20	E.coli Bacteria (MPN/100 mL)	0	33	13	79	49	170
06-Mar-20	E.coli Bacteria (MPN/100 mL)	0	7.8	110	34	130	170
07-Feb-20	Arsenic (mg/L)	<0.05	<0.0003	<0.0003			<0.0003
07-Feb-20	Cadmium (mg/L)	<0.003	<0.002	<0.002			<0.002
07-Feb-20	Iron (mg/L)		0.062	0.039			0.161
07-Feb-20	Lead (mg/L)	<0.01	<0.01	<0.01			<0.01
07-Feb-20	Manganese (mg/L)	<0.5	0.01	<0.005			<0.005
07-Feb-20	Mercury (mg/L)	<0.001	<0.0002	<0.0002			<0.0002

APPENDIX 5-6: *LANDFILL LEACHATE MONITORING RESULTS – Q1 2020*

		Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharged Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline							
6-Jan-20	pH	6.0-9.0				7.49		8.76	
6-Jan-20	Sat. DO (%)					147.1		256.8	
6-Jan-20	DO (mg/L)					10.49		18.8	
6-Jan-20	Conductivity (µS/cm)					203.5		451	
6-Jan-20	TDS (mg/L)					101		225.5	
6-Jan-20	Turbidity (NTU)					4.59		16.2	
6-Jan-20	BOD5 (mg/L)	<30				<6		28.8	
6-Jan-20	COD (mg/L)	<125				93.3		206	
6-Jan-20	Faecal Coliform (MPN/100mL)	<400				0		0	
6-Jan-20	Total Coliform (MPN/100mL)	<400				17		8	
6-Jan-20	Total nitrogen (mg/L)	<10				1		1	
6-Jan-20	Lead (mg/L)	<0.2				<0.031		<0.031	

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		Site Name	NNP1 Landfill Leachate					Houay Soup Landfill	
		Location	Pond No.01	Pond No.02	Pond No.03	Pond No.04	Discharge Point	Last pond	Discharged Point
		Station	LL1	LL2	LL3	LL4	LL5	LL6	LL7
Date	Parameter (Unit)	Guideline							
6-Jan-20	Copper (mg/L)					<0.006		<0.006	
6-Jan-20	Iron (mg/L)					1.29		1.2	
6-Jan-20	Ammonia nitrogen (mg/L)	<10				<2		<2	